FN Clarivate Analytics Web of Science

VR 1.0

PT J

AU Grgic, A

Nestle, U

Schaefer-Schuler, A

Kremp, S

Kirsch, CM

Hellwig, D

AF Grgic, Aleksandar

Nestle, Ursula

Schaefer-Schuler, Andrea

Kremp, Stephanie

Kirsch, Carl-Martin

Hellwig, Dirk

TI FDG-PET-BASED RADIOTHERAPY PLANNING IN LUNG CANCER: OPTIMUM BREATHING

PROTOCOL AND PATIENT POSITIONING-AN INTRAINDIVIDUAL COMPARISON

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

DE Non-small-cell lung carcinoma (NSCLC); Spiral computed tomography;

Positron emission tomography; Computer-assisted radiotherapy planning;

Computer-assisted image analysis

ID POSITRON-EMISSION-TOMOGRAPHY; TARGET VOLUME DEFINITION;

COMPUTED-TOMOGRAPHY; CO-REGISTRATION; CT; DELINEATION; IMPACT; MOTION

AB Purpose: Fluoro-2-deoxy-D-glucose (FDG)-positron emission tomography (PET) and PET/computed tomography (CT) are increasingly used for radiotherapy (RT) planning in patients with non-small-cell lung carcinoma. The planning process often is based on separately acquired FDG-PET/CT and planning CT scans. We compared intraindividual differences between PET acquired in diagnostic (D-PET) and RT treatment position (RT-PET) coregistered with planning CTs acquired using different breathing protocols.

Methods and Materials: Sixteen patients with non-small-cell lung carcinoma underwent two PET acquisitions (DPET and RT-PET) and three planning CT acquisitions (expiration [EXP], inspiration [INS], and mid-breath hold [MID]) on the same day. All scans were rigidly coregistered, resulting in six fused data sets: D-INS, D-EXP, D-MID, RT-INS, RT-EXP, and RT-MID. Fusion accuracy was assessed by three readers at eight anatomic landmarks, lung apices, aortic arch, heart, spine, sternum, carina, diaphragm, and tumor, by using an alignment score ranging from 1 (no alignment) to 5 (exact alignment).

Results: The RT-PET showed better alignment with any CT than D-PET (p < 0.001). With regard to breathing, RT-MID showed the best mean alignment score (3.7 +/- 1.0), followed by RT-EXP (3.5 +/- 0.9) and RT-INS (3.0 +/- 11.8), with all differences significant (p < 0.001). Comparing alignment scores with regard to anatomic landmarks, the largest deviations were found at the diaphragm, heart, and apices. Overall, there was fair agreement (K = 0.48; p < 0.001) among the three readers.

Conclusions: Significantly better fusion of PET and planning CT can be reached with PET acquired in the RT position. The best intraindividual fusion results are obtained with the planning CT performed during mid-breath hold. Our data justify the acquisition of a separate planning PET in RT treatment position if only a diagnostic PET scan is available. (C) 2009 Elsevier Inc.

C1 [Grgic, Aleksandar; Nestle, Ursula; Schaefer-Schuler, Andrea; Kirsch, Carl-Martin; Hellwig, Dirk] Univ Saarland, Med Ctr, Dept Nucl Med, D-66421 Homburg, Germany.

RP Grgic, A (通讯作者)，Univ Saarland, Med Ctr, Dept Nucl Med, Geb 50, D-66421 Homburg, Germany.

EM aleksandar.grgic@gmx.de

RI Hellwig, Dirk/O-8617-2019; Nestle, Ursula/ABG-2339-2021; Hellwig,

Dirk/A-4128-2008

OI Hellwig, Dirk/0000-0002-3056-0143;

CR Aquino SL, 2003, J COMPUT ASSIST TOMO, V27, P479, DOI 10.1097/00004728-200307000-00004

Beyer T, 2000, J NUCL MED, V41, P1369

Beyer T, 2003, EUR J NUCL MED MOL I, V30, P588, DOI 10.1007/s00259-002-1097-6

Bradley J, 2004, INT J RADIAT ONCOL, V59, P78, DOI 10.1016/j.ijrobp.2003.10.044

De Ruysscher D, 2005, INT J RADIAT ONCOL, V62, P988, DOI 10.1016/j.ijrobp.2004.12.019

Dwamena BA, 1999, RADIOLOGY, V213, P530, DOI 10.1148/radiology.213.2.r99nv46530

Fitton I, 2008, INT J RADIAT ONCOL, V70, P1403, DOI 10.1016/j.ijrobp.2007.08.063

Fitton I, 2007, RADIOTHER ONCOL, V83, P42, DOI 10.1016/j.radonc.2007.02.010

Fleiss J. L, 1981, STAT METHODS RATES P

Gilman MD, 2006, AM J ROENTGENOL, V187, P1357, DOI 10.2214/AJR.05.1427

Goerres GW, 2002, EUR J NUCL MED MOL I, V29, P351, DOI 10.1007/s00259-001-0710-4

Gould MK, 2003, ANN INTERN MED, V139, P879, DOI 10.7326/0003-4819-139-11-200311180-00013

Gould MK, 2003, ANN INTERN MED, V138, P724, DOI 10.7326/0003-4819-138-9-200305060-00009

Grosu AL, 2005, STRAHLENTHER ONKOL, V181, P483, DOI 10.1007/s00066-005-1422-7

Hellwig D, 2001, Pneumologie, V55, P367, DOI 10.1055/s-2001-16201

Jarritt PH, 2006, BRIT J RADIOL, V79, pS27, DOI 10.1259/bjr/35628509

Krishnasetty V, 2005, RADIOLOGY, V237, P635, DOI 10.1148/radiol.2372041719

Lardinois D, 2003, NEW ENGL J MED, V348, P2500, DOI 10.1056/NEJMoa022136

Nestle U, 2005, J NUCL MED, V46, P1342

Nestle U, 2007, EUR J NUCL MED MOL I, V34, P453, DOI 10.1007/s00259-006-0252-x

Nestle U, 2006, RADIOTHER ONCOL, V81, P209, DOI 10.1016/j.radonc.2006.09.011

Shekhar R, 2005, J NUCL MED, V46, P1488

Sonke JJ, 2008, INT J RADIAT ONCOL, V70, P590, DOI 10.1016/j.ijrobp.2007.08.067

Underberg RWM, 2006, RADIAT ONCOL, V1, DOI 10.1186/1748-717X-1-8

Vanuytsel LJ, 2000, RADIOTHER ONCOL, V55, P317, DOI 10.1016/S0167-8140(00)00138-9

Wolthaus JWH, 2005, PHYS MED BIOL, V50, P1569, DOI 10.1088/0031-9155/50/7/017

Wolz G, 2007, NUKLEARMED-NUCL MED, V46, P43, DOI 10.1055/s-0037-1616625

NR 27

TC 42

Z9 42

U1 0

U2 0

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD JAN 1

PY 2009

VL 73

IS 1

BP 103

EP 111

DI 10.1016/j.ijrobp.2008.03.063

PG 9

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA 385NF

UT WOS:000261820200017

PM 18632217

DA 2022-08-24

ER

PT J

AU Ubaldi, L

Valenti, V

Borgese, RF

Collura, G

Fantacci, ME

Ferrera, G

Iacoviello, G

Abbate, BF

Laruina, F

Tripoli, A

Retico, A

Marrale, M

AF Ubaldi, L.

Valenti, V.

Borgese, R. F.

Collura, G.

Fantacci, M. E.

Ferrera, G.

Iacoviello, G.

Abbate, B. F.

Laruina, F.

Tripoli, A.

Retico, A.

Marrale, M.

TI Strategies to develop radiomics and machine learning models for lung

cancer stage and histology prediction using small data samples

SO PHYSICA MEDICA-EUROPEAN JOURNAL OF MEDICAL PHYSICS

LA English

DT Article

DE Radiomics; Machine learning; Cross validation; Non-small cell lung

cancer

ID STEREOTACTIC ABLATIVE RADIOTHERAPY; ARTIFICIAL-INTELLIGENCE;

RADIATION-THERAPY; BODY RADIOTHERAPY; MEDICAL IMAGES; SURVIVAL;

CLASSIFICATION; DIAGNOSIS; OUTCOMES; SBRT

AB Predictive models based on radiomics and machine-learning (ML) need large and annotated datasets for training, often difficult to collect. We designed an operative pipeline for model training to exploit data already available to the scientific community. The aim of this work was to explore the capability of radiomic features in predicting tumor histology and stage in patients with non-small cell lung cancer (NSCLC).

We analyzed the radiotherapy planning thoracic CT scans of a proprietary sample of 47 subjects (L-RT) and integrated this dataset with a publicly available set of 130 patients from the MAASTRO NSCLC collection (Lung1). We implemented intra- and inter-sample cross-validation strategies (CV) for evaluating the ML predictive model performances with not so large datasets.

We carried out two classification tasks: histology classification (3 classes) and overall stage classification (two classes: stage I and II). In the first task, the best performance was obtained by a Random Forest classifier, once the analysis has been restricted to stage I and II tumors of the Lung1 and L-RT merged dataset (AUC = 0.72 +/- 0.11). For the overall stage classification, the best results were obtained when training on Lung1 and testing of L-RT dataset (AUC = 0.72 +/- 0.04 for Random Forest and AUC = 0.84 +/- 0.03 for linear-kernel Support Vector Machine).

According to the classification task to be accomplished and to the heterogeneity of the available dataset(s), different CV strategies have to be explored and compared to make a robust assessment of the potential of a predictive model based on radiomics and ML.

C1 [Ubaldi, L.; Fantacci, M. E.; Laruina, F.] Univ Pisa, Phys Dept, Pisa, Italy.

[Ubaldi, L.; Fantacci, M. E.; Laruina, F.; Retico, A.] Natl Inst Nucl Phys INFN, Pisa Div, Largo Bruno Pontecorvo 3, I-56127 Pisa, Italy.

[Valenti, V.; Tripoli, A.] REM Radiat Therapy Ctr, I-95029 Catania, Italy.

[Borgese, R. F.; Collura, G.; Marrale, M.] Univ Palermo, Phys & Chem Dept Emilio Segre, Palermo, Italy.

[Borgese, R. F.; Collura, G.; Marrale, M.] Natl Inst Nucl Phys INFN, Catania Div, Catania, Italy.

[Iacoviello, G.; Abbate, B. F.] ARNAS Civ Hosp, Med Phys Dept, Palermo, Italy.

[Ferrera, G.] ARNAS Civ Hosp, Radiat Oncol, Palermo, Italy.

RP Retico, A (通讯作者)，Natl Inst Nucl Phys INFN, Pisa Div, Largo Bruno Pontecorvo 3, I-56127 Pisa, Italy.

RI Fantacci, Maria Evelina/ABD-4227-2020; ferrera, giuseppe/AAD-2649-2019;

MARRALE, MAURIZIO/I-9926-2014

OI Fantacci, Maria Evelina/0000-0003-2130-4372; MARRALE,

MAURIZIO/0000-0002-0091-3243; Valenti, Vito/0000-0002-2247-339X;

Laruina, Francesco/0000-0002-9401-9460; Collura,

Giorgio/0000-0003-0169-174X

FU INFN

FX This work has been carried out within the Artificial Intelligence in

Medicine (AIM) project funded by INFN (CSN5, 2019-2021) , https://

www.pi.infn.it/aim.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Arcangeli S, 2015, BRIT J RADIOL, V88, DOI 10.1259/bjr.20140728

Astaraki M, 2021, PHYS MEDICA, V83, P146, DOI 10.1016/j.ejmp.2021.03.013

Aurelien, 2019, HANDS ON MACHINE LEA

Avanzo M, 2021, PHYS MEDICA, V83, P221, DOI 10.1016/j.ejmp.2021.04.010

Avanzo M, 2020, MED PHYS, V47, pE185, DOI 10.1002/mp.13678

Baine MJ, 2018, LUNG CANCER, V118, P20, DOI 10.1016/j.lungcan.2018.01.021

Balagurunathan Y, PHYS MED, V83, P72, DOI [10.1016/j, DOI 10.1016/J]

Baumann P, 2009, J CLIN ONCOL, V27, P3290, DOI 10.1200/JCO.2008.21.5681

Beckers R, 2021, PHYS MEDICA, V83, P1, DOI 10.1016/j.ejmp.2021.02.011

Biship C. M, 2006, PATTERN RECOGN, V4

Brawley OW, 2011, CA-CANCER J CLIN, V61, P67, DOI 10.3322/caac.20108

Castiglioni I, 2021, PHYS MEDICA, V83, P9, DOI 10.1016/j.ejmp.2021.02.006

Chang JY, 2014, INT J RADIAT ONCOL, V88, P1120, DOI 10.1016/j.ijrobp.2014.01.022

Chansky K, 2009, J THORAC ONCOL, V4, P792, DOI 10.1097/JTO.0b013e3181a7716e

Chi A, 2010, RADIOTHER ONCOL, V94, P1, DOI 10.1016/j.radonc.2009.12.008

Crino L, 2010, ANN ONCOL, V21, pv103, DOI 10.1093/annonc/mdq207

Cuccia F, 2020, J GERIATR ONCOL, V11, P475, DOI 10.1016/j.jgo.2019.05.002

Diaz O, 2021, PHYS MEDICA, V81, P141, DOI 10.1016/j.ejmp.2020.11.037

Edge SB, 2010, ANN SURG ONCOL, V17, P1471, DOI 10.1245/s10434-010-0985-4

Ferini G, 2021, IN VIVO, V35, P1379, DOI 10.21873/invivo.12390

Ferlay J, 2019, INT J CANCER, V144, P1941, DOI 10.1002/ijc.31937

Figlia V, 2018, RADIOL MED, V123, P406, DOI 10.1007/s11547-018-0858-7

Franks KN, 2015, CLIN ONCOL-UK, V27, P280, DOI 10.1016/j.clon.2015.01.006

Ganeshan B, 2010, CANCER IMAGING, V10, P137, DOI 10.1102/1470-7330.2010.0021

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Halabi S, 2014, J CLIN ONCOL, V32, P671, DOI 10.1200/JCO.2013.52.3696

Hofman V, 2014, B CANCER, V101, P958, DOI 10.1684/bdc.2014.2041

Hrnjica B, 2018, EMERGING RES OPPORTU, P310, DOI [DOI 10.4018/978-1-5225-6005-0, 10.4018/978-1-5225-6005-0]

Kikinis R., 2014, INTRAOPERATIVE IMAGI, P277, DOI DOI 10.1007/978-1-4614-7657-3\_19

Kortesniemi M, 2018, PHYS MEDICA, V56, P90, DOI 10.1016/j.ejmp.2018.11.005

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Louie AV, 2014, CHEST, V146, P1021, DOI 10.1378/chest.13-2924

Manco L, 2021, PHYS MEDICA, V83, P194, DOI 10.1016/j.ejmp.2021.03.026

Muren LP, 2013, RADIOTHER ONCOL, V109, P337, DOI 10.1016/j.radonc.2013.11.007

Nardone V, 2020, ONCOL LETT, V19, P1559, DOI 10.3892/ol.2019.11220

Onishi H, 2004, CANCER-AM CANCER SOC, V101, P1623, DOI 10.1002/cncr.20539

Ost D, 2008, AM J RESP CRIT CARE, V177, P516, DOI 10.1164/rccm.200706-815OC

Papadimitroulas P, 2021, PHYS MEDICA, V83, P108, DOI 10.1016/j.ejmp.2021.03.009

Patil R, 2016, TOMOGRAPHY, V2, P374, DOI 10.18383/j.tom.2016.00244

Pedregosa F, 2011, J MACH LEARN RES, V12, P2825

Pieper S, 2004, 2004 2ND IEEE INTERNATIONAL SYMPOSIUM ON BIOMEDICAL IMAGING: MACRO TO NANO, VOLS 1 and 2, P632

Raschka S., 2017, MACHINE LEARNING PYT

Rizzo Stefania, 2018, Eur Radiol Exp, V2, P36, DOI 10.1186/s41747-018-0068-z

Rusthoven KE, 2010, JAMA-J AM MED ASSOC, V303, P2354, DOI 10.1001/jama.2010.777

Scott WJ, 2007, CHEST, V132, p234S, DOI 10.1378/chest.07-1378

Senthi S, 2013, RADIOTHER ONCOL, V106, P276, DOI 10.1016/j.radonc.2013.01.004

Shiue K, 2018, J THORAC ONCOL, V13, P1549, DOI 10.1016/j.jtho.2018.06.007

Tran B, 2012, J CLIN ONCOL, V30, P647, DOI 10.1200/JCO.2011.39.2316

Traverso A, 2018, INT J RADIAT ONCOL, V102, P1143, DOI 10.1016/j.ijrobp.2018.05.053

Vadala RE, 2016, CLIN TRANSL ONCOL, V18, P1158, DOI 10.1007/s12094-016-1552-7

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Vansteenkiste J, 2014, ANN ONCOL, V25, P1462, DOI 10.1093/annonc/mdu089

Vellido A, 2020, NEURAL COMPUT APPL, V32, P18069, DOI 10.1007/s00521-019-04051-w

Woody NM, 2017, J THORAC ONCOL, V12, P510, DOI 10.1016/j.jtho.2016.11.002

Wu WM, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00071

Yip SSF, 2016, PHYS MED BIOL, V61, pR150, DOI 10.1088/0031-9155/61/13/R150

Zhang JX, 2013, LANCET ONCOL, V14, P1295, DOI 10.1016/S1470-2045(13)70491-1

NR 59

TC 3

Z9 3

U1 4

U2 8

PU ELSEVIER SCI LTD

PI OXFORD

PA THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

SN 1120-1797

EI 1724-191X

J9 PHYS MEDICA

JI Phys. Medica

PD OCT

PY 2021

VL 90

BP 13

EP 22

DI 10.1016/j.ejmp.2021.08.015

EA SEP 2021

PG 10

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA UY5ZN

UT WOS:000701601700003

PM 34521016

OA Green Published

DA 2022-08-24

ER

PT J

AU Tortora, M

Cordelli, E

Sicilia, R

Miele, M

Matteucci, P

Iannello, G

Ramella, S

Soda, P

AF Tortora, Matteo

Cordelli, Ermanno

Sicilia, Rosa

Miele, Marianna

Matteucci, Paolo

Iannello, Giulio

Ramella, Sara

Soda, Paolo

TI Deep Reinforcement Learning for Fractionated Radiotherapy in Non-Small

Cell Lung Carcinoma

SO ARTIFICIAL INTELLIGENCE IN MEDICINE

LA English

DT Article

DE Deep reinforcement learning; D3QN; Particle swarm optimization; NSCLC;

Radiation therapy; Tumour treatment optimization

ID MATHEMATICAL-MODELS; OPTIMIZATION; CANCER; TISSUE; TUMOR

AB Lung cancer is by far the leading cause of cancer death among both men and women. Radiation therapy is one of the main approaches to lung cancer treatment, and its planning is crucial for the therapy outcome. However, the current practice that uniformly delivers the dose does not take into account the patient-specific tumour features that may affect treatment success. Since radiation therapy is by its very nature a sequential procedure, Deep Reinforcement Learning (DRL) is a well-suited methodology to overcome this limitation. In this respect, in this work we present a DRL controller optimizing the daily dose fraction delivered to the patient on the basis of CT scans collected over time during the therapy, offering a personalized treatment not only for volume adaptation, as currently intended, but also for daily fractionation. Furthermore, this contribution introduces a virtual radiotherapy environment based on a set of ordinary differential equations modelling the tissue radiosensitivity by combining both the effect of the radiotherapy treatment and cell growth. Their parameters are estimated from CT scans routinely collected using the Particle Swarm Optimization algorithm. This permits the DRL to learn the optimal behaviour through an iterative trial and error process with the environment. We performed several experiments considering three rewards functions modelling treatment strategies with different tissue aggres-siveness and two exploration strategies for the exploration-exploitation dilemma. The results show that our DRL approach can adapt to radiation therapy treatment, optimizing its behaviour according to the different reward functions and outperforming the current clinical practice.

C1 [Tortora, Matteo; Cordelli, Ermanno; Sicilia, Rosa; Iannello, Giulio; Soda, Paolo] Univ Campus Biomed Rome, Dept Engn, Unit Comp Syst & Bioinformat, Via Alvaro del Portillo 21, I-00128 Rome, Italy.

[Miele, Marianna; Matteucci, Paolo; Ramella, Sara] Univ Campus Biomed Rome, Dept Med, Radiat Oncol, Via Alvaro del Portillo 21, I-00128 Rome, Italy.

RP Cordelli, E (通讯作者)，Univ Campus Biomed Rome, Dept Engn, Unit Comp Syst & Bioinformat, Via Alvaro del Portillo 21, I-00128 Rome, Italy.

EM m.tortora@unicampus.it; e.cordelli@unicampus.it; r.sicilia@unicampus.it;

m.miele@unicampus.it; p.matteucci@unicampus.it; g.iannello@unicampus.it;

s.ramella@unicampus.it; p.soda@unicampus.it

RI Sicilia, Rosa/AAC-6012-2022; RAMELLA, SARA/AAC-6523-2022

OI Sicilia, Rosa/0000-0002-2513-0827; RAMELLA, SARA/0000-0002-5782-7717;

Tortora, Matteo/0000-0002-3932-7380

CR Arulkumaran K, 2017, IEEE SIGNAL PROC MAG, V34, P26, DOI 10.1109/MSP.2017.2743240

Belfatto A, 2016, IEEE J BIOMED HEALTH, V20, P802, DOI 10.1109/JBHI.2015.2453437

Bentzen SM., 2009, BASIC CLIN RADIOBIOL, V4th, P120

Bentzen SM, 2012, RADIOTHER ONCOL, V105, P266, DOI 10.1016/j.radonc.2012.10.006

Benzekry S, 2014, PLOS COMPUT BIOL, V10, DOI 10.1371/journal.pcbi.1003800

Bibault JE, 2013, CANCER METAST REV, V32, P479, DOI 10.1007/s10555-013-9419-7

Bodgi L, 2016, J THEOR BIOL, V394, P93, DOI 10.1016/j.jtbi.2016.01.018

Boski M, 2017, 2017 10TH INTERNATIONAL WORKSHOP ON MULTIDIMENSIONAL (ND) SYSTEMS (NDS)

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Burnet Neil G, 2004, Cancer Imaging, V4, P153, DOI 10.1102/1470-7330.2004.0054

Busoniu L, 2008, IEEE T SYST MAN CY C, V38, P156, DOI 10.1109/TSMCC.2007.913919

Chapman JD, 2016, RADIOTHERAPY TREATME, V1st

Coronato A, 2022, IEEE T KNOWL DATA EN, V34, P3095, DOI 10.1109/TKDE.2020.3023553

Coronato A, 2020, ARTIF INTELL MED, V109, DOI 10.1016/j.artmed.2020.101964

Dong Y, 2019, BMC MED INF DECIS MA, V19, P19

Ertefaie A, 2016, STAT MED, V35, P2221, DOI 10.1002/sim.6859

Escandell-Montero P, 2014, ARTIF INTELL MED, V62, P47, DOI 10.1016/j.artmed.2014.07.004

Floreano D., 2008, BIOINSPIRED ARTIFICI

Fortunato M, INT C LEARN REPR

Fowler J. F., 2011, TECHNICAL BASIS RAD, P3

FOWLER JF, 1989, BRIT J RADIOL, V62, P679, DOI 10.1259/0007-1285-62-740-679

Gareth J., 2013, INTRO STAT LEARNING

Gerlee P, 2013, CANCER RES, V73, P2407, DOI 10.1158/0008-5472.CAN-12-4355

Gottesman O, 2019, NAT MED, V25, P16, DOI 10.1038/s41591-018-0310-5

Hasselt H. V., 2010, ADV NEURAL INFORM PR, V23, P2613

Hessel M, 2018, AAAI CONF ARTIF INTE, P3215

ISO I., 2007, MED DEVICES APPL RIS

Jalalimanesh A, 2017, J EXP THEOR ARTIF IN, V29, P1071, DOI 10.1080/0952813X.2017.1292319

Jalalimanesh A, 2017, MATH COMPUT SIMULAT, V133, P235, DOI 10.1016/j.matcom.2016.05.008

Jones B, 1999, ACTA ONCOL, V38, P883, DOI 10.1080/028418699432572

Kennedy J., 1995, 1995 IEEE International Conference on Neural Networks Proceedings (Cat. No.95CH35828), P1942, DOI 10.1109/ICNN.1995.488968

King DB, 2015, ACS SYM SER, V1214, P1

LeCun Y, 2015, NATURE, V521, P436, DOI DOI 10.1038/NATURE14539

Lei Ba J., 2016, ABS160706450 CORR

Liu Y, 2017, 2017 IEEE INTERNATIONAL CONFERENCE ON HEALTHCARE INFORMATICS (ICHI), P380, DOI 10.1109/ICHI.2017.45

Lou B, 2019, LANCET DIGIT HEALTH, V1, pE136, DOI 10.1016/S2589-7500(19)30058-5

Marcu LG, 2012, COMPUT MATH METHOD M, V2012, DOI 10.1155/2012/960256

McMahon SJ, 2019, CANCERS, V11, DOI 10.3390/cancers11020205

Mnih V., 2013, PLAYING ATARI DEEP R

Mnih V, 2015, NATURE, V518, P529, DOI 10.1038/nature14236

Molina JR, 2008, MAYO CLIN PROC, V83, P584, DOI 10.4065/83.5.584

Murphy H, 2016, BMC CANCER, V16, DOI 10.1186/s12885-016-2164-x

Ngo Phuong D., 2018, 2018 IEEE EMBS International Conference on Biomedical & Health Informatics (BHI), P333, DOI 10.1109/BHI.2018.8333436

NORTON L, 1988, CANCER RES, V48, P7067

Orth M, 2014, RADIAT ENVIRON BIOPH, V53, P1, DOI 10.1007/s00411-013-0497-2

Padmanabhan R, 2015, BIOMED SIGNAL PROCES, V22, P54, DOI 10.1016/j.bspc.2015.05.013

Peng X, 2018, AMIA ANN S P

Piot B, 2017, IEEE T NEUR NET LEAR, V28, P1814, DOI 10.1109/TNNLS.2016.2543000

Ramella S, 2018, PLOS ONE, V13, DOI 10.1371/journal.pone.0207455

Russell S.J., 2016, ARTIF INTELL, V3rd ed

Santiago A, 2016, RADIAT ONCOL, V11, DOI 10.1186/s13014-016-0643-5

Scheenstra AEH, 2014, INT J RADIAT ONCOL, V88, P224, DOI 10.1016/j.ijrobp.2013.10.015

Scheidegger S, 2011, Z MED PHYS, V21, P164, DOI 10.1016/j.zemedi.2010.11.001

Silver D, 2016, NATURE, V529, P484, DOI 10.1038/nature16961

Sutton R. S., 1988, Machine Learning, V3, P9, DOI 10.1023/A:1022633531479

Sutton RS, 2018, ADAPT COMPUT MACH LE, P1

Thames H D., 1987, FRACTIONATION RADIOT

Tseng HH, 2017, MED PHYS, V44, P6690, DOI 10.1002/mp.12625

US National Library of Medicine L. H. N. C. f. B. C., WHAT IS DIFF PREC ME

van Hasselt H, 2016, AAAI CONF ARTIF INTE, P2094

van Leeuwen CM, 2018, RADIAT ONCOL, V13, DOI 10.1186/s13014-018-1040-z

Vincent R., 2014, REINFORCEMENT LEARNI

Virtanen P, 2020, NAT METHODS, V17, P261, DOI 10.1038/s41592-019-0686-2

Wang ZY, 2016, PR MACH LEARN RES, V48

Winsor CP, 1932, P NATL ACAD SCI USA, V18, P1, DOI 10.1073/pnas.18.1.1

WITHERS H R, 1983, Radiotherapy and Oncology, V1, P187, DOI 10.1016/S0167-8140(83)80021-8

Yu C. M., ARXIV PREPRINT ARXIV

NR 67

TC 0

Z9 1

U1 3

U2 7

PU ELSEVIER

PI AMSTERDAM

PA RADARWEG 29, 1043 NX AMSTERDAM, NETHERLANDS

SN 0933-3657

EI 1873-2860

J9 ARTIF INTELL MED

JI Artif. Intell. Med.

PD SEP

PY 2021

VL 119

AR 102137

DI 10.1016/j.artmed.2021.102137

EA AUG 2021

PG 13

WC Computer Science, Artificial Intelligence; Engineering, Biomedical;

Medical Informatics

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Computer Science; Engineering; Medical Informatics

GA UR8WM

UT WOS:000697022300003

PM 34531006

DA 2022-08-24

ER

PT J

AU Kakar, M

Mencattini, A

Salmeri, M

AF Kakar, Manish

Mencattini, Arianna

Salmeri, Marcello

TI Extracting Fuzzy Classification Rules from Texture Segmented HRCT Lung

Images

SO JOURNAL OF DIGITAL IMAGING

LA English

DT Article

DE NSCLC; IGRT; FIS; Rule-based classification

ID COMPUTER-AIDED DIAGNOSIS; PULMONARY NODULES; CT; RADIOTHERAPY; MOTION;

DELINEATION; VOLUME; SIZE

AB Automatic tools for detection and identification of lung and lesion from high-resolution CT (HRCT) are becoming increasingly important both for diagnosis and for delivering high-precision radiation therapy. However, development of robust and interpretable classifiers still presents a challenge especially in case of non-small cell lung carcinoma (NSCLC) patients. In this paper, we have attempted to devise such a classifier by extracting fuzzy rules from texture segmented regions from HRCT images of NSCLC patients. A fuzzy inference system (FIS) has been constructed starting from a feature extraction procedure applied on overlapping regions from the same organs and deriving simple if-then rules so that more linguistically interpretable decisions can be implemented. The proposed method has been tested on 138 regions extracted from CT scan images acquired from patients with lung cancer. Assuming two classes of tissues C1 (healthy tissues) and C2 (lesion) as negative and positive, respectively; preliminary results report an AUC = 0.98 for lesions and AUC = 0.93 for healthy tissue, with an optimal operating condition related to sensitivity = 0.96, and specificity = 0.98 for lesions and sensitivity 0.99, and specificity = 0.94 for healthy tissue. Finally, the following results have been obtained: false-negative rate (FNR) = 6 % (C1), FNR = 2 % (C2), false-positive rate (FPR) = 4 % (C1), FPR = 3 % (C2), true-positive rate (TPR) = 94 %, (C1) and TPR = 98 % (C2).

C1 [Kakar, Manish] Oslo Univ Hosp, Inst Canc Res, Dept Radiat Biol, Div Canc & Surg, N-0310 Oslo, Norway.

[Mencattini, Arianna; Salmeri, Marcello] Univ Roma Tor Vergata, Dept Elect Engn, Rome, Italy.

RP Mencattini, A (通讯作者)，Univ Roma Tor Vergata, Dept Elect Engn, Rome, Italy.

EM Manish.Kakar@rr-research.no; mencattini@ing.uniroma2.it;

salmeri@ing.uniroma2.it

RI Kakar, Manish/AAF-8066-2020; Mencattini, Arianna/K-7910-2015; Kakar,

Manish/N-6828-2019

OI Mencattini, Arianna/0000-0002-3753-0457;

CR Andersson ER, 2007, FUZZY ROUGH TECHNIQU

Armato SG, 2003, MED PHYS, V30, P1188, DOI 10.1118/1.1573210

Armato SG, 1999, RADIOGRAPHICS, V19, P1303, DOI 10.1148/radiographics.19.5.g99se181303

Arslan S, 2002, MED SCI MONITOR, V8, P493

Berbeco RI, 2005, PHYS MED BIOL, V50, P3655, DOI 10.1088/0031-9155/50/16/001

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Colgan R, 2008, PHYS MED BIOL, V53, P5815, DOI 10.1088/0031-9155/53/20/017

Dewas S, 2011, RADIAT ONCOL, V6, DOI 10.1186/1748-717X-6-118

Ekberg L, 1998, RADIOTHER ONCOL, V48, P71, DOI 10.1016/S0167-8140(98)00046-2

Ferrero A., 2010, IEEE INSTR MEAS TECH

Geraghty PR, 2003, RADIOLOGY, V229, P475, DOI 10.1148/radiol.2291020499

Giraud P, 2002, RADIOTHER ONCOL, V62, P27, DOI 10.1016/S0167-8140(01)00444-3

Goo JM, 2011, KOREAN J RADIOL, V12, P145, DOI 10.3348/kjr.2011.12.2.145

GRAHAM MV, 1994, INT J RADIAT ONCOL, V29, P1105, DOI 10.1016/0360-3016(94)90407-3

Hamilton C S, 1992, Clin Oncol (R Coll Radiol), V4, P141, DOI 10.1016/S0936-6555(05)81075-1

Hoisak JDP, 2004, INT J RADIAT ONCOL, V60, P1298, DOI 10.1016/j.ijrobp.2004.07.681

Kakar M., 2009, IEEE C FUZZ SYST JEJ

Kakar M, 2009, COMPUT MED IMAG GRAP, V33, P72, DOI 10.1016/j.compmedimag.2008.10.009

Keall PJ, 2005, MED PHYS, V32, P942, DOI 10.1118/1.1879152

LEUNENS G, 1993, RADIOTHER ONCOL, V29, P169, DOI 10.1016/0167-8140(93)90243-2

Li Q, 2007, COMPUT MED IMAG GRAP, V31, P248, DOI 10.1016/j.compmedimag.2007.02.005

Mencattini A., 2011, IEEE INT WORKSH MED

Mencattini A, 2012, INT J COMPUT ASS RAD, V7, P573, DOI 10.1007/s11548-011-0659-0

PADLEY SPG, 1991, CLIN RADIOL, V44, P222, DOI 10.1016/S0009-9260(05)80183-7

Seiler PG, 2000, PHYS MED BIOL, V45, pN103, DOI 10.1088/0031-9155/45/9/402

Sharp GC, 2004, PHYS MED BIOL, V49, P5347, DOI 10.1088/0031-9155/49/23/011

Stevens CW, 2001, INT J RADIAT ONCOL, V51, P62, DOI 10.1016/S0360-3016(01)01621-2

TAIT DM, 1990, EUR J CANCER, V26, P750, DOI 10.1016/0277-5379(90)90135-G

URIE MM, 1991, INT J RADIAT ONCOL, V21, P91, DOI 10.1016/0360-3016(91)90170-9

Vorwerk H, 2009, RADIOTHER ONCOL, V91, P455, DOI 10.1016/j.radonc.2009.03.014

WATANABE H, 1994, IEEE T FUZZY SYST, V2, P267, DOI 10.1109/91.324806

Wiemker R, 2002, PROC SPIE, V4684, P677, DOI 10.1117/12.467210

Xing L, 2007, SEMIN RADIAT ONCOL, V17, P245, DOI 10.1016/j.semradonc.2007.07.004

ZADEH LA, 1965, INFORM CONTROL, V8, P338, DOI 10.1016/S0019-9958(65)90241-X

NR 34

TC 0

Z9 0

U1 0

U2 6

PU SPRINGER

PI NEW YORK

PA 233 SPRING ST, NEW YORK, NY 10013 USA

SN 0897-1889

EI 1618-727X

J9 J DIGIT IMAGING

JI J. Digit. Imaging

PD APR

PY 2013

VL 26

IS 2

BP 227

EP 238

DI 10.1007/s10278-012-9514-2

PG 12

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 191SX

UT WOS:000322434000012

PM 22890442

OA Green Published

DA 2022-08-24

ER

PT J

AU Della Gala, G

Dirkx, MLP

Hoekstra, N

Fransen, D

Lanconelli, N

van de Pol, M

Heijmen, BJM

Petit, SF

AF Della Gala, Giuseppe

Dirkx, Maarten L. P.

Hoekstra, Nienke

Fransen, Dennie

Lanconelli, Nico

van de Pol, Marjan

Heijmen, Ben J. M.

Petit, Steven F.

TI Fully automated VMAT treatment planning for advanced-stage NSCLC

patients

SO STRAHLENTHERAPIE UND ONKOLOGIE

LA English

DT Article

DE Radiotherapy; intensity-modulated; Volumetric-modulated arc therapy;

Computer-assisted radiotherapy planning; Non-small cell lung carcinoma;

Organs at risk

ID MODULATED ARC THERAPY; PROSTATE-CANCER; LUNG-CANCER; OPTIMIZATION;

PLANS; NECK; HEAD; GENERATION

AB Purpose To develop a fully automated procedure for multicriterial volumetric modulated arc therapy (VMAT) treatment planning (autoVMAT) for stage III/IV non-small cell lung cancer (NSCLC) patients treated with curative intent.

Materials and methods After configuring the developed autoVMAT system for NSCLC, autoVMAT plans were compared with manually generated clinically delivered intensity-modulated radiotherapy (IMRT) plans for 41 patients. AutoVMAT plans were also compared to manually generated VMAT plans in the absence of time pressure. For 16 patients with reduced planning target volume (PTV) dose prescription in the clinical IMRT plan (to avoid violation of organs at risk tolerances), the potential for dose escalation with autoVMAT was explored.

Results Two physicians evaluated 35/41 autoVMAT plans (85%) as clinically acceptable. Compared to the manually generated IMRT plans, autoVMAT plans showed statistically significant improved PTV coverage (V-95% increased by 1.1% +/- 1.1%), higher dose conformity (R-50 reduced by 12.2% +/- 12.7%), and reduced mean lung, heart, and esophagus doses (reductions of 0.9 Gy +/- 1.0 Gy, 1.5 Gy +/- 1.8 Gy, 3.6 Gy +/- 2.8 Gy, respectively, all p < 0.001). To render the six remaining autoVMAT plans clinically acceptable, a dosimetrist needed less than 10 min hands-on time for fine-tuning. AutoVMAT plans were also considered equivalent or better than manually optimized VMAT plans. For 6/16 patients, autoVMAT allowed tumor dose escalation of 5-10 Gy.

Conclusion Clinically deliverable, high-quality autoVMAT plans can be generated fully automatically for the vast majority of advanced-stage NSCLC patients. For a subset of patients, autoVMAT allowed for tumor dose escalation.

C1 [Della Gala, Giuseppe; Dirkx, Maarten L. P.; Hoekstra, Nienke; Fransen, Dennie; van de Pol, Marjan; Heijmen, Ben J. M.; Petit, Steven F.] Erasmus MC, Dept Radiat Oncol, Inst Canc, NL-3008 AE Rotterdam, Netherlands.

[Della Gala, Giuseppe; Lanconelli, Nico] Univ Bologna, Scuola Sci, Alma Mater Studiorum, Bologna, Italy.

[Petit, Steven F.] Harvard Med Sch, Dept Radiat Oncol, Massachusetts Gen Hosp, Boston, MA USA.

RP Dirkx, MLP (通讯作者)，Erasmus MC, Dept Radiat Oncol, Inst Canc, NL-3008 AE Rotterdam, Netherlands.

EM m.dirkx@erasmusmc.nl

RI Hoekstra, Nienke/ABG-1917-2020

OI Hoekstra, Nienke/0000-0001-7355-6219; Della Gala,

Giuseppe/0000-0002-7143-6528

FU Dutch Cancer Society [KWF EMCR 2014-6667]

FX The department of Radiation Oncology of Erasmus MC Cancer Institute has

research collaborations with Elekta AB and Accuray. G. Della Gala,

M.L.P. Dirkx, N. Hoekstra, D. Fransen, N. Lanconelli, M. van de Pol, and

B.J.M. Heijmen declare that they have no competing interests. S.F. Petit

receives financial support from the Dutch Cancer Society (KWF EMCR

2014-6667).

CR Amit G, 2015, MED PHYS, V42, P770, DOI 10.1118/1.4905111

Bezjak A, 2012, Clin Oncol (R Coll Radiol), V24, P508, DOI 10.1016/j.clon.2012.05.007

Boylan C, 2014, J APPL CLIN MED PHYS, V15, P213, DOI 10.1120/jacmp.v15i1.4530

Breedveld S, 2012, MED PHYS, V39, P951, DOI 10.1118/1.3676689

Fiege J, 2011, MED PHYS, V38, P5217, DOI 10.1118/1.3615622

Fogliata A, 2014, RADIOTHER ONCOL, V113, P385, DOI 10.1016/j.radonc.2014.11.009

Hazell I, 2016, J APPL CLIN MED PHYS, V17, P272, DOI 10.1120/jacmp.v17i1.5901

Kamran SC, 2016, RADIOTHER ONCOL, V118, P515, DOI 10.1016/j.radonc.2015.12.028

Krayenbuehl J, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0533-2

Quan EM, 2012, INT J RADIAT ONCOL, V84, pE69, DOI 10.1016/j.ijrobp.2012.02.017

Sharfo AWM, 2015, RADIOTHER ONCOL, V114, P395, DOI 10.1016/j.radonc.2015.02.006

Sharpe MB, 2014, MED PHYS, V41, DOI 10.1118/1.4894496

Tol JP, 2016, MED PHYS, V43, P1818, DOI 10.1118/1.4944063

Voet PWJ, 2014, INT J RADIAT ONCOL, V88, P1175, DOI 10.1016/j.ijrobp.2013.12.046

Voet PWJ, 2013, INT J RADIAT ONCOL, V85, P866, DOI 10.1016/j.ijrobp.2012.04.015

Wu BB, 2012, INT J RADIAT ONCOL, V84, pE647, DOI 10.1016/j.ijrobp.2012.06.047

Zhang XD, 2011, PHYS MED BIOL, V56, P3873, DOI 10.1088/0031-9155/56/13/009

NR 17

TC 33

Z9 33

U1 1

U2 3

PU URBAN & VOGEL

PI MUNICH

PA NEUMARKTER STRASSE 43, D-81673 MUNICH, GERMANY

SN 0179-7158

EI 1439-099X

J9 STRAHLENTHER ONKOL

JI Strahlenther. Onkol.

PD MAY

PY 2017

VL 193

IS 5

BP 402

EP 409

DI 10.1007/s00066-017-1121-1

PG 8

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA ET2NM

UT WOS:000400110400006

PM 28314877

OA Green Published, hybrid

DA 2022-08-24

ER

PT J

AU Li, SL

Yang, N

Li, B

Zhou, ZG

Hao, HX

Folkert, MR

Iyengar, P

Westover, K

Choy, H

Timmerman, R

Jiang, S

Wang, J

AF Li, Shulong

Yang, Ning

Li, Bin

Zhou, Zhiguo

Hao, Hongxia

Folkert, Michael R.

Iyengar, Puneeth

Westover, Kenneth

Choy, Hak

Timmerman, Robert

Jiang, Steve

Wang, Jing

TI A pilot study using kernelled support tensor machine for distant failure

prediction in lung SBRT

SO MEDICAL IMAGE ANALYSIS

LA English

DT Article

DE Support tensor machine; NSCLC; SBRT; Radiomics; Medical imaging

ID STEREOTACTIC BODY RADIATION; CONVOLUTIONAL NEURAL-NETWORKS;

COMPUTER-AIDED DETECTION; FDG-PET; ALZHEIMERS-DISEASE; CANCER-TREATMENT;

TEXTURE ANALYSIS; RADIOMICS MODEL; IMAGE-ANALYSIS; FEATURES

AB We developed a kernelled support tensor machine (KSTM)-based model with tumor tensors derived from pre-treatment PET and CT imaging as input to predict distant failure in early stage non-small cell lung cancer (NSCLC) treated with stereotactic body radiation therapy (SBRT). The patient cohort included 110 early stage NSCLC patients treated with SBRT, 25 of whom experienced failure at distant sites. Three-dimensional tumor tensors were constructed and used as input for the KSTM-based classifier. A KSTM iterative algorithm with a convergent proof was developed to train the weight vectors for every mode of the tensor for the classifier. In contrast to conventional radiomics approaches that rely on handcrafted imaging features, the KSTM-based classifier uses 3D imaging as input, taking full advantage of the imaging information. The KSTM-based classifier preserves the intrinsic 3D geometry structure of the medical images and the correlation in the original images and trains the classification hyper-plane in an adaptive feature tensor space. The KSTM-based predictive algorithm was compared with three conventional machine learning models and three radiomics approaches. For PET and CT, the KSTM-based predictive method achieved the highest prediction results among the seven methods investigated in this study based on 10-fold cross validation and independent testing. (C) 2018 Elsevier B.V. All rights reserved.

C1 [Li, Shulong; Li, Bin] Southern Med Univ, Guangdong Prov Key Lab Med Image, Sch Biomed Engn, Proc, Guangzhou 510515, Guangdong, Peoples R China.

[Yang, Ning] Guangdong 2 Prov Peoples Hosp, Dept Med Imaging, Guangzhou 510317, Guangdong, Peoples R China.

[Zhou, Zhiguo; Folkert, Michael R.; Iyengar, Puneeth; Westover, Kenneth; Choy, Hak; Timmerman, Robert; Jiang, Steve; Wang, Jing] Univ Texas Southwestern Med Ctr Dallas, Dept Radiat Oncol, Dallas, TX 75235 USA.

[Hao, Hongxia] Xidian Univ, Sch Comp Sci & Technol, Xian 710071, Shaanxi, Peoples R China.

RP Wang, J (通讯作者)，Univ Texas Southwestern Med Ctr Dallas, Dept Radiat Oncol, Dallas, TX 75235 USA.

EM jing.wang@utsouthwestern.edu

RI Wang, Jing/N-7332-2019; Westover, Ken/AAZ-1795-2020; Hao,

Hongxia/AAO-7462-2020; Li, Shulong/AAK-9054-2020

OI Westover, Ken/0000-0003-3653-5923; Wang, Jing/0000-0002-8491-4146; Li,

Shulong/0000-0002-7466-4366

FU American Cancer Society [ACS-IRG-02-196]; National Institutes of Health

[5P30CA142543]; National Natural Science Foundation of China (NSFC)

[11771456]; NATIONAL CANCER INSTITUTE [P30CA142543] Funding Source: NIH

RePORTER

FX This work was partly supported by the American Cancer Society

(ACS-IRG-02-196), the National Institutes of Health (5P30CA142543) and

the National Natural Science Foundation of China (NSFC, 11771456). The

authors would like to thank Dr. Damiana Chiavolini for editing the

manuscript.

CR Abdi H, 2010, WIRES COMPUT STAT, V2, P433, DOI 10.1002/wics.101

Aerts H.J., 2014, NATURE COMMUN, V5

Ahmmed A., 2011, 2011 IEEE Symposium on Computers & Informatics (ISCI), P215, DOI 10.1109/ISCI.2011.5958914

[Anonymous], 2017, BRIEFINGS BIOINFORMA

Biswas S. K., 2016, ARXIV160907878

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Chi A, 2010, RADIOTHER ONCOL, V94, P1, DOI 10.1016/j.radonc.2009.12.008

Chung A. G., 2015, ARXIV150900111

Church TR, 2013, NEW ENGL J MED, V368, P1980, DOI 10.1056/NEJMoa1209120

Ciompi F, 2015, MED IMAGE ANAL, V26, P195, DOI 10.1016/j.media.2015.08.001

Clarke K, 2012, RADIOTHER ONCOL, V104, P62, DOI 10.1016/j.radonc.2012.04.019

Cook GJR, 2014, CLIN TRANSL IMAGING, V2, P269, DOI 10.1007/s40336-014-0064-0

CORTES C, 1995, MACH LEARN, V20, P273, DOI 10.1023/A:1022627411411

Tao DC, 2007, KNOWL INF SYST, V13, P1, DOI 10.1007/s10115-006-0050-6

DAVIS LS, 1979, IEEE T PATTERN ANAL, V1, P251, DOI 10.1109/TPAMI.1979.4766921

De Lathauwer L., 1997, SIGNAL PROCESSING BA

Ettinger DS, 2010, J NATL COMPR CANC NE, V8, P740, DOI 10.6004/jnccn.2010.0056

Fletcher R. H., 2012, CLIN EPIDEMIOLOGY ES

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Ginsberg Robert J., 1995, Annals of Thoracic Surgery, V60, P615, DOI 10.1016/0003-4975(95)00537-U

Hao ZF, 2013, IEEE T IMAGE PROCESS, V22, P2911, DOI 10.1109/TIP.2013.2253485

Howlader N., SEER CANC STAT REV 1

Huang M, 2017, SCI REP, V7

Keogh E., 2017, ENCY MACHINE LEARNIN, P314, DOI DOI 10.1007/978-0-387-30164-8\_192

Khamis H, 2017, MED IMAGE ANAL, V36, P15, DOI 10.1016/j.media.2016.10.007

Kohavi R, 1997, ARTIF INTELL, V97, P273, DOI 10.1016/S0004-3702(97)00043-X

Kolda TG, 2009, SIAM REV, V51, P455, DOI 10.1137/07070111X

Kononenko I, 1997, APPL INTELL, V7, P39, DOI 10.1023/A:1008280620621

Kooi T, 2017, MED IMAGE ANAL, V35, P303, DOI 10.1016/j.media.2016.07.007

Krizhevsky A, 2017, COMMUN ACM, V60, P84, DOI 10.1145/3065386

Kumar D, 2015, ARXIV150900117

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Li SL, 2009, NONLINEAR ANAL-THEOR, V71, P5695, DOI 10.1016/j.na.2009.04.048

Lian CF, 2016, MED IMAGE ANAL, V32, P257, DOI 10.1016/j.media.2016.05.007

Liu HW, 2015, RADIOTHER ONCOL, V117, P71, DOI 10.1016/j.radonc.2015.08.027

Liu MX, 2017, MED IMAGE ANAL, V36, P123, DOI 10.1016/j.media.2016.11.002

Lovinfosse P, 2016, EUR J NUCL MED MOL I, V43, P1453, DOI 10.1007/s00259-016-3314-8

Madabhushi A, 2016, MED IMAGE ANAL, V33, P170, DOI 10.1016/j.media.2016.06.037

Magnin B, 2009, NEURORADIOLOGY, V51, P73, DOI 10.1007/s00234-008-0463-x

MARTINI N, 1995, J THORAC CARDIOV SUR, V109, P120, DOI 10.1016/S0022-5223(95)70427-2

Miller KD, 2016, CA-CANCER J CLIN, V66, P271, DOI 10.3322/caac.21349

Ming Liu, 2010, Proceedings of the 2010 Sixth International Conference on Intelligent Information Hiding and Multimedia Signal Processing (IIHMSP 2010), P462, DOI 10.1109/IIHMSP.2010.118

Namburete AIL, 2015, MED IMAGE ANAL, V21, P72, DOI 10.1016/j.media.2014.12.006

Nath SK, 2011, RADIOTHER ONCOL, V99, P12, DOI 10.1016/j.radonc.2011.02.006

Nikolaev A, 2016, INT J RADIAT ONCOL, V96, pE424, DOI 10.1016/j.ijrobp.2016.06.1695

OTSU N, 1979, IEEE T SYST MAN CYB, V9, P62, DOI 10.1109/TSMC.1979.4310076

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

RAUDYS SJ, 1991, IEEE T PATTERN ANAL, V13, P252, DOI 10.1109/34.75512

Roth HR, 2016, IEEE T MED IMAGING, V35, P1170, DOI 10.1109/TMI.2015.2482920

SATHYAMURTHY N, 1975, J CHEM PHYS, V63, P464, DOI 10.1063/1.431126

Senthi S, 2012, LANCET ONCOL, V13, P802, DOI 10.1016/S1470-2045(12)70242-5

Shashua A., 2001, P IEEE COMP SOC COMP, V1, P1

Shen Wei, 2015, Inf Process Med Imaging, V24, P588, DOI 10.1007/978-3-319-19992-4\_46

Shin HC, 2016, IEEE T MED IMAGING, V35, P1285, DOI 10.1109/TMI.2016.2528162

Tajbakhsh N, 2016, IEEE T MED IMAGING, V35, P1299, DOI 10.1109/TMI.2016.2535302

Tan S, 2013, INT J RADIAT ONCOL, V85, P1375, DOI 10.1016/j.ijrobp.2012.10.017

Tao D., 2005, P 5 IEEE INT C DAT M, P8

Timmerman RD, 2014, INT J RADIAT ONCOL, V90, pS30, DOI 10.1016/j.ijrobp.2014.05.135

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

Vansteenkiste JF, 1999, J CLIN ONCOL, V17, P3201, DOI 10.1200/JCO.1999.17.10.3201

Wimmer G, 2016, MED IMAGE ANAL, V31, P16, DOI 10.1016/j.media.2016.02.001

Wu J, 2016, RADIOLOGY, V281, P270, DOI 10.1148/radiol.2016151829

Zhang LF, 2011, IEEE GEOSCI REMOTE S, V8, P374, DOI 10.1109/LGRS.2010.2077272

Zhou Z, 2017, ARXIV171001614

Zhou ZG, 2013, COMPUT BIOL MED, V43, P1462, DOI 10.1016/j.compbiomed.2013.07.023

Zhou ZG, 2017, PHYS MED BIOL, V62, P4460, DOI 10.1088/1361-6560/aa6ae5

Zhou ZG, 2016, RADIOTHER ONCOL, V119, P501, DOI 10.1016/j.radonc.2016.04.029

Zuluaga MA, 2015, MED IMAGE ANAL, V26, P185, DOI 10.1016/j.media.2015.09.001

NR 70

TC 10

Z9 10

U1 1

U2 22

PU ELSEVIER

PI AMSTERDAM

PA RADARWEG 29, 1043 NX AMSTERDAM, NETHERLANDS

SN 1361-8415

EI 1361-8423

J9 MED IMAGE ANAL

JI Med. Image Anal.

PD DEC

PY 2018

VL 50

BP 106

EP 116

DI 10.1016/j.media.2018.09.004

PG 11

WC Computer Science, Artificial Intelligence; Computer Science,

Interdisciplinary Applications; Engineering, Biomedical; Radiology,

Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Computer Science; Engineering; Radiology, Nuclear Medicine & Medical

Imaging

GA HA0KM

UT WOS:000449896900008

PM 30266009

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Chen, XG

Sheikh, K

Nakajima, E

Lin, CT

Lee, J

Hu, C

Hales, RK

Forde, PM

Naidoo, J

Voong, KR

AF Chen, Xuguang

Sheikh, Khadija

Nakajima, Erica

Lin, Cheng Ting

Lee, Junghoon

Hu, Chen

Hales, Russell K.

Forde, Patrick M.

Naidoo, Jarushka

Khinh Ranh Voong

TI Radiation Versus Immune Checkpoint Inhibitor Associated Pneumonitis:

Distinct Radiologic Morphologies

SO ONCOLOGIST

LA English

DT Article

DE Immune checkpoint inhibitor; Immune-related adverse event;

Immune-related pneumonitis; Radiation pneumonitis; Non-small cell lung

carcinoma

ID CELL LUNG-CANCER; DEFINITIVE CHEMORADIATION; RADIOGRAPHIC PATTERNS;

RADIOMICS; THERAPY; CT

AB Background Patients with non-small cell lung cancer may develop pneumonitis after thoracic radiotherapy (RT) and immune checkpoint inhibitors (ICIs). We hypothesized that distinct morphologic features are associated with different pneumonitis etiologies. Materials and Methods We systematically compared computed tomography (CT) features of RT- versus ICI-pneumonitis. Clinical and imaging features were tested for association with pneumonitis severity. Lastly, we constructed an exploratory radiomics-based machine learning (ML) model to discern pneumonitis etiology. Results Between 2009 and 2019, 82 patients developed pneumonitis: 29 after thoracic RT, 23 after ICI, and 30 after RT + ICI. Fifty patients had grade 2 pneumonitis, 22 grade 3, and 7 grade 4. ICI-pneumonitis was more likely bilateral (65% vs. 28%; p = .01) and involved more lobes (66% vs. 45% involving at least three lobes) and was less likely to have sharp border (17% vs. 59%; p = .004) compared with RT-pneumonitis. Pneumonitis morphology after RT + ICI was heterogeneous, with 47% bilateral, 37% involving at least three lobes, and 40% sharp borders. Among all patients, risk factors for severe pneumonitis included poor performance status, smoking history, worse lung function, and bilateral and multifocal involvement on CT. An ML model based on seven radiomic features alone could distinguish ICI- from RT-pneumonitis with an area under the receiver-operating curve of 0.76 and identified the predominant etiology after RT + ICI concordant with multidisciplinary consensus. Conclusion RT- and ICI-pneumonitis exhibit distinct spatial features on CT. Bilateral and multifocal lung involvement is associated with severe pneumonitis. Integrating these morphologic features in the clinical management of patients who develop pneumonitis after RT and ICIs may improve treatment decision-making. Implications for Practice Patients with non-small cell lung cancer often receive thoracic radiation and immune checkpoint inhibitors (ICIs), both of which can cause pneumonitis. This study identified similarities and differences in pneumonitis morphology on computed tomography (CT) scans among pneumonitis due to radiotherapy (RT) alone, ICI alone, and the combination of both. Patients who have bilateral CT changes involving at least three lobes are more likely to have ICI-pneumonitis, whereas those with unilateral CT changes with sharp borders are more likely to have radiation pneumonitis. After RT and/or ICI, severe pneumonitis is associated with bilateral and multifocal CT changes. These results can help guide clinicians in triaging patients who develop pneumonitis after radiation and during ICI treatment.

C1 [Chen, Xuguang; Sheikh, Khadija; Lee, Junghoon; Hales, Russell K.; Khinh Ranh Voong] Johns Hopkins Univ, Sch Med, Dept Radiat Oncol & Mol Radiat Sci, Baltimore, MD USA.

[Lin, Cheng Ting] Johns Hopkins Univ, Dept Radiol & Radiol Sci, Baltimore, MD USA.

[Hu, Chen] Johns Hopkins Univ, Dept Biostat, Baltimore, MD 21205 USA.

[Nakajima, Erica; Hu, Chen; Forde, Patrick M.; Naidoo, Jarushka] Johns Hopkins Univ, Dept Oncol, Baltimore, MD USA.

RP Voong, KR (通讯作者)，Sidney Kimmel Canc Ctr, Thorac Ctr Excellence, Dept Radiat Oncol & Mol Radiat Sci, Johns Hopkins Bayview, 300 Mason Lord Dr, Baltimore, MD 21224 USA.

EM kvoong1@jhmi.edu

RI Forde, Patrick/AAX-2936-2021

OI Hu, Chen/0000-0003-4672-1981; Chen, Xuguang/0000-0001-8761-810X; Sheikh,

Khadija/0000-0002-1168-1783

FU Projekt DEAL

FX Open access funding enabled and organized by Projekt DEAL.; Open access

funding enabled and organized by Projekt DEAL.

CR Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Balaji A, 2021, J IMMUNOTHER CANCER, V9, DOI 10.1136/jitc-2020-001731

Barron F, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.570233

Brzezianska E, 2006, MUTAT RES-FUND MOL M, V599, P26, DOI 10.1016/j.mrfmmm.2005.12.013

Castillo R, 2014, RADIAT ONCOL, V9, DOI 10.1186/1748-717X-9-74

Chaudhuri AA, 2016, RADIOTHER ONCOL, V119, P454, DOI 10.1016/j.radonc.2016.05.007

Chen S, 2019, CANCER IMAGING, V19, DOI 10.1186/s40644-019-0243-3

Choi YW, 2004, RADIOGRAPHICS, V24, P985, DOI 10.1148/rg.244035160

Colen RR, 2018, INVEST NEW DRUG, V36, P601, DOI 10.1007/s10637-017-0524-2

Cousin F, 2021, RADIOTHER ONCOL, V157, P47, DOI 10.1016/j.radonc.2021.01.001

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Darnell EP, 2020, CURR ONCOL REP, V22, DOI 10.1007/s11912-020-0897-9

Dolladille C, 2020, JAMA ONCOL, V6, P865, DOI 10.1001/jamaoncol.2020.0726

Ekert K, 2020, CANCERS, V12, DOI 10.3390/cancers12030761

Friedes C, 2020, CLIN LUNG CANCER, V21, pE622, DOI 10.1016/j.cllc.2020.05.013

Gomez DR, 2019, J CLIN ONCOL, V37, DOI 10.1200/JCO.19.00201

Gomez DR, 2016, LANCET ONCOL, V17, P1672, DOI 10.1016/S1470-2045(16)30532-0

Keffer S, 2020, ADV RADIAT ONCOL, V5, P238, DOI 10.1016/j.adro.2019.08.010

Ko EC, 2018, CLIN CANCER RES, V24, P5792, DOI 10.1158/1078-0432.CCR-17-3620

Kocher M, 2020, STRAHLENTHER ONKOL, V196, P856, DOI 10.1007/s00066-020-01626-8

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Li MQ, 2019, BBA-REV CANCER, V1871, P323, DOI 10.1016/j.bbcan.2019.02.004

Lovinfosse P, 2018, EUR J NUCL MED MOL I, V45, P365, DOI 10.1007/s00259-017-3855-5

Luna JM, 2019, RADIOTHER ONCOL, V133, P106, DOI 10.1016/j.radonc.2019.01.003

Moran A, 2017, CLIN LUNG CANCER, V18, pE425, DOI 10.1016/j.cllc.2017.05.014

Naidoo J, 2017, J CLIN ONCOL, V35, P709, DOI 10.1200/JCO.2016.68.2005

Nishino M, 2016, CLIN CANCER RES, V22, P6051, DOI 10.1158/1078-0432.CCR-16-1320

Park H, 2020, EUR J RADIOL, V132, DOI 10.1016/j.ejrad.2020.109275

Park KJ, 2000, RADIOGRAPHICS, V20, P83, DOI 10.1148/radiographics.20.1.g00ja0483

Petit SF, 2011, INT J RADIAT ONCOL, V81, P698, DOI 10.1016/j.ijrobp.2010.06.016

Reuss JE, 2020, CURR ONCOL REP, V22, DOI 10.1007/s11912-020-00920-z

Robnett TJ, 2000, INT J RADIAT ONCOL, V48, P89, DOI 10.1016/S0360-3016(00)00648-9

Sheikh K, 2019, RADIAT ONCOL, V14, DOI 10.1186/s13014-019-1339-4

Suresh K, 2019, J CLIN INVEST, V129, P4305, DOI 10.1172/JCI128654

Thomas R, 2020, LUNG CANCER, V145, P132, DOI 10.1016/j.lungcan.2020.03.023

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Voong KR, 2020, LUNG CANCER, V150, P249, DOI 10.1016/j.lungcan.2020.08.022

Voong KR, 2019, CLIN LUNG CANCER, V20, pE470, DOI 10.1016/j.cllc.2019.02.018

Yu H, 2019, CLIN CANCER RES, V25, P4343, DOI 10.1158/1078-0432.CCR-18-1084

Yu HW, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.00412

Yu H, 2009, IEEE T MED IMAGING, V28, P374, DOI 10.1109/TMI.2008.2004425

Yue JB, 2017, CLIN TRANSL RAD ONCO, V4, P1, DOI 10.1016/j.ctro.2017.04.001

NR 43

TC 5

Z9 5

U1 0

U2 4

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1083-7159

EI 1549-490X

J9 ONCOLOGIST

JI Oncologist

PD OCT

PY 2021

VL 26

IS 10

BP E1822

EP E1832

DI 10.1002/onco.13900

EA AUG 2021

PG 11

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA WA7JB

UT WOS:000680951500001

PM 34251728

OA Green Published, hybrid

DA 2022-08-24

ER

PT J

AU Avanzo, M

Gagliardi, V

Stancanello, J

Blanck, O

Pirrone, G

El Naqa, I

Revelant, A

Sartor, G

AF Avanzo, Michele

Gagliardi, Vito

Stancanello, Joseph

Blanck, Oliver

Pirrone, Giovanni

El Naqa, Issam

Revelant, Alberto

Sartor, Giovanna

TI Combining computed tomography and biologically effective dose in

radiomics and deep learning improves prediction of tumor response to

robotic lung stereotactic body radiation therapy

SO MEDICAL PHYSICS

LA English

DT Article

DE lung cancer; machine learning; radiomics; radiotherapy; SBRT

ID CANCER; INTEROBSERVER; RADIOTHERAPY; VARIABILITY; OUTCOMES; RECIST; PET

AB Purpose The aim of this study is to improve the performance of machine learning (ML) models in predicting response of non-small cell lung cancer (NSCLC) to stereotactic body radiation therapy (SBRT) by integrating image features from pre-treatment computed tomography (CT) with features from the biologically effective dose (BED) distribution. Materials and methods Image features, consisting of crafted radiomic features or machine-learned features extracted using a convolutional neural network, were calculated from pre-treatment CT data and from dose distributions converted into BED for 80 NSCLC lesions over 76 patients treated with robotic guided SBRT. ML models using different combinations of features were trained to predict complete or partial response according to response criteria in solid tumors, including radiomics CT (Rad(CT)), radiomics CT and BED (Rad(CT,BED)), deep learning (DL) CT (DLCT), and DL CT and BED (DLCT,BED). Training of ML included feature selection by neighborhood component analysis followed by ensemble ML using robust boosting. A model was considered as acceptable when the sum of average sensitivity and specificity on test data in repeated cross validations was at least 1.5. Results Complete or partial response occurred in 58 out of 80 lesions. The best models to predict the tumor response were those using BED variables, achieving significantly better area under curve (AUC) and accuracy than those using only features from CT, including a Rad(CT,BED) model using three radiomic features from BED, which scored an accuracy of 0.799 (95% confidence intervals (0.75-0.85)) and AUC of 0.773 (0.688-0.846), and a DLCT,BED model also using three variables with an accuracy of 0.798 (0.649-0.829) and AUC of 0.812 (0.755-0.867). Conclusion According to our results, the inclusion of BED features improves the response prediction of ML models for lung cancer patients undergoing SBRT, regardless of the use of radiomic or DL features.

C1 [Avanzo, Michele; Gagliardi, Vito; Pirrone, Giovanni; Sartor, Giovanna] Ctr Riferimento Oncol Aviano CRO IRCCS, Med Phys Dept, Via F Gallini 2, I-33081 Aviano, PN, Italy.

[Stancanello, Joseph] Elekta SA, Boulogne, France.

[Blanck, Oliver] Univ Med Ctr Schleswig Holstein, Dept Radiat Oncol, Kiel, Germany.

[El Naqa, Issam] Moffitt Univ, Dept Machine Learning, Tampa, FL USA.

[Revelant, Alberto] Ctr Riferimento Oncol Aviano CRO IRCCS, Radiat Oncol Dept, Aviano, PN, Italy.

RP Avanzo, M (通讯作者)，Ctr Riferimento Oncol Aviano CRO IRCCS, Med Phys Dept, Via F Gallini 2, I-33081 Aviano, PN, Italy.

EM mavanzo@cro.it

RI Avanzo, Michele/C-8529-2009; Revelant, Alberto/AAC-4972-2022

OI Avanzo, Michele/0000-0003-1711-4242; Revelant,

Alberto/0000-0002-4505-9650; Blanck, Oliver/0000-0003-1391-1308

FU "5x1000 per la Ricerca Sanitaria" of Centro di Riferimento Oncologico

diAviano (CRO) IRCCS [J32F16001240001]; National Institute of Health

(NIH) [R37-CA222215, R01-CA233487, R41CA243722]; NIBIB

[75N92020D00018/75N92020F0001]

FX The present researchwas in part supported by "5x1000 per la Ricerca

Sanitaria" of Centro di Riferimento Oncologico diAviano (CRO) IRCCS,

Grant Number J32F16001240001 and grants fromNational Institute of Health

(NIH): R37-CA222215 and R01-CA233487,R41CA243722 and NIBIB contract

75N92020D00018/75N92020F0001

CR Avanzo M, 2020, MED PHYS, V47, pE185, DOI 10.1002/mp.13678

Avanzo M, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.00490

Avanzo M, 2020, STRAHLENTHER ONKOL, V196, P879, DOI 10.1007/s00066-020-01625-9

Avanzo M, 2019, MED PHYS, V46, P1447, DOI 10.1002/mp.13379

Avanzo M, 2017, PHYS MEDICA, V38, P122, DOI 10.1016/j.ejmp.2017.05.071

Baek S, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-53461-2

Baumann R, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00171

Bousabarah K, 2019, STRAHLENTHER ONKOL, V195, P830, DOI 10.1007/s00066-019-01452-7

Bridle J. S., 1990, Neurocomputing, Algorithms, Architectures and Applications. Proceedings of the NATO Advanced Research Workshop, P227

Ciompi F, 2017, SCI REP-UK, V7, DOI 10.1038/srep46479

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Dissaux G, 2020, J NUCL MED, V61, P814, DOI 10.2967/jnumed.119.228106

Donahue Jeff, 2013, CORR

Dou TH, 2018, PLOS ONE, V13, DOI 10.1371/journal.pone.0206108

El Naqa I, 2018, MED PHYS, V45, pE834, DOI 10.1002/mp.12811

Costa MGF, 2019, BMC MED IMAGING, V19, DOI 10.1186/s12880-019-0389-2

Ferreira JR, 2021, CLIN IMAG, V74, P27, DOI 10.1016/j.clinimag.2020.12.017

Freund Y, 2009, ARXIV09052138

Fried DV, 2016, RADIOLOGY, V278, P214, DOI 10.1148/radiol.2015142920

Garau N, 2020, MED PHYS, V47, P4125, DOI 10.1002/mp.14308

Greengrass E., 2005, 5 IEEE INT C DAT MIN

Grills IS, 2012, J THORAC ONCOL, V7, P1382, DOI 10.1097/JTO.0b013e318260e00d

Guckenberger M, 2014, STRAHLENTHER ONKOL, V190, P26, DOI 10.1007/s00066-013-0450-y

Hawkins SH, 2014, IEEE ACCESS, V2, P1418, DOI 10.1109/ACCESS.2014.2373335

He KM, 2016, PROC CVPR IEEE, P770, DOI 10.1109/CVPR.2016.90

Hosny A, 2018, PLOS MED, V15, DOI 10.1371/journal.pmed.1002711

Hubbard L, 2019, EUR RADIOL EXP, V3, DOI 10.1186/s41747-019-0093-6

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Ioffe S, 2015, PR MACH LEARN RES, V37, P448

Kim H, 2021, KNOWL-BASED SYST, V218, DOI 10.1016/j.knosys.2021.106855

Klement RJ, 2020, INT J RADIAT ONCOL, V107, P579, DOI 10.1016/j.ijrobp.2020.03.005

Lafata K, 2018, PHYS MED BIOL, V63, DOI 10.1088/1361-6560/aae56a

Lafata KJ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf5a5

Lao JW, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-10649-8

Li ZY, 2014, 2014 IEEE INTERNATIONAL SYMPOSIUM ON HAPTIC, AUDIO AND VISUAL ENVIRONMENTS AND GAMES (HAVE)

Liang B, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00269

Lundervold AS, 2019, Z MED PHYS, V29, P102, DOI 10.1016/j.zemedi.2018.11.002

Ma Y, 2012, ENSEMBLE MACHINE LEARNING: METHODS AND APPLICATIONS, P1, DOI 10.1007/978-1-4419-9326-7

Mattonen SA, 2016, BRIT J RADIOL, V89, DOI 10.1259/bjr.20160113

Mazzola R, 2019, STRAHLENTHER ONKOL, V195, P719, DOI 10.1007/s00066-018-01419-0

McErlean Aoife, 2013, Radiology, V269, P451, DOI 10.1148/radiol.13122665

Moran A, 2017, CLIN LUNG CANCER, V18, pE425, DOI 10.1016/j.cllc.2017.05.014

Moreno AC, 2020, J THORAC ONCOL, V15, P101, DOI 10.1016/j.jtho.2019.08.2505

Muenzel D, 2012, RADIOL ONCOL, V46, P8, DOI 10.2478/v10019-012-0009-z

Muhlbaier M, 2005, LECT NOTES COMPUT SC, V3541, P326

Ohri N, 2018, PRACT RADIAT ONCOL, V8, pE33, DOI 10.1016/j.prro.2017.10.002

Ohri N, 2012, INT J RADIAT ONCOL, V84, pE379, DOI 10.1016/j.ijrobp.2012.04.040

Oikonomou A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-22357-y

Orlhac F, 2017, J NUCL MED, V58, P387, DOI 10.2967/jnumed.116.181859

Pan YX, 2018, J APPL CLIN MED PHYS, V19, P142, DOI 10.1002/acm2.12314

Parekh V, 2016, EXPERT REV PRECIS ME, V1, P207, DOI 10.1080/23808993.2016.1164013

Parekh VS, 2019, EXPERT REV PRECIS ME, V4, P59, DOI 10.1080/23808993.2019.1585805

Parmar C, 2018, CLIN CANCER RES, V24, P3492, DOI 10.1158/1078-0432.CCR-18-0385

Power Michael, 2013, Evid Based Med, V18, P5, DOI 10.1136/eb-2012-100645

Sankar V., 2019, ARXIV190104641

Shiue K, 2018, J THORAC ONCOL, V13, P1549, DOI 10.1016/j.jtho.2018.06.007

Suzuki C, 2010, ACTA ONCOL, V49, P509, DOI 10.3109/02841861003705794

Temming S, 2018, STRAHLENTHER ONKOL, V194, P91, DOI 10.1007/s00066-017-1194-x

Varma S, 2006, BMC BIOINFORMATICS, V7, DOI 10.1186/1471-2105-7-91

Wang KD, 2021, IEEE T CYBERNETICS, V51, P1556, DOI 10.1109/TCYB.2019.2957101

Welch ML, 2020, PHYS MEDICA, V70, P145, DOI 10.1016/j.ejmp.2020.01.027

Xu YW, 2019, CLIN CANCER RES, V25, P3266, DOI 10.1158/1078-0432.CCR-18-2495

Yamashita R., 2018, INSIGHTS IMAGING, V9, P611, DOI [10.1007/s13244-018-0639-9, DOI 10.1007/s13244-018-0639-9]

Yosinski J., 2015, INT C MACH LEARN WOR

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

Zhang YC, 2017, SCI REP-UK, V7, DOI 10.1038/srep46349

Zwanenburg A, 2016, ARXIV, DOI DOI 10.1148/RADIOL.2020191145

NR 67

TC 7

Z9 7

U1 3

U2 8

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD OCT

PY 2021

VL 48

IS 10

BP 6257

EP 6269

DI 10.1002/mp.15178

EA SEP 2021

PG 13

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA WR0CC

UT WOS:000693372100001

PM 34415574

DA 2022-08-24

ER

PT J

AU Sun, WB

Niraula, D

El Naqa, I

Ten Haken, RK

Dinov, I

Cuneo, K

Jin, JDY

AF Sun, Wenbo

Niraula, Dipesh

El Naqa, Issam

Ten Haken, Randall K.

Dinov, Ivo

Cuneo, Kyle

Jin, Judy (Jionghua)

TI Precision radiotherapy via information integration of expert human

knowledge and AI recommendation to optimize clinical decision making

SO COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE

LA English

DT Article

DE Precision medicine; Decision making; Artificial intelligence; Computer

model calibration; Gaussian process modeling

ID INDUCIBLE PROTEIN-10; LUNG-CANCER; RADIATION; STATISTICS

AB In the precision medicine era, there is a growing need for precision radiotherapy where the planned radiation dose needs to be optimally determined by considering a myriad of patient-specific information in order to ensure treatment efficacy. Existing artificial-intelligence (AI) methods can recommend radiation dose prescriptions within the scope of this available information. However, treating physicians may not fully entrust the AI's recommended prescriptions due to known limitations or at instances when the AI recommendation may go beyond physicians' current knowledge. This paper lays out a systematic method to integrate expert human knowledge with AI recommendations for optimizing clinical decision making. Towards this goal, Gaussian process (GP) models are integrated with deep neural networks (DNNs) to quantify the uncertainty of the treatment outcomes given by physicians and AI recommendations, respectively, which are further used as a guideline to educate clinical physicians and improve AI models performance. The proposed method is demonstrated in a comprehensive dataset where patient-specific information and treatment outcomes are prospectively collected during radiotherapy of 67 non-small cell lung cancer (NSCLC) patients and are retrospectively analyzed.(c) 2022 Elsevier B.V. All rights reserved.

C1 [Sun, Wenbo; Jin, Judy (Jionghua)] Univ Michigan, Dept Ind & Operat Engn, Ann Arbor, MI 48109 USA.

[Niraula, Dipesh; El Naqa, Issam] H Lee Moffitt Canc Ctr & Res Inst, Dept Machine Learning, Tampa, FL USA.

[Ten Haken, Randall K.; Cuneo, Kyle] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI USA.

[Dinov, Ivo] Univ Michigan, Dept Computat Med & Bioinformat, Ann Arbor, MI USA.

RP Sun, WB (通讯作者)，Univ Michigan, Dept Ind & Operat Engn, Ann Arbor, MI 48109 USA.

EM sunwbgt@umich.edu; Dipesh.Niraula@moffitt.org; Issam.ElNaqa@moffitt.org;

rth@med.umich.edu; kcuneo@umich.edu; jhjin@umich.edu

RI El Naqa, Issam/T-3066-2019

OI El Naqa, Issam/0000-0001-6023-1132; Niraula, Dipesh/0000-0002-2245-8536

FU NIH [R01-CA233487]

FX The research is partly supported by NIH grant R01-CA233487. The authors

would like to thank Dr. Yi Luo for valuable discussions

CR ANGIOLILLO AL, 1995, J EXP MED, V182, P155, DOI 10.1084/jem.182.1.155

Ashton JR, 2018, THERANOSTICS, V8, P1782, DOI 10.7150/thno.22621

Benedict SH, 2016, INT J RADIAT ONCOL, V95, P873, DOI 10.1016/j.ijrobp.2016.03.006

Bengio Y., 2016, DEEP LEARNING

Carroll Gabriel., 2021, GEN FRAMEWORK ROBUST

Chakraborty B., 2013, STAT METHODS DYNAMIC

Chang JS, 2008, INT J CANCER, V123, P2095, DOI 10.1002/ijc.23801

Cressie N, 2003, STAT SCI, V18, P436, DOI 10.1214/ss/1081443228

Dufour JH, 2002, J IMMUNOL, V168, P3195, DOI 10.4049/jimmunol.168.7.3195

El Naqa I., 2018, GUIDE OUTCOME MODELI

El Naqa I, 2018, JCO CLIN CANCER INFO, V2, DOI 10.1200/CCI.18.00002

Goodfellow I., 2014, ADV NEURAL INFORM PR, P2672

Hildebrandt MAT, 2010, PLOS ONE, V5, DOI 10.1371/journal.pone.0012402

IMDRF SaMD Working Group, 2015, SOFTWARE MEDICAL DEV

IMDRF SaMD Working Group, 2013, SOFTW MED DEV SAMD K

IMDRF Software as a Medical Device (SaMD) Working Group, 2014, SOFTW MED DEV POSS F

Kennedy MC, 2001, J R STAT SOC B, V63, P425, DOI 10.1111/1467-9868.00294

Kiyohara Chikako, 2007, Int J Med Sci, V4, P59

Kong FM, 2017, JAMA ONCOL, V3, P1358, DOI 10.1001/jamaoncol.2017.0982

Laffey JG, 2002, ANESTHESIOLOGY, V97, P215

Luo Y, 2018, MED PHYS, V45, P3980, DOI 10.1002/mp.13029

Luo Y, 2017, RADIOTHER ONCOL, V123, P85, DOI 10.1016/j.radonc.2017.02.004

LUSTER AD, 1985, NATURE, V315, P672, DOI 10.1038/315672a0

Mahasittiwat P, 2013, J RADIOL ONCOL, V2, P191, DOI 10.1007/s13566-013-0091-x

Moodie EEM, 2014, STAT BIOSCI, V6, P223, DOI 10.1007/s12561-013-9103-z

Niraula D, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-021-02910-y

Pearl J, 2009, STAT SURV, V3, P96, DOI 10.1214/09-SS057

Qian M, 2011, ANN STAT, V39, P1180, DOI 10.1214/10-AOS864

Ramirez MF, 2013, ANESTHESIOLOGY, V3, P133, DOI DOI 10.4236/0JANES.2013.33031

Rasmussen CE, 2004, LECT NOTES ARTIF INT, V3176, P63, DOI 10.1007/978-3-540-28650-9\_4

Rich AS, 2019, NAT MACH INTELL, V1, P174, DOI 10.1038/s42256-019-0038-z

Schaue D, 2012, RADIAT RES, V178, P505, DOI 10.1667/RR3031.1

Sutton RS, 2018, ADAPT COMPUT MACH LE, P1

TIERNEY L, 1986, J AM STAT ASSOC, V81, P82, DOI 10.2307/2287970

Tseng HH, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00266

Tseng HH, 2017, MED PHYS, V44, P6690, DOI 10.1002/mp.12625

U.S. Department of Health and Human Services Food and Drug Administration Center for Devices and Radiological Health, 2017, SOFTW MED DEV SAMD C

USFDA, 2019, PROPOSED REGULATORY

Vallieres M. C., 2018, THESIS MCGILL U LIB

van Hasselt H, 2016, AAAI CONF ARTIF INTE, P2094

Zhao YQ, 2012, J AM STAT ASSOC, V107, P1106, DOI 10.1080/01621459.2012.695674

NR 41

TC 0

Z9 0

U1 0

U2 0

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0169-2607

EI 1872-7565

J9 COMPUT METH PROG BIO

JI Comput. Meth. Programs Biomed.

PD JUN

PY 2022

VL 221

AR 106927

DI 10.1016/j.cmpb.2022.106927

PG 10

WC Computer Science, Interdisciplinary Applications; Computer Science,

Theory & Methods; Engineering, Biomedical; Medical Informatics

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Computer Science; Engineering; Medical Informatics

GA 2M5WJ

UT WOS:000817769500001

PM 35675722

OA Green Submitted

DA 2022-08-24

ER

PT J

AU Kerhet, A

Small, C

Quon, H

Riauka, T

Schrader, L

Greiner, R

Yee, D

McEwan, A

Roa, W

AF Kerhet, A.

Small, C.

Quon, H.

Riauka, T.

Schrader, L.

Greiner, R.

Yee, D.

McEwan, A.

Roa, W.

TI Application of machine learning methodology for PET-based definition of

lung cancer

SO CURRENT ONCOLOGY

LA English

DT Article

DE Positron-emission tomography; PET; radiation treatment; lung cancer;

gross tumour volume; GTV; artificial intelligence; machine learning;

support vector machine; SVM

ID TARGET VOLUME DEFINITION; F-18-FDG PET; THRESHOLD SEGMENTATION; IMAGE

SEGMENTATION; FDG-PET; RADIOTHERAPY; DELINEATION; CT

AB We applied a learning methodology framework to assist in the threshold-based segmentation of non-small-cell lung cancer (NSCLC) tumours in positron-emission tomography-computed tomography (PET-CT) imaging for use in radiotherapy planning. Gated and standard free-breathing studies of two patients were independently analysed (four studies in total). Each study had a PET-CT and a treatment-planning CT image. The reference gross tumour volume (GTV) was identified by two experienced radiation oncologists who also determined reference standardized uptake value (SUV) thresholds that most closely approximated the GTV contour on each slice. A set of uptake distribution-related attributes was calculated for each pet slice. A machine learning algorithm was trained on a subset of the pet slices to cope with slice-to-slice variation in the optimal SUV threshold: that is, to predict the most appropriate SUV threshold from the calculated attributes for each slice. The algorithm's performance was evaluated using the remainder of the pet slices. A high degree of geometric similarity was achieved between the areas outlined by the predicted and the reference SUV thresholds (Jac-card index exceeding 0.82). No significant difference was found between the gated and the free-breathing results in the same patient. In this preliminary work, we demonstrated the potential applicability of a machine learning methodology as an auxiliary tool for radiation treatment planning in NSCLC.

C1 [Kerhet, A.; Riauka, T.; McEwan, A.] Univ Alberta, Dept Oncol, Edmonton, AB T6G 1Z2, Canada.

[Small, C.; Quon, H.; Yee, D.; Roa, W.] Cross Canc Inst, Dept Radiat Oncol, Edmonton, AB T6G 1Z2, Canada.

[Riauka, T.] Cross Canc Inst, Dept Med Phys, Edmonton, AB T6G 1Z2, Canada.

[Schrader, L.; McEwan, A.] Cross Canc Inst, Dept Oncol Imaging, Edmonton, AB T6G 1Z2, Canada.

[Greiner, R.] Univ Alberta, Dept Comp Sci, Edmonton, AB T6G 1Z2, Canada.

[Greiner, R.] Alberta Ingenu Ctr Machine Learning, Edmonton, AB, Canada.

RP Kerhet, A (通讯作者)，Univ Alberta, Dept Oncol, 11560 Univ Ave, Edmonton, AB T6G 1Z2, Canada.

EM kerhet@ualberta.ca

RI Greiner, Russell/AAQ-4502-2020

OI Greiner, Russell/0000-0001-8327-934X

FU Alberta Cancer Board; Alberta Cancer Foundation; Natural Sciences and

Engineering Research Council of Canada; Alberta Ingenuity Centre for

Machine Learning

FX This project was made possible by a grant from the Alberta Cancer Board

and the Alberta Cancer Foundation. Russell Greiner was partially funded

by the Natural Sciences and Engineering Research Council of Canada and

the Alberta Ingenuity Centre for Machine Learning.

CR Bailey D.L., 2005, POSITRON EMISSION TO

Black QC, 2004, INT J RADIAT ONCOL, V60, P1272, DOI 10.1016/j.ijrobp.2004.06.254

Canadian Cancer Society/National Cancer Institute of Canada. Canadian Cancer Statistics, 2008, CAN CANC STAT 2008

Daisne JF, 2003, RADIOTHER ONCOL, V69, P247, DOI 10.1016/S0167-8140(03)00270-6

Drever L, 2007, J APPL CLIN MED PHYS, V8, P93, DOI 10.1120/jacmp.v8i2.2367

Drever L, 2007, MED PHYS, V34, P1253, DOI 10.1118/1.2712043

Drever L, 2006, MED PHYS, V33, P1583, DOI 10.1118/1.2198308

El Naqa I, 2007, MED PHYS, V34, P4738, DOI 10.1118/1.2799886

Faria SL, 2008, INT J RADIAT ONCOL, V70, P1035, DOI 10.1016/j.ijrobp.2007.07.2379

Geets X, 2007, EUR J NUCL MED MOL I, V34, P1427, DOI 10.1007/s00259-006-0363-4

Greco C, 2007, LUNG CANCER, V57, P125, DOI 10.1016/j.lungcan.2007.03.020

Gregoire V, 2007, J NUCL MED, V48, p68S

Nestle U, 2005, J NUCL MED, V46, P1342

Nestle U, 2007, EUR J NUCL MED MOL I, V34, P453, DOI 10.1007/s00259-006-0252-x

Nestle U, 2006, RADIOTHER ONCOL, V81, P209, DOI 10.1016/j.radonc.2006.09.011

Parkin DM, 2005, CA-CANCER J CLIN, V55, P74, DOI 10.3322/canjclin.55.2.74

PISANI P, 1993, INT J CANCER, V55, P891, DOI 10.1002/ijc.2910550604

Rembielak A, 2008, ONKOLOGIE, V31, P57, DOI [10.1159/000112207, 10.1159/0000112207]

Ries L, 2002, SEER CANC STAT REV 1

Smola AJ, 2004, STAT COMPUT, V14, P199, DOI 10.1023/B:STCO.0000035301.49549.88

Valk P.E, 2006, POSITRON EMISSION TO

van Baardwijk A, 2006, CANCER TREAT REV, V32, P245, DOI 10.1016/j.ctrv.2006.02.002

Vapnik V., 1999, NATURE STAT LEARNING

WIELER HJ, 2000, PET CLIN ONCOLOGY

Yu HM, 2009, EUR J RADIOL, V72, P104, DOI 10.1016/j.ejrad.2008.06.015

NR 25

TC 14

Z9 14

U1 2

U2 13

PU MULTIMED INC

PI TORONTO

PA 66 MARTIN ST, TORONTO, ON L9T 2R2, CANADA

SN 1198-0052

J9 CURR ONCOL

JI Curr. Oncol.

PY 2010

VL 17

IS 1

BP 41

EP 47

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA V27XB

UT WOS:000208644800003

PM 20179802

OA gold, Green Submitted, Green Published

DA 2022-08-24

ER

PT J

AU Zhang, FL

Wang, QS

Li, HP

AF Zhang, Fuli

Wang, Qiusheng

Li, Haipeng

TI Automatic Segmentation of the Gross Target Volume in Non-Small Cell Lung

Cancer Using a Modified Version of ResNet

SO TECHNOLOGY IN CANCER RESEARCH & TREATMENT

LA English

DT Article

DE deep learning; automatic segmentation; gross target volume; non-small

cell lung cancer; residual convolutional block; convolutional neural

network

ID RADIOTHERAPY; TUMORS; RISK; CT

AB Radiotherapy plays an important role in the treatment of non-small cell lung cancer. Accurate segmentation of the gross target volume is very important for successful radiotherapy delivery. Deep learning techniques can obtain fast and accurate segmentation, which is independent of experts' experience and saves time compared with manual delineation. In this paper, we introduce a modified version of ResNet and apply it to segment the gross target volume in computed tomography images of patients with non-small cell lung cancer. Normalization was applied to reduce the differences among images and data augmentation techniques were employed to further enrich the data of the training set. Two different residual convolutional blocks were used to efficiently extract the deep features of the computed tomography images, and the features from all levels of the ResNet were merged into a single output. This simple design achieved a fusion of deep semantic features and shallow appearance features to generate dense pixel outputs. The test loss tended to be stable after 50 training epochs, and the segmentation took 21 ms per computed tomography image. The average evaluation metrics were: Dice similarity coefficient, 0.73; Jaccard similarity coefficient, 0.68; true positive rate, 0.71; and false positive rate, 0.0012. Those results were better than those of U-Net, which was used as a benchmark. The modified ResNet directly extracted multi-scale context features from original input images. Thus, the proposed automatic segmentation method can quickly segment the gross target volume in non-small cell lung cancer cases and be applied to improve consistency in contouring.

C1 [Zhang, Fuli] Chinese Peoples Liberat Army Gen Hosp, Dept Radiat Oncol, Med Ctr 7, Beijing 100700, Peoples R China.

[Wang, Qiusheng; Li, Haipeng] Beihang Univ, Sch Automat Sci & Elect Engn, Beijing, Peoples R China.

RP Zhang, FL (通讯作者)，Chinese Peoples Liberat Army Gen Hosp, Dept Radiat Oncol, Med Ctr 7, Beijing 100700, Peoples R China.

EM radiozfli@163.com

OI Zhang, FL/0000-0002-7213-9031

FU Beijing Municipal Science and Technology Commission

FX The study was supported by Beijing Municipal Science and Technology

Commission (No.Z181100001718011). The author(s) received no financial

support for the research, authorship, and/or publication of this

article.

CR Barkati M, 2016, J MED IMAG RADIAT ON, V60, P255, DOI 10.1111/1754-9485.12416

Bauer S, 2011, LECT NOTES COMPUT SC, V6893, P354, DOI 10.1007/978-3-642-23626-6\_44

Bi N, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.01192

Bottou Leon, 2012, Neural Networks: Tricks of the Trade. Second Edition: LNCS 7700, P421, DOI 10.1007/978-3-642-35289-8\_25

Ferlay J, 2015, INT J CANCER, V136, pE359, DOI 10.1002/ijc.29210

Iqbal S, 2018, MICROSC RES TECHNIQ, V81, P419, DOI 10.1002/jemt.22994

Janardhanaprabhu S, 2019, J MED SYST, V43, DOI 10.1007/s10916-019-1366-6

Jian JM, 2018, AUSTRALAS PHYS ENG S, V41, P393, DOI 10.1007/s13246-018-0636-9

Jiang J, 2018, LECT NOTES COMPUT SC, V11071, P777, DOI 10.1007/978-3-030-00934-2\_86

Jiang J, 2019, IEEE T MED IMAGING, V38, P134, DOI 10.1109/TMI.2018.2857800

Kaiming He, 2016, 2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), P770, DOI 10.1109/CVPR.2016.90

Kingma D, 2014, ARXIV

Kirillov A, 2019, PROC CVPR IEEE, P6392, DOI 10.1109/CVPR.2019.00656

Krizhevsky A, 2017, COMMUN ACM, V60, P84, DOI 10.1145/3065386

Lin L, 2019, RADIOLOGY, V291, P677, DOI 10.1148/radiol.2019182012

Lin Tsung-Yi, 2020, IEEE Trans Pattern Anal Mach Intell, V42, P318, DOI [10.1109/TPAMI.2018.2858826, 10.1109/ICCV.2017.324]

Lin TY, 2017, PROC CVPR IEEE, P936, DOI 10.1109/CVPR.2017.106

Liu HH, 2007, INT J RADIAT ONCOL, V68, P531, DOI 10.1016/j.ijrobp.2006.12.066

Liu Y, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0185844

Long J, 2015, PROC CVPR IEEE, P3431, DOI 10.1109/CVPR.2015.7298965

Men K, 2018, PHYS MED BIOL, V63, DOI 10.1088/1361-6560/aada6c

Men K, 2018, PHYS MEDICA, V50, P13, DOI 10.1016/j.ejmp.2018.05.006

Men K, 2017, MED PHYS, V44, P6377, DOI 10.1002/mp.12602

Nakai H, 2020, ACAD RADIOL, V27, P563, DOI 10.1016/j.acra.2019.05.016

Razzak MI, 2019, IEEE J BIOMED HEALTH, V23, P1911, DOI 10.1109/JBHI.2018.2874033

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

Siegel RL., 2020, CA-CANCER J CLIN, V70, P7, DOI [DOI 10.3322/caac.21551, 10.3322/caac.21590]

Sudre CH, 2017, LECT NOTES COMPUT SC, V10553, P240, DOI 10.1007/978-3-319-67558-9\_28

Tang W, 2019, CHINESE J CANCER RES, V31, P316, DOI 10.21147/j.issn.1000-9604.2019.02.06

Thillaikkarasi R, 2019, J MED SYST, V43, DOI 10.1007/s10916-019-1223-7

Trebeschi S, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-05728-9

van Mourik AM, 2010, RADIOTHER ONCOL, V94, P286, DOI 10.1016/j.radonc.2010.01.009

Wang C, 2019, RADIOTHER ONCOL, V131, P101, DOI 10.1016/j.radonc.2018.10.037

Yu F., 2016, ICLR

Zhao XM, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf44b

Zhong ZS, 2019, MED PHYS, V46, P619, DOI 10.1002/mp.13331

NR 36

TC 8

Z9 8

U1 7

U2 17

PU SAGE PUBLICATIONS INC

PI THOUSAND OAKS

PA 2455 TELLER RD, THOUSAND OAKS, CA 91320 USA

SN 1533-0346

EI 1533-0338

J9 TECHNOL CANCER RES T

JI Technol. Cancer Res. Treat.

PD AUG 14

PY 2020

VL 19

AR 1533033820947484

DI 10.1177/1533033820947484

PG 9

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA NF5PF

UT WOS:000563348100001

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Luna, JM

Chao, HH

Diffenderfer, ES

Valdes, G

Chinniah, C

Ma, G

Cengel, KA

Solberg, TD

Berman, AT

Simone, CB

AF Luna, Jose Marcio

Chao, Hann-Hsiang

Diffenderfer, Eric S.

Valdes, Gilmer

Chinniah, Chidambaram

Ma, Grace

Cengel, Keith A.

Solberg, Timothy D.

Berman, Abigail T.

Simone, Charles B., II

TI Predicting radiation pneumonitis in locally advanced stage II-III

non-small cell lung cancer using machine learning

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Radiation pneumonitis; Non-small cell lung cancer; Machine learning;

Random forest; RUSBoost; CART; Support vector machines; Logistic

regression

ID VOLUME HISTOGRAM PARAMETERS; PULMONARY TOXICITY; THERAPY; RADIOTHERAPY;

OUTCOMES

AB Background and purpose: Radiation pneumonitis (RP) is a radiotherapy dose-limiting toxicity for locally advanced non-small cell lung cancer (LA-NSCLC). Prior studies have proposed relevant dosimetric constraints to limit this toxicity. Using machine learning algorithms, we performed analyses of contributing factors in the development of RP to uncover previously unidentified criteria and elucidate the relative importance of individual factors.

Materials and methods: We evaluated 32 clinical features per patient in a cohort of 203 stage II-III LANSCLC patients treated with definitive chemoradiation to a median dose of 66.6 Gy in 1.8 Gy daily fractions at our institution from 2008 to 2016. Of this cohort, 17.7% of patients developed grade >= 2 RP. Univariate analysis was performed using trained decision stumps to individually analyze statistically significant predictors of RP and perform feature selection. Applying Random Forest, we performed multivariate analysis to assess the combined performance of important predictors of RP.

Results: On univariate analysis, lung V20, lung mean, lung V10 and lung V5 were found to be significant RP predictors with the greatest balance of specificity and sensitivity. On multivariate analysis, Random Forest (AUC = 0.66, p = 0.0005) identified esophagus max (20.5%), lung V20 (16.4%), lung mean (15.7%) and pack-year (14.9%) as the most common primary differentiators of RP.

Conclusions: We highlight Random Forest as an accurate machine learning method to identify known and new predictors of symptomatic RP. Furthermore, this analysis confirms the importance of lung V20, lung mean and pack-year as predictors of RP while also introducing esophagus max as an important RP predictor. (C) 2019 Elsevier B.V. All rights reserved.

C1 [Luna, Jose Marcio; Chao, Hann-Hsiang; Diffenderfer, Eric S.; Ma, Grace; Cengel, Keith A.; Berman, Abigail T.] Univ Penn, Dept Radiat Oncol, 3400 Civ Ctr Blvd,TRC 8-130, Philadelphia, PA 19104 USA.

[Valdes, Gilmer; Solberg, Timothy D.] Univ Calif San Francisco, Dept Radiat Oncol, San Francisco, CA USA.

[Chinniah, Chidambaram] Albany Med Coll, Albany, NY 12208 USA.

[Simone, Charles B., II] Univ Maryland, Sch Med, Dept Radiat Oncol, Baltimore, MD 21201 USA.

RP Luna, JM (通讯作者)，Univ Penn, Dept Radiat Oncol, 3400 Civ Ctr Blvd,TRC 8-130, Philadelphia, PA 19104 USA.

EM Jose.Luna@uphs.upenn.edu

RI Luna, Jose Marcio/ABG-1296-2020

OI Simone, Charles/0000-0002-0867-3694; Luna, Jose/0000-0002-5513-022X; ,

Timothy/0000-0001-8829-7774

FU Abramson Cancer Center of the University of Pennsylvania

FX This work was partially supported by the Abramson Cancer Center of the

University of Pennsylvania through award granted by the Emerson

Collective.

CR [Anonymous], [No title captured]

Barriger RB, 2010, INT J RADIAT ONCOL, V78, P1381, DOI 10.1016/j.ijrobp.2009.09.030

Bentzen SM, 2010, INT J RADIAT ONCOL, V76, pS3, DOI 10.1016/j.ijrobp.2009.09.040

Bledsoe TJ, 2017, CLIN CHEST MED, V38, P201, DOI 10.1016/j.ccm.2016.12.004

Bradley JD, 2007, INT J RADIAT ONCOL, V69, P985, DOI 10.1016/j.ijrobp.2007.04.077

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

CORTES C, 1995, MACH LEARN, V20, P273, DOI 10.1023/A:1022627411411

COX DR, 1958, J R STAT SOC B, V20, P215

Dang J, 2014, LUNG CANCER, V86, P329, DOI 10.1016/j.lungcan.2014.10.005

Dang J, 2014, RADIAT ONCOL, V9, DOI 10.1186/1748-717X-9-172

Dang J, 2013, ACTA ONCOL, V52, P1175, DOI 10.3109/0284186X.2012.747696

Darcy AM, 2016, JAMA-J AM MED ASSOC, V315, P551, DOI 10.1001/jama.2015.18421

El Naqa I, 2009, PHYS MED BIOL, V54, pS9, DOI 10.1088/0031-9155/54/18/S02

Friedman J.H., 1984, CLASSIFICATION REGRE, P368, DOI DOI 10.1201/9781315139470-8

Graham MV, 1999, INT J RADIAT ONCOL, V45, P323, DOI 10.1016/S0360-3016(99)00183-2

Graves PR, 2010, SEMIN RADIAT ONCOL, V20, P201, DOI 10.1016/j.semradonc.2010.01.010

Hernando ML, 2001, INT J RADIAT ONCOL, V51, P650, DOI 10.1016/S0360-3016(01)01685-6

Kang J, 2015, INT J RADIAT ONCOL, V93, P1127, DOI 10.1016/j.ijrobp.2015.07.2286

Kim M, 2011, RADIAT ONCOL J, V29, P181, DOI 10.3857/roj.2011.29.3.181

Kocak Z, 2007, INT J RADIAT ONCOL, V67, P178, DOI 10.1016/j.ijrobp.2006.09.031

Kolda TG, 2003, SIAM REV, V45, P385, DOI 10.1137/S0036144502428893

Lipton Z, 2016, ICML WORKSH HUM INT, P1

Luna J. M., 2017, NIPS, P1

Luo Y, 2017, RADIOTHER ONCOL, V123, P85, DOI 10.1016/j.radonc.2017.02.004

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Marks LB, 1997, INT J RADIAT ONCOL, V39, P563, DOI 10.1016/S0360-3016(97)00343-X

MathWorks, 2015, MATLAB, V118

MCDONALD S, 1995, INT J RADIAT ONCOL, V31, P1187, DOI 10.1016/0360-3016(94)00429-O

Palma DA, 2013, INT J RADIAT ONCOL, V85, P444, DOI 10.1016/j.ijrobp.2012.04.043

Parashar B, 2011, AM J CLIN ONCOL-CANC, V34, P160, DOI 10.1097/COC.0b013e3181d6b40f

Park YH, 2013, RADIAT ONCOL J, V31, P34, DOI 10.3857/roj.2013.31.1.34

Ramella S, 2010, INT J RADIAT ONCOL, V76, P110, DOI 10.1016/j.ijrobp.2009.01.036

Rancati T, 2003, RADIOTHER ONCOL, V67, P275, DOI 10.1016/S0167-8140(03)00119-1

Rodrigues G, 2004, RADIOTHER ONCOL, V71, P127, DOI 10.1016/j.radonc.2004.02.015

Seiffert C, 2010, IEEE T SYST MAN CY A, V40, P185, DOI 10.1109/TSMCA.2009.2029559

Simone CB, 2017, SEMIN RADIAT ONCOL, V27, P370, DOI 10.1016/j.semradonc.2017.04.009

Svetnik V, 2003, J CHEM INF COMP SCI, V43, P1947, DOI 10.1021/ci034160g

Valdes G, 2016, SCI REP-UK, V6, DOI 10.1038/srep37854

Valdes G, 2016, PHYS MED BIOL, V61, P6105, DOI 10.1088/0031-9155/61/16/6105

Wang DQ, 2013, CLIN TRANSL ONCOL, V15, P364, DOI 10.1007/s12094-012-0931-y

NR 40

TC 32

Z9 34

U1 0

U2 9

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD APR

PY 2019

VL 133

BP 106

EP 112

DI 10.1016/j.radonc.2019.01.003

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA HQ9QK

UT WOS:000462762200016

PM 30935565

DA 2022-08-24

ER

PT J

AU Zhang, T

Yang, Y

Wang, JB

Men, K

Wang, X

Deng, L

Bi, N

AF Zhang, Tao

Yang, Yin

Wang, Jingbo

Men, Kuo

Wang, Xin

Deng, Lei

Bi, Nan

TI Comparison between atlas and convolutional neural network based

automatic segmentation of multiple organs at risk in non-small cell lung

cancer

SO MEDICINE

LA English

DT Article

DE automatic segmentation based on atlas; automatic segmentation based on

convolutional neural network; non-small cell lung cancer; organs at

risk; postoperative radiation therapy

ID CLINICAL TARGET VOLUME; RADIATION-THERAPY; STAGE-II; RADIOTHERAPY;

IMAGES; HEAD; CT

AB Delineation of organs at risk (OARs) is important but time consuming for radiotherapy planning. Automatic segmentation of OARs based on convolutional neural network (CNN) has been established for lung cancer patients at our institution. The aim of this study is to compare automatic segmentation based on CNN (AS-CNN) with automatic segmentation based on atlas (AS-Atlas) in terms of the efficiency and accuracy of OARs contouring. The OARs, including the lungs, esophagus, heart, liver, and spinal cord, of 19 non-small cell lung cancer patients were delineated using three methods: AS-CNN, AS-Atlas in the Pinnacle(3)-software, and manual delineation (MD) by a senior radiation oncologist. MD was used as the ground-truth reference, and the segmentation efficiency was evaluated by the time spent per patient. The accuracy was evaluated using the Mean surface distance (MSD) and Dice similarity coefficient (DSC). The paired t-test or Wilcoxon signed-rank test was used to compare these indexes between the 2 automatic segmentation models. In the 19 testing cases, both AS-CNN and AS-Atlas saved substantial time compared with MD. AS-CNN was more efficient than AS-Atlas (1.6 min vs 2.4 min,P < .001). In terms of the accuracy, AS-CNN performed well in the esophagus, with a DSC of 73.2%. AS-CNN was better than AS-Atlas in segmenting the left lung (DSC: 94.8% vs 93.2%,P = .01; MSD: 1.10 cm vs 1.73 cm,P < .001) and heart (DSC: 89.3% vs 85.8%,P = .05; MSD: 1.65 cm vs 3.66 cm,P < .001). Furthermore, AS-CNN exhibited superior performance in segmenting the liver (DSC: 93.7% vs 93.6%,P = .81; MSD: 2.03 cm VS 2.11 cm,P = .66). The results obtained from AS-CNN and AS-Atlas were similar in segmenting the right lung. However, the performance of AS-CNN in the spinal cord was inferior to that of AS-Atlas (DSC: 82.1% vs 86.8%,P = .01; MSD: 0.87 cm vs 0.66 cm,P = .01). Our study demonstrated that AS-CNN significantly reduced the contouring time and outperformed AS-Atlas in most cases. AS-CNN can potentially be used for OARs segmentation in patients with pathological N2 (pN2) non-small cell lung cancer.

C1 [Zhang, Tao; Yang, Yin; Wang, Jingbo; Men, Kuo; Wang, Xin; Deng, Lei; Bi, Nan] Chinese Acad Med Sci & Peking Union Med Coll, Canc Hosp, Natl Clin Res Ctr Canc, Dept Radiat Oncol,Natl Canc Ctr, 17 PanjiayuanNanli, Beijing 100021, Peoples R China.

RP Bi, N (通讯作者)，Chinese Acad Med Sci & Peking Union Med Coll, Canc Hosp, Natl Clin Res Ctr Canc, Dept Radiat Oncol,Natl Canc Ctr, 17 PanjiayuanNanli, Beijing 100021, Peoples R China.

EM binan\_email@163.com

FU CAMS Innovation Fund for Medical Sciences [2017-I2M-1-009]; Beijing

Municipal Science AMP; Technology Commission [Z181100001918002]

FX This study was supported by grants of CAMS Innovation Fund for Medical

Sciences (No. 2017-I2M-1-009) and the Beijing Municipal Science &

Technology Commission (No. Z181100001918002)

CR Ayyalusamy A, 2019, RADIAT ONCOL J, V37, P134, DOI 10.3857/roj.2019.00038

Bi N, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.01192

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Chang JY, 2017, JAMA ONCOL, V3, DOI 10.1001/jamaoncol.2017.2032

Delpon G, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00178

Douillard JY, 2008, INT J RADIAT ONCOL, V72, P695, DOI 10.1016/j.ijrobp.2008.01.044

Ibragimov B, 2017, PHYS MED BIOL, V62, P8943, DOI 10.1088/1361-6560/aa9262

Ibragimov B, 2017, MED PHYS, V44, P547, DOI 10.1002/mp.12045

Kilburn JM, 2016, PRACT RADIAT ONCOL, V6, pE73, DOI 10.1016/j.prro.2015.10.004

Lally BE, 2006, J CLIN ONCOL, V24, P2998, DOI 10.1200/JCO.2005.04.6110

Lee H, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00239

Li XA, 2009, INT J RADIAT ONCOL, V73, P944, DOI 10.1016/j.ijrobp.2008.10.034

Liao ZXX, 2010, INT J RADIAT ONCOL, V76, P775, DOI 10.1016/j.ijrobp.2009.02.032

Men K, 2018, PHYS MEDICA, V50, P13, DOI 10.1016/j.ejmp.2018.05.006

Men K, 2017, FRONT ONCOL, V7, DOI 10.3389/fonc.2017.00315

Men K, 2017, MED PHYS, V44, P6377, DOI 10.1002/mp.12602

National Comprehensive Cancer Network, 2020, NON SMALL CELL LUNG

Schreibmann E, 2014, J APPL CLIN MED PHYS, V15, P4468, DOI DOI 10.1120/JACMP.V15I4.4468

Wang SW, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0946-1

Wardman K, 2016, J APPL CLIN MED PHYS, V17, P146, DOI 10.1120/jacmp.v17i4.6051

Wennstig AK, 2017, RADIOTHER ONCOL, V122, P72, DOI 10.1016/j.radonc.2016.11.007

Wittenstein O, 2019, STRAHLENTHER ONKOL, V195, P1094, DOI 10.1007/s00066-019-01463-4

Xu YJ, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-14629-w

Zhu JH, 2019, ACTA ONCOL, V58, P257, DOI 10.1080/0284186X.2018.1529421

ZIJDENBOS AP, 1994, IEEE T MED IMAGING, V13, P716, DOI 10.1109/42.363096

NR 25

TC 8

Z9 9

U1 3

U2 9

PU LIPPINCOTT WILLIAMS & WILKINS

PI PHILADELPHIA

PA TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA, PA 19103 USA

SN 0025-7974

EI 1536-5964

J9 MEDICINE

JI Medicine (Baltimore)

PD AUG 21

PY 2020

VL 99

IS 34

AR e21800

DI 10.1097/MD.0000000000021800

PG 6

WC Medicine, General & Internal

WE Science Citation Index Expanded (SCI-EXPANDED)

SC General & Internal Medicine

GA OC9DS

UT WOS:000579455900070

PM 32846816

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Luna, JM

Chao, HH

Shinohara, RT

Ungar, LH

Cengel, KA

Pryma, DA

Chinniah, C

Berman, AT

Katz, SI

Kontos, D

Simone, CB

Diffenderfer, ES

AF Luna, Jose Marcio

Chao, Hann-Hsiang

Shinohara, Russel T.

Ungar, Lyle H.

Cengel, Keith A.

Pryma, Daniel A.

Chinniah, Chidambaram

Berman, Abigail T.

Katz, Sharyn, I

Kontos, Despina

Simone, Charles B., II

Diffenderfer, Eric S.

TI Machine learning highlights the deficiency of conventional dosimetric

constraints for prevention of high-grade radiation esophagitis in

non-small cell lung cancer treated with chemoradiation

SO CLINICAL AND TRANSLATIONAL RADIATION ONCOLOGY

LA English

DT Article

DE Radiation esophagitis; Machine learning; Non-small cell lung cancer;

Chemoradiation; Radiation-induced toxicity; Intensity-modulated

radiation therapy; Proton beam therapy

ID CONCURRENT CHEMORADIATION; PREDICTORS; THERAPY; RADIOTHERAPY; TOXICITY;

CHEMOTHERAPY; CARCINOMA; MODEL; TIME

AB Background and Purpose: Radiation esophagitis is a clinically important toxicity seen with treatment for locally-advanced non-small cell lung cancer. There is considerable disagreement among prior studies in identifying predictors of radiation esophagitis. We apply machine learning algorithms to identify factors contributing to the development of radiation esophagitis to uncover previously unidentified criteria and more robust dosimetric factors.

Materials and Methods: We used machine learning approaches to identify predictors of grade >= 3 radiation esophagitis in a cohort of 202 consecutive locally-advanced non-small cell lung cancer patients treated with definitive chemoradiation from 2008 to 2016. We evaluated 35 clinical features per patient grouped into risk factors, comorbidities, imaging, stage, histology, radiotherapy, chemotherapy and dosimetry. Univariate and multivariate analyses were performed using a panel of 11 machine learning algorithms combined with predictive power assessments.

Results: All patients were treated to a median dose of 66.6 Gy at 1.8 Gy per fraction using photon (89.6%) and proton (10.4%) beam therapy, most often with concurrent chemotherapy (86.6%). 11.4% of patients developed grade >= 3 radiation esophagitis. On univariate analysis, no individual feature was found to predict radiation esophagitis (AUC range 0.45-0.55, p >= 0.07). In multivariate analysis, all machine learning algorithms exhibited poor predictive performance (AUC range 0.46-0.56, p >= 0.07).

Conclusions: Contemporary machine learning algorithms applied to our modern, relatively large institutional cohort could not identify any reliable predictors of grade >= 3 radiation esophagitis. Additional patients are needed, and novel patient-specific and treatment characteristics should be investigated to develop clinically meaningful methods to mitigate this survival altering toxicity. (C) 2020 The Author(s). Published by Elsevier B.V. on behalf of European Society for Radiotherapy and Oncology.

C1 [Luna, Jose Marcio; Cengel, Keith A.; Berman, Abigail T.; Diffenderfer, Eric S.] Univ Penn, Perelman Ctr Adv Med, Dept Radiat Oncol, 3400 Civ Ctr Blvd, Philadelphia, PA 19104 USA.

[Chao, Hann-Hsiang] Hunter Holmes McGuire Vet Affairs Med Ctr, Dept Radiat Oncol, 1201 Broad Rock Blvd, Richmond, VA 23249 USA.

[Shinohara, Russel T.] Univ Penn, Dept Biostat & Epidemiol, 423 Guardian Dr, Philadelphia, PA 19104 USA.

[Ungar, Lyle H.] Univ Penn, Dept Comp & Informat Sci, 3330 Walnut St, Philadelphia, PA 19104 USA.

[Pryma, Daniel A.; Katz, Sharyn, I; Kontos, Despina] Univ Penn, Dept Radiol, 3400 Spruce St, Philadelphia, PA 19104 USA.

[Chinniah, Chidambaram] Albany Med Coll, 43 New Scotland Ave, Albany, NY 12208 USA.

[Simone, Charles B., II] New York Proton Ctr, Dept Radiat Oncol, 225 East 126th St, New York, NY 10035 USA.

RP Luna, JM (通讯作者)，Bldg 421,SCTR 8-130,3400 Civ Ctr Blvd, Philadelphia, PA 19104 USA.

EM jose.luna@pennmedicine.upenn.edu

RI Katz, Sharyn/AAK-1408-2020; Luna, Jose Marcio/ABG-1296-2020

OI Katz, Sharyn/0000-0001-9816-2291; Luna, Jose/0000-0002-5513-022X

FU Emerson Collective Research Fund

FX This work was partially supported by an award granted by the Emerson

Collective Research Fund. Special thanks to Grace Ma for her assistance

extracting clinical information for the cohort.

CR Ahn SJ, 2005, INT J RADIAT ONCOL, V61, P335, DOI 10.1016/j.ijrobp.2004.06.014

Altman DG, 2014, CLIN CHEM, V60, P580, DOI 10.1373/clinchem.2013.220335

[Anonymous], [No title captured]

Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

Bahn E, 2020, RADIOTHER ONCOL, V144, P148, DOI 10.1016/j.radonc.2019.11.018

Belderbos J, 2005, RADIOTHER ONCOL, V75, P157, DOI 10.1016/j.radonc.2005.03.021

Bradley J, 2004, SEMIN RADIAT ONCOL, V14, P280, DOI 10.1016/j.semradonc.2004.06.003

Bradley J, 2004, INT J RADIAT ONCOL, V58, P1106, DOI 10.1016/j.ijrobp.2003.09.080

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Chajon E, 2015, BRIT J RADIOL, V88, DOI 10.1259/bjr.20150311

Chao HH, 2018, J APPL CLIN MED PHYS, V19, P539, DOI 10.1002/acm2.12415

Chapet O, 2005, RADIOTHER ONCOL, V77, P176, DOI 10.1016/j.radonc.2005.10.001

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

CORTES C, 1995, MACH LEARN, V20, P273, DOI 10.1023/A:1022627411411

COX DR, 1958, J R STAT SOC B, V20, P215

Curran WJ, 2011, J NATL CANCER I, V103, P1452, DOI 10.1093/jnci/djr325

Duda R.O., 2006, PATTERN CLASSIFICATI

Folch-Fortuny A, 2015, CHEMOMETR INTELL LAB, V146, P77, DOI 10.1016/j.chemolab.2015.05.006

Giaddui T, 2016, RADIAT ONCOL, V11, DOI 10.1186/s13014-016-0640-8

Gomez DR, 2012, INT J RADIAT ONCOL, V84, P1010, DOI 10.1016/j.ijrobp.2012.01.071

Hawkins Peter G, 2018, Transl Oncol, V11, P102, DOI 10.1016/j.tranon.2017.11.005

Huang EX, 2017, ADV RADIAT ONCOL, V2, P37, DOI 10.1016/j.adro.2016.11.003

Luna JM, 2019, RADIOTHER ONCOL, V133, P106, DOI 10.1016/j.radonc.2019.01.003

Machtay M, 2005, INT J RADIAT ONCOL, V63, P667, DOI 10.1016/j.ijrobp.2005.03.037

Maguire PD, 1999, INT J RADIAT ONCOL, V45, P97, DOI 10.1016/S0360-3016(99)00163-7

Manapov F, 2013, RADIAT ONCOL, V8, DOI 10.1186/1748-717X-8-122

Mehmood Q, 2016, J THORAC ONCOL, V11, P213, DOI 10.1016/j.jtho.2015.10.006

Movsas B, 2016, JAMA ONCOL, V2, P359, DOI 10.1001/jamaoncol.2015.3969

Palma DA, 2013, INT J RADIAT ONCOL, V87, P690, DOI 10.1016/j.ijrobp.2013.07.029

Patel AB, 2004, INT J RADIAT ONCOL, V60, P1106, DOI 10.1016/j.ijrobp.2004.04.051

PRAAGMAN J, 1985, EUR J OPER RES, V19, P144, DOI 10.1016/0377-2217(85)90321-2

Rose J, 2009, RADIOTHER ONCOL, V91, P282, DOI 10.1016/j.radonc.2008.09.010

Rwigema JCM, 2017, CANCER-AM CANCER SOC, V123, P4244, DOI 10.1002/cncr.30870

Seiffert C, 2010, IEEE T SYST MAN CY A, V40, P185, DOI 10.1109/TSMCA.2009.2029559

Simone CB, 2017, SEMIN RADIAT ONCOL, V27, P370, DOI 10.1016/j.semradonc.2017.04.009

Singh AK, 2003, INT J RADIAT ONCOL, V55, P337, DOI 10.1016/S0360-3016(02)03937-8

Svetnik V, 2003, J CHEM INF COMP SCI, V43, P1947, DOI 10.1021/ci034160g

Thor M, 2019, RADIOTHER ONCOL, V138, P45, DOI 10.1016/j.radonc.2019.05.011

Wada K, 2019, ANTICANCER RES, V39, P491, DOI 10.21873/anticanres.13139

Werner-Wasik M, 2000, INT J RADIAT ONCOL, V48, P689, DOI 10.1016/S0360-3016(00)00699-4

Werner-Wasik M, 2005, SEMIN ONCOL, V32, pS60, DOI 10.1053/j.seminoncol.2005.03.011

Werner-Wasik M, 2011, CLIN LUNG CANCER, V12, P245, DOI 10.1016/j.cllc.2011.03.026

NR 43

TC 4

Z9 5

U1 1

U2 4

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

EI 2405-6308

J9 CLIN TRANSL RAD ONCO

JI Clin. Transl. Radiat. Oncol.

PD MAY

PY 2020

VL 22

BP 69

EP 75

DI 10.1016/j.ctro.2020.03.007

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA LL9BE

UT WOS:000531846900011

PM 32274426

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Bi, N

Wang, JB

Zhang, T

Chen, XY

Xia, WL

Miao, JJ

Xu, KP

Wu, LF

Fan, QR

Wang, LH

Li, YX

Zhou, ZM

Dai, JR

AF Bi, Nan

Wang, Jingbo

Zhang, Tao

Chen, Xinyuan

Xia, Wenlong

Miao, Junjie

Xu, Kunpeng

Wu, Linfang

Fan, Quanrong

Wang, Luhua

Li, Yexiong

Zhou, Zongmei

Dai, Jianrong

TI Deep Learning Improved Clinical Target Volume Contouring Quality and

Efficiency for Postoperative Radiation Therapy in Non-small Cell Lung

Cancer

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE non-small cell lung cancer; postoperative radiotherapy; clinical target

volume; deep learning; automatic contour

ID LYMPH-NODE STATIONS; BIG DATA; RADIOTHERAPY; ONCOLOGY; SEGMENTATION;

ATLAS; DEFINITION; OUTCOMES; CT; DELINEATION

AB Purpose: To investigate whether a deep learning-assisted contour (DLAC) could provide greater accuracy, inter-observer consistency, and efficiency compared with a manual contour (MC) of the clinical target volume (CTV) for non-small cell lung cancer (NSCLC) receiving postoperative radiotherapy (PORT). Materials and Methods: A deep dilated residual network was used to achieve the effective automatic contour of the CTV. Eleven junior physicians contoured CTVs on 19 patients by using both MC and DLAC methods independently. Compared with the ground truth, the accuracy of the contour was evaluated by using the Dice coefficient and mean distance to agreement (MDTA). The coefficient of variation (CV) and standard distance deviation (SDD) were rendered to measure the inter-observer variability or consistency. The time consumed for each of the two contouring methods was also compared. Results: A total of 418 CTV sets were generated. DLAC improved contour accuracy when compared with MC and was associated with a larger Dice coefficient (mean +/- SD: 0.75 +/- 0.06 vs. 0.72 +/- 0.07, p < 0.001) and smaller MDTA (mean +/- SD: 2.97 +/- 0.91 mm vs. 3.07 +/- 0.98 mm, p < 0.001). The DLAC was also associated with decreased inter-observer variability, with a smaller CV (mean +/- SD: 0.129 +/- 0.040 vs. 0.183 +/- 0.043, p < 0.001) and SDD (mean +/- SD: 0.47 +/- 0.22 mm vs. 0.72 +/- 0.41 mm, p < 0.001). In addition, a value of 35% of time saving was provided by the DLAC (median: 14.81 min vs. 9.59 min, p < 0.001). Conclusions: Compared with MC, the DLAC is a promising strategy to obtain superior accuracy, consistency, and efficiency for the PORT-CTV in NSCLC.

C1 [Bi, Nan; Wang, Jingbo; Zhang, Tao; Chen, Xinyuan; Xia, Wenlong; Miao, Junjie; Xu, Kunpeng; Wu, Linfang; Fan, Quanrong; Wang, Luhua; Li, Yexiong; Zhou, Zongmei; Dai, Jianrong] Chinese Acad Med Sci & Peking Union Med Coll, Dept Radiat Oncol, Natl Canc Ctr, Natl Clin Res Ctr Canc,Canc Hosp, Beijing, Peoples R China.

[Wang, Luhua] Chinese Acad Med Sci & Peking Union Med Coll, Canc Hosp, Natl Canc Ctr, Natl Clin Res Ctr Canc, Beijing, Peoples R China.

[Wang, Luhua] Chinese Acad Med Sci & Peking Union Med Coll, Shenzhen Hosp, Beijing, Peoples R China.

RP Zhou, ZM; Dai, JR (通讯作者)，Chinese Acad Med Sci & Peking Union Med Coll, Dept Radiat Oncol, Natl Canc Ctr, Natl Clin Res Ctr Canc,Canc Hosp, Beijing, Peoples R China.

EM zhouzongmei2013@163.com; dai\_jianrong@cicams.ac.cn

FU CAMS Initiative for Innovative Medicine (CAMS-I2M) [2017-I2M-1-005,

2016-I2M-1-001]; National Natural Science Foundation of China

[11875320]; Non-profit Central Research Institute Fund of Chinese

Academy of Medical Sciences [2018PT32011]

FX This work was supported by the CAMS Initiative for Innovative Medicine

(CAMS-I2M, Grant Nos: 2017-I2M-1-005, 2016-I2M-1-001), the National

Natural Science Foundation of China (Grant No: 11875320), and the

Non-profit Central Research Institute Fund of Chinese Academy of Medical

Sciences (Grant No: 2018PT32011).

CR Bibault JE, 2016, CANCER LETT, V382, P110, DOI 10.1016/j.canlet.2016.05.033

Billiet C, 2016, CANCER TREAT REV, V51, P10, DOI 10.1016/j.ctrv.2016.10.001

Chapet O, 2005, INT J RADIAT ONCOL, V63, P170, DOI 10.1016/j.ijrobp.2004.12.060

Comelli A, 2019, ARTIF INTELL MED, V94, P67, DOI 10.1016/j.artmed.2019.01.002

Corso CD, 2015, J THORAC ONCOL, V10, P148, DOI 10.1097/JTO.0000000000000406

Cui YF, 2015, PRACT RADIAT ONCOL, V5, pE67, DOI 10.1016/j.prro.2014.05.005

Eaton BR, 2016, JNCI-J NATL CANCER I, V108, DOI 10.1093/jnci/djw034

Feng X, 2019, MED PHYS, V46, P2169, DOI 10.1002/mp.13466

Giri MG, 2016, MED PHYS, V43, P2491, DOI 10.1118/1.4947123

Herskovic A, 2017, J THORAC ONCOL, V12, P302, DOI 10.1016/j.jtho.2016.09.135

Hillner BE, 2000, J CLIN ONCOL, V18, P2327, DOI 10.1200/JCO.2000.18.11.2327

Ibragimov B, 2018, MED PHYS, V45, P4763, DOI 10.1002/mp.13122

Itazawa T, 2017, J RADIAT RES, V58, P86, DOI 10.1093/jrr/rrw076

Jia YQ, 2014, PROCEEDINGS OF THE 2014 ACM CONFERENCE ON MULTIMEDIA (MM'14), P675, DOI 10.1145/2647868.2654889

Jiang J, 2018, LECT NOTES COMPUT SC, V11071, P777, DOI 10.1007/978-3-030-00934-2\_86

Lin L, 2019, RADIOLOGY, V291, P677, DOI 10.1148/radiol.2019182012

Liu C, 2019, INT J RADIAT ONCOL, V104, P924, DOI 10.1016/j.ijrobp.2019.03.017

Louie AV, 2010, RADIOTHER ONCOL, V95, P166, DOI 10.1016/j.radonc.2009.12.028

Lustberg T, 2018, RADIOTHER ONCOL, V126, P312, DOI 10.1016/j.radonc.2017.11.012

Men K, 2018, PHYS MED BIOL, V63, DOI 10.1088/1361-6560/aada6c

Men K, 2018, PHYS MEDICA, V50, P13, DOI 10.1016/j.ejmp.2018.05.006

Men K, 2017, MED PHYS, V44, P6377, DOI 10.1002/mp.12602

Mikell JL, 2015, J THORAC ONCOL, V10, P462, DOI 10.1097/JTO.0000000000000411

Mikell JK, 2018, EJNMMI PHYS, V5, DOI 10.1186/s40658-018-0230-y

Nouranian S, 2015, IEEE T MED IMAGING, V34, P950, DOI 10.1109/TMI.2014.2371823

O'Sullivan D., 2010, GEOGRAPHICAL INFORM

Ohri N, 2013, JNCI-J NATL CANCER I, V105, P387, DOI 10.1093/jnci/djt001

Pallavaram S, 2015, NEUROSURGERY, V76, P756, DOI 10.1227/NEU.0000000000000714

Piert M, 2018, EJNMMI RES, V8, DOI 10.1186/s13550-018-0377-5

Robinson CG, 2015, J CLIN ONCOL, V33, P870, DOI 10.1200/JCO.2014.58.5380

Rusch VW, 2009, J THORAC ONCOL, V4, P568, DOI 10.1097/JTO.0b013e3181a0d82e

Segedin B, 2016, RADIOL ONCOL, V50, P254, DOI 10.1515/raon-2016-0023

Spoelstra FOB, 2010, INT J RADIAT ONCOL, V76, P1106, DOI 10.1016/j.ijrobp.2009.02.072

Taha AA, 2015, BMC MED IMAGING, V15, DOI 10.1186/s12880-015-0068-x

Urban D, 2013, J THORAC ONCOL, V8, P940, DOI 10.1097/JTO.0b013e318292c53e

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

Van de Steene J, 2002, RADIOTHER ONCOL, V62, P37, DOI 10.1016/S0167-8140(01)00453-4

Vinod SK, 2016, RADIOTHER ONCOL, V121, P169, DOI 10.1016/j.radonc.2016.09.009

Wang EH, 2015, J THORAC ONCOL, V10, P937, DOI 10.1097/JTO.0000000000000519

Wang LH, 2017, SEMIN RADIAT ONCOL, V27, P164, DOI 10.1016/j.semradonc.2016.11.008

Wisnivesky JP, 2012, CANCER-AM CANCER SOC, V118, P4478, DOI 10.1002/cncr.26585

Yang JZ, 2018, MED PHYS, V45, P4568, DOI 10.1002/mp.13141

Zhuang MZ, 2016, MED PHYS, V43, P4483, DOI 10.1118/1.4954844

NR 43

TC 14

Z9 15

U1 2

U2 18

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD NOV 13

PY 2019

VL 9

AR 1192

DI 10.3389/fonc.2019.01192

PG 8

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA JR2RQ

UT WOS:000499479100001

PM 31799181

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Valdes, G

Solberg, TD

Heskel, M

Ungar, L

Simone, CB

AF Valdes, Gilmer

Solberg, Timothy D.

Heskel, Marina

Ungar, Lyle

Simone, Charles B., II

TI Using machine learning to predict radiation pneumonitis in patients with

stage I non-small cell lung cancer treated with stereotactic body

radiation therapy

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE radiation pneumonitis; stereotactic body radiation therapy (SBRT);

non-small cell lung cancer; machine learning; Decision Trees; RUSBoost;

Random Forests

ID DOSE-VOLUME HISTOGRAM; INDUCED PULMONARY TOXICITY; RADIOTHERAPY

OUTCOMES; RISK

AB To develop a patient-specific 'big data' clinical decision tool to predict pneumonitis in stage I non-small cell lung cancer (NSCLC) patients after stereotactic body radiation therapy (SBRT).

61 features were recorded for 201 consecutive patients with stage I NSCLC treated with SBRT, in whom 8 (4.0%) developed radiation pneumonitis. Pneumonitis thresholds were found for each feature individually using decision stumps. The performance of three different algorithms (Decision Trees, Random Forests, RUSBoost) was evaluated. Learning curves were developed and the training error analyzed and compared to the testing error in order to evaluate the factors needed to obtain a cross-validated error smaller than 0.1. These included the addition of new features, increasing the complexity of the algorithm and enlarging the sample size and number of events.

In the univariate analysis, the most important feature selected was the diffusion capacity of the lung for carbon monoxide (DLCO adj%). On multivariate analysis, the three most important features selected were the dose to 15 cc of the heart, dose to 4 cc of the trachea or bronchus, and race. Higher accuracy could be achieved if the RUSBoost algorithm was used with regularization. To predict radiation pneumonitis within an error smaller than 10%, we estimate that a sample size of 800 patients is required.

Clinically relevant thresholds that put patients at risk of developing radiation pneumonitis were determined in a cohort of 201 stage I NSCLC patients treated with SBRT. The consistency of these thresholds can provide radiation oncologists with an estimate of their reliability and may inform treatment planning and patient counseling. The accuracy of the classification is limited by the number of patients in the study and not by the features gathered or the complexity of the algorithm.

C1 [Valdes, Gilmer; Solberg, Timothy D.; Heskel, Marina; Simone, Charles B., II] Univ Penn, Dept Radiat Oncol, Perelman Ctr Adv Med, Philadelphia, PA 19104 USA.

[Ungar, Lyle] Univ Penn, Dept Comp & Informat Sci, 200 S 33Rd St, Philadelphia, PA 19104 USA.

RP Valdes, G (通讯作者)，Univ Penn, Dept Radiat Oncol, Perelman Ctr Adv Med, Philadelphia, PA 19104 USA.

EM gilmer.valdes@ucsf.edu

OI Simone, Charles/0000-0002-0867-3694; , Timothy/0000-0001-8829-7774

FU NATIONAL HUMAN GENOME RESEARCH INSTITUTE [T32HG000046] Funding Source:

NIH RePORTER

CR Arias M, 2014, PHARMACOECONOMICS, V32, P1141, DOI 10.1007/s40273-014-0195-1

BREIMAN L, 2001, MACH LEARN, V0045

Breiman L., 2004, 670 UC BERK

Chang DT, 2006, INT J RADIAT ONCOL, V65, P125, DOI 10.1016/j.ijrobp.2005.09.047

Chen S, 2007, MED PHYS, V34, P3808, DOI 10.1118/1.2776669

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Dang J, 2014, LUNG CANCER, V86, P329, DOI 10.1016/j.lungcan.2014.10.005

El Naqa I, 2006, INT J RADIAT ONCOL, V64, P1275, DOI 10.1016/j.ijrobp.2005.11.022

El Naqa I, 2009, PHYS MED BIOL, V54, pS9, DOI 10.1088/0031-9155/54/18/S02

Graham MV, 1999, INT J RADIAT ONCOL, V45, P323, DOI 10.1016/S0360-3016(99)00183-2

Hastie T., 2009, SPRINGER SERIES STAT, V2nd ed., DOI [10.1007/978-0-387-84858-7, DOI 10.1007/978-0-387-21606-5]

Hernando ML, 2001, INT J RADIAT ONCOL, V51, P650, DOI 10.1016/S0360-3016(01)01685-6

Hope AJ, 2006, INT J RADIAT ONCOL, V65, P112, DOI 10.1016/j.ijrobp.2005.11.046

Kang J, 2015, INT J RADIAT ONCOL, V93, P1127, DOI 10.1016/j.ijrobp.2015.07.2286

Kim M, 2011, RADIAT ONCOL J, V29, P181, DOI 10.3857/roj.2011.29.3.181

Klement RJ, 2014, INT J RADIAT ONCOL, V88, P732, DOI 10.1016/j.ijrobp.2013.11.216

Kwa SLS, 1998, INT J RADIAT ONCOL, V42, P1, DOI 10.1016/S0360-3016(98)00196-5

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lee S, 2015, MED PHYS, V42, P2421, DOI 10.1118/1.4915284

Lind PA, 2006, INT J RADIAT ONCOL, V64, P765, DOI 10.1016/j.ijrobp.2005.08.011

MARTEL MK, 1994, INT J RADIAT ONCOL, V28, P575, DOI 10.1016/0360-3016(94)90181-3

Moiseenko V, 2003, RADIOTHER ONCOL, V67, P265, DOI 10.1016/S0167-8140(03)00003-3

Parkin DM, 2005, CA-CANCER J CLIN, V55, P74, DOI 10.3322/canjclin.55.2.74

Pudil J N P, 1994, PATTERN RECOGNIT LET, V15, P6

Rancati T, 2003, RADIOTHER ONCOL, V67, P275, DOI 10.1016/S0167-8140(03)00119-1

Rijsbergen C. J. V., 1979, INFORM RETRIEVAL

Robnett TJ, 2000, INT J RADIAT ONCOL, V48, P89, DOI 10.1016/S0360-3016(00)00648-9

Saeys Y, 2007, BIOINFORMATICS, V23, P2507, DOI 10.1093/bioinformatics/btm344

Seiffert C, 2010, IEEE T SYST MAN CY A, V40, P185, DOI 10.1109/TSMCA.2009.2029559

Simone CB, 2015, ANN TRANSL MED, V3, DOI 10.3978/j.issn.2305-5839.2015.07.26

Simone CB, 2013, CHEST, V143, P1784, DOI 10.1378/chest.12-2580

Theuws JCM, 1998, RADIOTHER ONCOL, V48, P33, DOI 10.1016/S0167-8140(98)00019-X

Theuws JCM, 1998, RADIOTHER ONCOL, V49, P233, DOI 10.1016/S0167-8140(98)00117-0

Tsujino K, 2006, INT J RADIAT ONCOL, V64, P1100, DOI 10.1016/j.ijrobp.2005.09.025

NR 34

TC 58

Z9 60

U1 2

U2 22

PU IOP Publishing Ltd

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD AUG 21

PY 2016

VL 61

IS 16

BP 6105

EP 6120

DI 10.1088/0031-9155/61/16/6105

PG 16

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA DX2NZ

UT WOS:000384208600018

PM 27461154

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Hu, SL

Luo, M

Li, YL

AF Hu, Shuli

Luo, Man

Li, Yaling

TI Machine Learning for the Prediction of Lymph Nodes Micrometastasis in

Patients with Non-Small Cell Lung Cancer: A Comparative Analysis of Two

Practical Prediction Models for Gross Target Volume Delineation

SO CANCER MANAGEMENT AND RESEARCH

LA English

DT Article

DE non-small cell lung cancer; lymph nodes micrometastasis; prediction

model; random forest; gross target volume; machine learning

ID POSITRON-EMISSION-TOMOGRAPHY; RADIATION-THERAPY; METASTASIS;

CLASSIFICATION; ADENOCARCINOMA; RADIOTHERAPY; PROGNOSIS; SURGERY; SIZE;

TNM

AB Purpose: The lymph node gross target volume (GTV) delineation in patients with non-small cell lung cancer (NSCLC) is crucial for prognosis. This study aimed to develop a predictive model that can be used to differentiate between lymph nodes micrometastasis (LNM) and non-lymph nodes micrometastasis (non-LNM).

Patients and Methods: A retrospective study involving 1524 patients diagnosed with NSCLC was collected in the First Hospital of Wuhan between January 1, 2017, and April 1, 2020. Duplicated and useless variables were excluded, and 16 candidate variables were selected for further analysis. The random forest (RF) algorithm and generalized linear (GL) algorithm were used to screen out the variables that greatly affected the LNM prediction, respectively. The area under the curve (AUC) was compared between the RF model and GL model.

Results: The RF model revealed that the variables, including pathology, degree of differentiation, maximum short diameter of lymph node, tumor diameter, pulmonary membrane invasion, clustered lymph nodes, and T stage, were more significant for LNM prediction. Multifactorial logistic regression analysis for the GL model indicated that vascular invasion, tumor diameter, degree of differentiation, pulmonary membrane invasion, and maximum standard uptake value (SUVmax) were positively associated with LNM. The AUC for the RF model and GL model was 0.83 (95% CI: 0.75 to 0.90) and 0.64 (95% CI: 0.60 to 0.70), respectively.

Conclusion: We successfully established an accurate and optimized RF model that could be used to predict LNM in patients with NSCLC. This model can be used to evaluate the risk of an individual patient experiencing LNM and therefore facilitate the choice of treatment.

C1 [Hu, Shuli; Li, Yaling] Wuhan 1 Hosp, Dept Intens Care Unit, 215 Zhongshan Rd, Wuhan 430022, Hubei, Peoples R China.

[Luo, Man] Wuhan 1 Hosp, Dept Oncol, Wuhan 430022, Peoples R China.

RP Li, YL (通讯作者)，Wuhan 1 Hosp, Dept Intens Care Unit, 215 Zhongshan Rd, Wuhan 430022, Hubei, Peoples R China.

EM 2861696710@qq.com

FU Special Fund for Clinical Research of Wu Jieping Medical Foundation

[320.6750.18463]

FX This research was supported by the Special Fund for Clinical Research of

Wu Jieping Medical Foundation (No.320.6750.18463).

CR Amin MB, 2017, CA-CANCER J CLIN, V67, P93, DOI 10.3322/caac.21388

Armstrong RA, 2014, OPHTHAL PHYSL OPT, V34, P502, DOI 10.1111/opo.12131

Bade BC, 2020, CLIN CHEST MED, V41, P1, DOI 10.1016/j.ccm.2019.10.001

Bille A, 2009, EUR J CARDIO-THORAC, V36, P440, DOI 10.1016/j.ejcts.2009.04.003

Brooks ED, 2020, J THORAC ONCOL, V15, P176, DOI 10.1016/j.jtho.2019.10.016

Chen KZ, 2013, ANN THORAC SURG, V96, P1761, DOI 10.1016/j.athoracsur.2013.06.038

Cortes J, 2020, CA-CANCER J CLIN, V70, P105, DOI 10.3322/caac.21597

De Leyn P, 2014, EUR J CARDIO-THORAC, V45, P787, DOI 10.1093/ejcts/ezu028

de Vries FEE, 2014, EJSO-EUR J SURG ONC, V40, P1777, DOI 10.1016/j.ejso.2014.08.483

Dong M, 2017, J MED IMAG RADIAT ON, V61, P652, DOI 10.1111/1754-9485.12599

Dreiseitl S, 2002, J BIOMED INFORM, V35, P352, DOI 10.1016/S1532-0464(03)00034-0

Edge SB, 2010, ANN SURG ONCOL, V17, P1471, DOI 10.1245/s10434-010-0985-4

Ettinger DS, 2015, J NATL COMPR CANC NE, V13, P515, DOI 10.6004/jnccn.2015.0071

Feng SH, 2019, DIAGN INTERV RADIOL, V25, P270, DOI 10.5152/dir.2019.18458

Gorai A, 2015, EUR J CARDIO-THORAC, V47, P653, DOI 10.1093/ejcts/ezu244

Graham ANJ, 1999, J THORAC CARDIOV SUR, V117, P246, DOI 10.1016/S0022-5223(99)70419-8

Haruki T, 2017, ANN THORAC CARDIOVAS, V23, P181, DOI 10.5761/atcs.oa.16-00309

Herbst RS, 2018, NATURE, V553, P446, DOI 10.1038/nature25183

Hetth FJF, 2008, CHEST, V133, P887, DOI 10.1378/chest.07-2535

Ito M, 2014, LUNG CANCER, V85, P270, DOI 10.1016/j.lungcan.2014.05.014

Kaseda K, 2016, WORLD J SURG, V40, P2976, DOI 10.1007/s00268-016-3652-5

Kelsey CR, 2009, CANCER-AM CANCER SOC, V115, P5218, DOI 10.1002/cncr.24625

Kristensen E, 2017, BEHAV RES METHODS, V49, P2255, DOI 10.3758/s13428-017-0856-z

Lee NK, 2013, CLIN LUNG CANCER, V14, P399, DOI 10.1016/j.cllc.2012.11.002

Moon Y, 2014, WORLD J SURG ONCOL, V12, DOI 10.1186/1477-7819-12-388

Mountain CF, 1997, CHEST, V111, P1718, DOI 10.1378/chest.111.6.1718

Murgu SD, 2015, CHEST, V147, P1401, DOI 10.1378/chest.14-1355

Nagata Y, 2015, INT J RADIAT ONCOL, V93, P989, DOI 10.1016/j.ijrobp.2015.07.2278

Nambu A, 2010, EUR J RADIOL, V73, P510, DOI 10.1016/j.ejrad.2009.01.021

Nomori H, 2004, J THORAC CARDIOV SUR, V127, P1087, DOI 10.1016/j.jtcvs.2003.08.010

Qu YM, 2015, PHARM STAT, V14, P56, DOI 10.1002/pst.1658

Rusch VW, 2009, J THORAC ONCOL, V4, P568, DOI 10.1097/JTO.0b013e3181a0d82e

Scott M, 2014, J SMALL ANIM PRACT, V55, P527, DOI 10.1111/jsap.12260

Shirai K, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00731

Song L, 2013, BMC BIOINFORMATICS, V14, DOI 10.1186/1471-2105-14-5

Strobl C, 2007, BMC BIOINFORMATICS, V8, DOI 10.1186/1471-2105-8-25

VANDENBREKEL MWM, 1990, RADIOLOGY, V177, P379, DOI 10.1148/radiology.177.2.2217772

Vorwerk H, 2009, RADIOTHER ONCOL, V91, P455, DOI 10.1016/j.radonc.2009.03.014

Wu S, 2020, J AM MED INFORM ASSN, V27, P457, DOI 10.1093/jamia/ocz200

Yanagawa N, 2014, ANN THORAC SURG, V98, P453, DOI 10.1016/j.athoracsur.2014.04.108

Yu Y, 2018, THORAC CANCER, V9, P516, DOI 10.1111/1759-7714.12598

Zhao F, 2019, BMC CANCER, V19, DOI 10.1186/s12885-019-5632-2

NR 42

TC 1

Z9 1

U1 1

U2 2

PU DOVE MEDICAL PRESS LTD

PI ALBANY

PA PO BOX 300-008, ALBANY, AUCKLAND 0752, NEW ZEALAND

SN 1179-1322

J9 CANCER MANAG RES

JI Cancer Manag. Res.

PY 2021

VL 13

BP 4811

EP 4820

DI 10.2147/CMAR.S313941

PG 10

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA ST0SH

UT WOS:000662160700001

PM 34168500

OA Green Published

DA 2022-08-24

ER

PT J

AU Zhang, YC

Oikonomou, A

Wong, A

Haider, MA

Khalvati, F

AF Zhang, Yucheng

Oikonomou, Anastasia

Wong, Alexander

Haider, Masoom A.

Khalvati, Farzad

TI Radiomics-based Prognosis Analysis for Non-Small Cell Lung Cancer

SO SCIENTIFIC REPORTS

LA English

DT Article

ID CT TEXTURE ANALYSIS; FEATURE-SELECTION; CLASSIFICATION; PREDICTION;

SMOTE

AB Radiomics characterizes tumor phenotypes by extracting large numbers of quantitative features from radiological images. Radiomic features have been shown to provide prognostic value in predicting clinical outcomes in several studies. However, several challenges including feature redundancy, unbalanced data, and small sample sizes have led to relatively low predictive accuracy. In this study, we explore different strategies for overcoming these challenges and improving predictive performance of radiomics-based prognosis for non-small cell lung cancer (NSCLC). CT images of 112 patients (mean age 75 years) with NSCLC who underwent stereotactic body radiotherapy were used to predict recurrence, death, and recurrence-free survival using a comprehensive radiomics analysis. Different feature selection and predictive modeling techniques were used to determine the optimal configuration of prognosis analysis. To address feature redundancy, comprehensive analysis indicated that Random Forest models and Principal Component Analysis were optimum predictive modeling and feature selection methods, respectively, for achieving high prognosis performance. To address unbalanced data, Synthetic Minority Over-sampling technique was found to significantly increase predictive accuracy. A full analysis of variance showed that data endpoints, feature selection techniques, and classifiers were significant factors in affecting predictive accuracy, suggesting that these factors must be investigated when building radiomics-based predictive models for cancer prognosis.

C1 [Zhang, Yucheng; Oikonomou, Anastasia; Haider, Masoom A.; Khalvati, Farzad] Univ Toronto, Sunnybrook Res Inst, Dept Med Imaging, Toronto, ON, Canada.

[Wong, Alexander] Univ Waterloo, Dept Syst Design Engn, Waterloo, ON, Canada.

RP Khalvati, F (通讯作者)，Univ Toronto, Sunnybrook Res Inst, Dept Med Imaging, Toronto, ON, Canada.

EM farzad.khalvati@sri.utoronto.ca

RI Haider, Masoom/Q-1315-2017

FU Sunnybrook Research Summer Student Award Program; Ontario Institute for

Cancer Research (OICR)

FX This research has been supported by Sunnybrook Research Summer Student

Award Program and Ontario Institute for Cancer Research (OICR).

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Al-Shahib Ali, 2005, Appl Bioinformatics, V4, P195, DOI 10.2165/00822942-200504030-00004

Allemani C, 2015, LANCET, V385, P977, DOI 10.1016/S0140-6736(14)62038-9

Bermingham ML, 2015, SCI REP-UK, V5, DOI 10.1038/srep10312

Blagus R, 2013, BMC BIOINFORMATICS, V14, DOI 10.1186/1471-2105-14-106

BREIMAN L, 2001, MACH LEARN, V0045

Cameron A, 2016, IEEE T BIO-MED ENG, V63, P1145, DOI 10.1109/TBME.2015.2485779

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Dy JG, 2004, J MACH LEARN RES, V5, P845

Fawcett T, 2006, PATTERN RECOGN LETT, V27, P861, DOI 10.1016/j.patrec.2005.10.010

Figueroa RL, 2012, BMC MED INFORM DECIS, V12, DOI 10.1186/1472-6947-12-8

Fort G, 2005, BIOINFORMATICS, V21, P1104, DOI 10.1093/bioinformatics/bti114

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Ganeshan B, 2010, CANCER IMAGING, V10, P137, DOI 10.1102/1470-7330.2010.0021

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Haider MA, 2017, CANCER IMAGING, V17, DOI 10.1186/s40644-017-0106-8

Hearst MA, 1998, IEEE INTELL SYST APP, V13, P18, DOI 10.1109/5254.708428

Hira Z. M., 2015, REV FEATURE SELECTIO, V2015

Huang LC, 2009, J TRANSL MED, V7, DOI 10.1186/1479-5876-7-81

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Jia Wu, 2016, RADIOLOGY, V281

Khalvati F, 2015, BMC MED IMAGING, V15, DOI 10.1186/s12880-015-0069-9

Kotsiantis S B, 2007, INFORMATICA, V31, P249, DOI DOI 10.31449/INF.V31I3.148

Kotsiantis S. B., 2007, MACHINE LEARNING REV, P159, DOI [10.1007/s10462-007-9052-3, DOI 10.1007/S10462-007-9052-3]

Krizhevsky A., 2012, ADV NEURAL INFORM PR, V25, DOI DOI 10.1145/3065386

Kuhn M, 2008, J STAT SOFTW, V28, P1, DOI 10.18637/jss.v028.i05

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Larran P., 2007, REV FEATURE SELECTIO, V23, P2507

Monti S, 2003, MACH LEARN, V52, P91, DOI 10.1023/A:1023949509487

Parekh V, 2016, EXPERT REV PRECIS ME, V1, P207, DOI 10.1080/23808993.2016.1164013

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Provost F., 2000, P AAAI 2000 WORKSH, DOI 10.1.1.33.507

Pyka T, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0407-7

Zhang J., 2016, J COMPUT VIS IMAGING, V2

NR 37

TC 140

Z9 148

U1 8

U2 37

PU NATURE PORTFOLIO

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD APR 18

PY 2017

VL 7

AR 46349

DI 10.1038/srep46349

PG 8

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA ES5VY

UT WOS:000399615400001

PM 28418006

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Kodama, T

Arimura, H

Shirakawa, Y

Ninomiya, K

Yoshitake, T

Shioyama, Y

AF Kodama, Takumi

Arimura, Hidetaka

Shirakawa, Yuko

Ninomiya, Kenta

Yoshitake, Tadamasa

Shioyama, Yoshiyuki

TI Relapse predictability of topological signature on pretreatment planning

CT images of stage I non-small cell lung cancer patients before

treatment with stereotactic ablative radiotherapy

SO THORACIC CANCER

LA English

DT Article

DE non-small cell lung cancer (NSCLC); radiotherapy; relapse; topology

ID BODY RADIATION-THERAPY; PREDICTION; RADIOMICS; FEATURES; SURGERY;

PROGNOSIS

AB Background This study aimed to explore the predictability of topological signatures linked to the locoregional relapse (LRR) and distant metastasis (DM) on pretreatment planning computed tomography images of stage I non-small cell lung cancer (NSCLC) patients before treatment with stereotactic ablative radiotherapy (SABR). Methods We divided 125 primary stage I NSCLC patients (LRR: 34, DM: 22) into training (n = 60) and test datasets (n = 65), and the training dataset was augmented to 260 cases using a synthetic minority oversampling technique. The relapse predictabilities of the conventional wavelet-based features (WF), topology-based features [BF, Betti number (BN) map features; iBF, inverted BN map features], and their combined features (BWF, iBWF) were compared. The patients were stratified into high-risk and low-risk groups using the medians of the radiomics scores in the training dataset. Results For the LRR in the test, the iBF, iBWF, and WF showed statistically significant differences (p < 0.05), and the highest nLPC was obtained for the iBF. For the DM in the test, the iBWF showed a significant difference and the highest nLPC. Conclusion The iBF indicated the potential of improving the LRR and DM prediction of stage I NSCLC patients prior to undergoing SABR.

C1 [Kodama, Takumi] Kyushu Univ, Grad Sch Med Sci, Dept Hlth Sci, Div Med Quantum Sci, Fukuoka, Japan.

[Arimura, Hidetaka] Kyushu Univ, Fac Med Sci, Dept Hlth Sci, Div Med Quantum Sci, Fukuoka, Japan.

[Shirakawa, Yuko] Natl Hosp Org Kyushu Canc Ctr, Fukuoka, Japan.

[Ninomiya, Kenta] Sanford Burnham Prebys Med Discovery Inst, La Jolla, CA USA.

[Yoshitake, Tadamasa] Kyushu Univ, Grad Sch Med Sci, Dept Clin Radiol, Fukuoka, Japan.

[Shioyama, Yoshiyuki] SAGA HIMAT Fdn, Ion Beam Therapy Ctr, Tosu, Saga, Japan.

RP Arimura, H (通讯作者)，Kyushu Univ, Dept Hlth Sci, Fac Med Sci, Higashi Ku, 3-1-1 Maidashi, Fukuoka, Japan.

EM arimura.hidetaka.616@m.kyushu-u.ac.jp

OI Kodama, Takumi/0000-0002-8134-0837

FU JSPS KAKENHI [JP20K08084]

FX JSPS KAKENHI, Grant/Award Number: JP20K08084

CR Ackerson BG, 2018, LUNG CANCER, V125, P185, DOI 10.1016/j.lungcan.2018.09.020

[Anonymous], 2018, HMISC V4 1 1

[Anonymous], GLMNETV

[Anonymous], 2020, SURVIVAL V32 7

Balari S Lorenzo G Gonzalez G., 2013, COMPUTATIONAL PHENOT, DOI [10.1093/acprof:oso/9780199665464.001.0001, DOI 10.1093/ACPROF:OSO/9780199665464.001.0001]

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Collins LG, 2007, AM FAM PHYSICIAN, V75, P56

Ettinger DS, 2017, J NATL COMPR CANC NE, V15, P504, DOI 10.6004/jnccn.2017.0050

HARRELL FE, 1982, JAMA-J AM MED ASSOC, V247, P2543, DOI 10.1001/jama.247.18.2543

HERMAN GT, 1992, IEEE COMPUT GRAPH, V12, P69, DOI 10.1109/38.135915

Kadoya N, 2020, MED PHYS, V47, P2197, DOI 10.1002/mp.14104

Kakino R, 2020, MED PHYS, V47, P4634, DOI 10.1002/mp.14380

Kolodziejski LS, 2003, NEOPLASMA, V50, P66

Ma LF, 2016, THORAC CANCER, V7, P442, DOI 10.1111/1759-7714.12352

Mackin D, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-20713-6

Mattonen SA, 2016, INT J RADIAT ONCOL, V94, P1121, DOI 10.1016/j.ijrobp.2015.12.369

Ninomiya K, 2021, PLOS ONE, V16, DOI 10.1371/journal.pone.0244354

Ninomiya K, 2020, PHYS MEDICA, V69, P90, DOI 10.1016/j.ejmp.2019.11.026

Onishi H, 2011, INT J RADIAT ONCOL, V81, P1352, DOI 10.1016/j.ijrobp.2009.07.1751

Santos MK, 2014, EUR J RADIOL, V83, P1275, DOI 10.1016/j.ejrad.2014.04.019

Schmid M, 2016, EXPERT SYST APPL, V63, P450, DOI 10.1016/j.eswa.2016.07.018

Seo YS, 2019, THORAC CANCER, V10, P1489, DOI 10.1111/1759-7714.13103

Soufi M, 2018, MED PHYS, V45, P5116, DOI 10.1002/mp.13202

Tandberg DJ, 2018, CANCER-AM CANCER SOC, V124, P667, DOI 10.1002/cncr.31196

Thawani R, 2018, LUNG CANCER, V115, P34, DOI 10.1016/j.lungcan.2017.10.015

Timmerman RD, 2018, JAMA ONCOL, V4, P1263, DOI 10.1001/jamaoncol.2018.1251

Vallieres, 2015, RADIOMICS MATLAB PRO

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

Wang SD, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-27707-4

Wu J, 2016, RADIOLOGY, V281, P270, DOI 10.1148/radiol.2016151829

Yang Y, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.746785

Zheng XP, 2014, INT J RADIAT ONCOL, V90, P603, DOI 10.1016/j.ijrobp.2014.05.055

NR 33

TC 0

Z9 0

U1 1

U2 1

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1759-7706

EI 1759-7714

J9 THORAC CANCER

JI Thorac. Cancer

PD AUG

PY 2022

VL 13

IS 15

BP 2117

EP 2126

DI 10.1111/1759-7714.14483

EA JUN 2022

PG 10

WC Oncology; Respiratory System

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Respiratory System

GA 3N0QZ

UT WOS:000811891700001

PM 35711108

OA Green Published

DA 2022-08-24

ER

PT J

AU Yoo, J

Lee, J

Cheon, M

Woo, SK

Ahn, MJ

Pyo, HR

Choi, YS

Han, JH

Choi, JY

AF Yoo, Jang

Lee, Jaeho

Cheon, Miju

Woo, Sang-Keun

Ahn, Myung-Ju

Pyo, Hong Ryull

Choi, Yong Soo

Han, Joung Ho

Choi, Joon Young

TI Predictive Value of F-18-FDG PET/CT Using Machine Learning for

Pathological Response to Neoadjuvant Concurrent Chemoradiotherapy in

Patients with Stage III Non-Small Cell Lung Cancer

SO CANCERS

LA English

DT Article

DE non-small cell lung cancer; neoadjuvant concurrent chemoradiotherapy;

F-18-FDG PET; CT; machine learning; random forest; pathologic complete

response

ID THERAPY; CHEMOTHERAPY; SURGERY; RADIOTHERAPY; CRITERIA; PERCIST; VOLUME;

TUMORS

AB Simple Summary The pathological complete response (pCR) after neoadjuvant chemoradiotherapy (CCRT) is an independent prognostic factor for progression-free and overall survival in non-small cell lung cancer (NSCLC). F-18-FDG PET/CT has been performed for initial staging work-up, treatment response, and follow-up in patients with NSCLC. Machine learning (ML) as an empirical data science has become relevant to nuclear medicine. We investigated the predictive performance of F-18-FDG PET/CT using an ML model to assess the treatment response to neoadjuvant CCRT in patients with stage III NSCLC, and compared the performance of the ML model predictions to predictions from conventional PET parameters and from physicians. The predictions from the ML model using radiomic features of F-18-FDG PET/CT provided better accuracy than predictions from conventional PET parameters and from physicians for the neoadjuvant CCRT response of stage III non-small cell lung cancer. We investigated predictions from F-18-FDG PET/CT using machine learning (ML) to assess the neoadjuvant CCRT response of patients with stage III non-small cell lung cancer (NSCLC) and compared them with predictions from conventional PET parameters and from physicians. A retrospective study was conducted of 430 patients. They underwent F-18-FDG PET/CT before initial treatment and after neoadjuvant CCRT followed by curative surgery. We analyzed texture features from segmented tumors and reviewed the pathologic response. The ML model employed a random forest and was used to classify the binary outcome of the pathological complete response (pCR). The predictive accuracy of the ML model for the pCR was 93.4%. The accuracy of predicting pCR using the conventional PET parameters was up to 70.9%, and the accuracy of the physicians' assessment was 80.5%. The accuracy of the prediction from the ML model was significantly higher than those derived from conventional PET parameters and provided by physicians (p < 0.05). The ML model is useful for predicting pCR after neoadjuvant CCRT, which showed a higher predictive accuracy than those achieved from conventional PET parameters and from physicians.

C1 [Yoo, Jang; Cheon, Miju] Vet Hlth Serv Med Ctr, Dept Nucl Med, Seoul 05368, South Korea.

[Lee, Jaeho] Seoul Natl Univ, Dept Prevent Med, Coll Med, Seoul 03080, South Korea.

[Woo, Sang-Keun] Korea Inst Radiol & Med Sci KIRAMS, Korea Canc Ctr Hosp, Dept Nucl Med, Seoul 01812, South Korea.

[Ahn, Myung-Ju] Sungkyunkwan Univ, Samsung Med Ctr, Dept Med, Div Hematol Oncol,Sch Med, Seoul 06351, South Korea.

[Pyo, Hong Ryull] Sungkyunkwan Univ, Samsung Med Ctr, Dept Radiat Oncol, Sch Med, Seoul 06351, South Korea.

[Choi, Yong Soo] Sungkyunkwan Univ, Samsung Med Ctr, Dept Thorac & Cardiovasc Surg, Sch Med, Seoul 06351, South Korea.

[Han, Joung Ho] Sungkyunkwan Univ, Samsung Med Ctr, Dept Pathol, Sch Med, Seoul 06351, South Korea.

[Choi, Joon Young] Sungkyunkwan Univ, Samsung Med Ctr, Dept Nucl Med, Sch Med, Seoul 06351, South Korea.

RP Choi, JY (通讯作者)，Sungkyunkwan Univ, Samsung Med Ctr, Dept Nucl Med, Sch Med, Seoul 06351, South Korea.

EM jang8214.yoo@gmail.com; hoyajh21@gmail.com; diva1813@naver.com;

skwoo@kirams.re.kr; silk.ahn@samsung.com; hr.pyo@samsung.com;

ysooyah.choi@samsung.com; joungho.han@samsung.com; jynm.choi@samsung.com

OI Yoo, Jang/0000-0003-4664-4904; CHEON, MIJU/0000-0001-7469-7769; Woo,

Sang-Keun/0000-0002-6728-8876; Choi, Joon Young/0000-0003-1060-0096

FU National Research Foundation of Korea (NRF) - Korea government (Ministry

of Science and ICT) [NRF-2020M2D9A1094072]; Future Medicine 20\*30

Project of the Samsung Medical Center [SMO1220071]; VHS Medical Center

Research Grant [VHSMC 22001]

FX This work was supported by the National Research Foundation of Korea

(NRF) grant funded by the Korea government (Ministry of Science and ICT)

(No. NRF-2020M2D9A1094072), Future Medicine 20\*30 Project of the Samsung

Medical Center (#SMO1220071), and VHS Medical Center Research Grant (No.

VHSMC 22001).

CR Antunovic L, 2019, EUR J NUCL MED MOL I, V46, P1468, DOI 10.1007/s00259-019-04313-8

Arbour KC, 2019, JAMA-J AM MED ASSOC, V322, P764, DOI 10.1001/jama.2019.11058

Cerfolio RJ, 2004, ANN THORAC SURG, V78, P1903, DOI 10.1016/j.athoracsur.2004.06.102

Cottrell TR, 2018, ANN ONCOL, V29, P1853, DOI 10.1093/annonc/mdy218

Cremonesi M, 2017, EUR J NUCL MED MOL I, V44, P1915, DOI 10.1007/s00259-017-3762-9

D'Angelillo RM, 2009, J THORAC ONCOL, V4, P1517, DOI 10.1097/JTO.0b013e3181b9e860

De Ruysscher D, 2009, RADIOTHER ONCOL, V91, P415, DOI 10.1016/j.radonc.2009.01.004

DeSantis CE, 2014, CA-CANCER J CLIN, V64, P252, DOI 10.3322/caac.21235

Eun NL, 2020, RADIOLOGY, V294, P31, DOI 10.1148/radiol.2019182718

Ha S, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-01524-7

Hoffmann B, 2019, METHODS MOL BIOL, V1878, P263, DOI 10.1007/978-1-4939-8868-6\_16

Huang CM, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-69345-9

Hyun OJ, 2016, RADIOLOGY, V280, P576, DOI 10.1148/radiol.2016142043

Hyun SH, 2015, AM J ROENTGENOL, V205, P623, DOI 10.2214/AJR.14.13847

Iravani A, 2019, EUR J NUCL MED MOL I, V46, P1869, DOI 10.1007/s00259-019-04388-3

Kim AW, 2011, ANN THORAC SURG, V92, P233, DOI 10.1016/j.athoracsur.2011.03.001

Kim HK, 2016, LUNG CANCER, V96, P56, DOI 10.1016/j.lungcan.2016.03.016

Li PL, 2020, EUR J NUCL MED MOL I, V47, P1116, DOI 10.1007/s00259-020-04684-3

Lo Gullo R, 2020, BREAST, V49, P115, DOI 10.1016/j.breast.2019.11.009

Meti N, 2021, JCO CLIN CANCER INFO, V5, P66, DOI 10.1200/CCI.20.00078

Mouillet G, 2012, J THORAC ONCOL, V7, P841, DOI 10.1097/JTO.0b013e31824c7d92

Pottgen C, 2013, EUR J CANCER, V49, P2107, DOI 10.1016/j.ejca.2013.02.030

Pottgen C, 2006, CLIN CANCER RES, V12, P97, DOI 10.1158/1078-0432.CCR-05-0510

Rami-Porta R, 2009, ANN THORAC CARDIOVAS, V15, P4

Roengvoraphoj O, 2018, STRAHLENTHER ONKOL, V194, P107, DOI 10.1007/s00066-017-1229-3

Schreiner W, 2018, J THORAC DIS, V10, P2795, DOI 10.21037/jtd.2018.05.68

Shen WC, 2020, ANN TRANSL MED, V8, DOI 10.21037/atm.2020.01.107

Shin S, 2020, J THORAC DIS, V12, P2602, DOI 10.21037/jtd.2020.03.23

Sollini M, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00426-y

Stupp R, 2009, LANCET ONCOL, V10, P785, DOI 10.1016/S1470-2045(09)70172-X

Szyszko TA, 2016, LUNG CANCER, V94, P7, DOI 10.1016/j.lungcan.2016.01.010

Tahmassebi A, 2019, INVEST RADIOL, V54, P110, DOI 10.1097/RLI.0000000000000518

Tanahashi M, 2020, J THORAC DIS, V12, P2644, DOI 10.21037/jtd.2020.03.17

Wahl RL, 2009, J NUCL MED, V50, p122S, DOI 10.2967/jnumed.108.057307

Yakar Melek, 2021, Technol Cancer Res Treat, V20, p15330338211016373, DOI 10.1177/15330338211016373

Yoo J, 2021, EUR RADIOL, V31, P4184, DOI 10.1007/s00330-020-07523-z

NR 36

TC 0

Z9 0

U1 3

U2 3

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2072-6694

J9 CANCERS

JI Cancers

PD APR

PY 2022

VL 14

IS 8

AR 1987

DI 10.3390/cancers14081987

PG 12

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA 0T1UU

UT WOS:000786759800001

PM 35454899

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Blanc-Durand, P

Campedel, L

Mule, S

Jegou, S

Luciani, A

Pigneur, F

Itti, E

AF Blanc-Durand, Paul

Campedel, Luca

Mule, Sebastien

Jegou, Simon

Luciani, Alain

Pigneur, Frederic

Itti, Emmanuel

TI Prognostic value of anthropometric measures extracted from whole-body CT

using deep learning in patients with non-small-cell lung cancer

SO EUROPEAN RADIOLOGY

LA English

DT Article

DE Tomography; X-ray computed; Machine learning; Lung cancer; Adiposity

ID VISCERAL ADIPOSE-TISSUE; NETWORK; VOLUME

AB Introduction The aim of the study was to extract anthropometric measures from CT by deep learning and to evaluate their prognostic value in patients with non-small-cell lung cancer (NSCLC). Methods A convolutional neural network was trained to perform automatic segmentation of subcutaneous adipose tissue (SAT), visceral adipose tissue (VAT), and muscular body mass (MBM) from low-dose CT images in 189 patients with NSCLC who underwent pretherapy PET/CT. After a fivefold cross-validation in a subset of 35 patients, anthropometric measures extracted by deep learning were normalized to the body surface area (BSA) to control the various patient morphologies. VAT/SAT ratio and clinical parameters were included in a Cox proportional-hazards model for progression-free survival (PFS) and overall survival (OS). Results Inference time for a whole volume was about 3 s. Mean Dice similarity coefficients in the validation set were 0.95, 0.93, and 0.91 for SAT, VAT, and MBM, respectively. For PFS prediction, T-stage, N-stage, chemotherapy, radiation therapy, and VAT/SAT ratio were associated with disease progression on univariate analysis. On multivariate analysis, only N-stage (HR = 1.7 [1.2-2.4]; p = 0.006), radiation therapy (HR = 2.4 [1.0-5.4]; p = 0.04), and VAT/SAT ratio (HR = 10.0 [2.7-37.9]; p < 0.001) remained significant prognosticators. For OS, male gender, smoking status, N-stage, a lower SAT/BSA ratio, and a higher VAT/SAT ratio were associated with mortality on univariate analysis. On multivariate analysis, male gender (HR = 2.8 [1.2-6.7]; p = 0.02), N-stage (HR = 2.1 [1.5-2.9]; p < 0.001), and the VAT/SAT ratio (HR = 7.9 [1.7-37.1]; p < 0.001) remained significant prognosticators. Conclusion The BSA-normalized VAT/SAT ratio is an independent predictor of both PFS and OS in NSCLC patients.

C1 [Blanc-Durand, Paul; Itti, Emmanuel] Henri Mondor Hosp, AP HP, Dept Nucl Med, F-94010 Creteil, France.

[Blanc-Durand, Paul; Itti, Emmanuel] U PEC, Team 8, INSERM IMRB, F-94000 Creteil, France.

[Blanc-Durand, Paul; Mule, Sebastien; Luciani, Alain; Itti, Emmanuel] U PEC, F-94000 Creteil, France.

[Campedel, Luca] Grp Hosp Pitie Salpetriere C Foix, AP HP, Dept Oncol, F-75013 Paris, France.

[Mule, Sebastien; Luciani, Alain; Pigneur, Frederic] Henri Mondor Hosp, AP HP, Dept Radiol, F-94010 Creteil, France.

[Jegou, Simon] Owkin, F-75010 Paris, France.

RP Blanc-Durand, P (通讯作者)，Henri Mondor Hosp, AP HP, Dept Nucl Med, F-94010 Creteil, France.; Blanc-Durand, P (通讯作者)，U PEC, Team 8, INSERM IMRB, F-94000 Creteil, France.; Blanc-Durand, P (通讯作者)，U PEC, F-94000 Creteil, France.

EM paul.blancdurand@aphp.fr

RI Mulé, Sébastien/ABI-6590-2020

OI Itti, Emmanuel/0000-0003-1578-4058; Mule, Sebastien/0000-0002-6896-6149

CR Bakr S, 2018, SCI DATA, V5, DOI 10.1038/sdata.2018.202

Belharbi S, 2017, COMPUT BIOL MED, V87, P95, DOI 10.1016/j.compbiomed.2017.05.018

Bridge CP, 2018, LECT NOTES COMPUT SC, V11041, P204, DOI 10.1007/978-3-030-01201-4\_22

Brown JC, 2018, EUR J NUTR, V57, P191, DOI 10.1007/s00394-016-1308-8

Buvat I, 2017, J NUCL MED, V58

C Nioche, 2016, MEADECINE NUCLEAAIRE, V40, P208, DOI DOI 10.1016/j.mednuc.2016.03.107

Chang PJ, 2019, RADIOLOGY, V290, P680, DOI 10.1148/radiol.2018182557

Cicek Ozgun, 2016, Medical Image Computing and Computer-Assisted Intervention - MICCAI 2016. 19th International Conference. Proceedings: LNCS 9901, P424, DOI 10.1007/978-3-319-46723-8\_49

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Decazes P, 2016, J NUCL MED, V57, P753, DOI 10.2967/jnumed.115.164913

Du Bois D, 1989, Nutrition, V5, P303

DUBOIS D, 1989, NUTRITION, V5, P303

Fidon L, 2018, LECT NOTES COMPUT SC, V10670, P64, DOI 10.1007/978-3-319-75238-9\_6

Gibson E, 2018, COMPUT METH PROG BIO, V158, P113, DOI 10.1016/j.cmpb.2018.01.025

Hilmi M, 2019, PHARMACOL THERAPEUT, V196, P135, DOI 10.1016/j.pharmthera.2018.12.003

Hochhegger B, 2015, J BRAS PNEUMOL, V41, P264, DOI 10.1590/S1806-37132015000004479

Hopkins JJ, 2017, EXPERT REV CLIN PHAR, V10, P947, DOI 10.1080/17512433.2017.1347503

Hunter JD, 2007, COMPUT SCI ENG, V9, P90, DOI 10.1109/MCSE.2007.55

Jegou S, 2017, IEEE COMPUT SOC CONF, P1175, DOI 10.1109/CVPRW.2017.156

Klopp AH, 2012, CLIN CANCER RES, V18, P771, DOI 10.1158/1078-0432.CCR-11-1916

Lee H, 2017, J DIGIT IMAGING, V30, P487, DOI 10.1007/s10278-017-9988-z

Lee JW, 2018, CLIN IMAG, V50, P308, DOI 10.1016/j.clinimag.2018.05.006

Lewiner T., 2003, Journal of Graphics Tools, V8, P1, DOI 10.1080/10867651.2003.10487582

Litjens G, 2017, MED IMAGE ANAL, V42, P60, DOI 10.1016/j.media.2017.07.005

Mendez J, 1960, METABOLISM

Mensink SD, 2011, PROC SPIE, V7963, DOI 10.1117/12.878017

Nattenmuller J, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169136

Popinat G, 2019, ONCOIMMUNOLOGY, V8, DOI 10.1080/2162402X.2019.1580128

Schaudinn A, 2015, NMR BIOMED, V28, P583, DOI 10.1002/nbm.3286

Shachar SS, 2016, EUR J CANCER, V57, P58, DOI 10.1016/j.ejca.2015.12.030

Villa C, 2017, CLIN PHYSIOL FUNCT I, V37, P183, DOI 10.1111/cpf.12284

Wang YZ, 2017, COMPUT METH PROG BIO, V144, P97, DOI 10.1016/j.cmpb.2017.03.017

Weston AD, 2019, RADIOLOGY, V290, P669, DOI 10.1148/radiol.2018181432

NR 33

TC 9

Z9 10

U1 1

U2 8

PU SPRINGER

PI NEW YORK

PA ONE NEW YORK PLAZA, SUITE 4600, NEW YORK, NY, UNITED STATES

SN 0938-7994

EI 1432-1084

J9 EUR RADIOL

JI Eur. Radiol.

PD JUN

PY 2020

VL 30

IS 6

BP 3528

EP 3537

DI 10.1007/s00330-019-06630-w

EA FEB 2020

PG 10

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA LR8BV

UT WOS:000516098100002

PM 32055950

DA 2022-08-24

ER

PT J

AU Grgic, A

Nestle, U

Schaefer-Schuler, A

Kremp, S

Ballek, E

Fleckenstein, J

Rube, C

Kirsch, CM

Hellwig, D

AF Grgic, Aleksandar

Nestle, Ursula

Schaefer-Schuler, Andrea

Kremp, Stephanie

Ballek, Elena

Fleckenstein, Jochen

Ruebe, Christian

Kirsch, Carl-Martin

Hellwig, Dirk

TI Nonrigid Versus Rigid Registration of Thoracic F-18-FDG PET and CT in

Patients with Lung Cancer: An Intraindividual Comparison of Different

Breathing Maneuvers

SO JOURNAL OF NUCLEAR MEDICINE

LA English

DT Article

DE non-small cell lung carcinoma (NSCLC); spiral computed tomography;

positron emission tomography; image registration; computer-assisted

image analysis

ID WHOLE-BODY PET; FDG-PET; CO-REGISTRATION; 3-DIMENSIONAL REGISTRATION;

EMISSION-TOMOGRAPHY; IMAGE REGISTRATION; RESPIRATORY MOTION; CLINICAL

ONCOLOGY; RADIOTHERAPY; DELINEATION

AB In lung cancer, F-18-FDG PET, CT, and F-18-FDG PET/CT are used for noninvasive staging and therapy planning. Even with improved image registration techniques-especially in the modern hybrid PET/CT scanners-inaccuracies in the fusion process may occur, leading to errors in image interpretation. The aim of this study was to investigate by an intraindividual analysis whether, in comparison with a rigid algorithm, a nonrigid registration algorithm improves the quality of fusion between F-18-FDG PET and CT. Methods: Sixteen patients with histologically proven non-small cell lung cancer underwent a thoracic F-18-FDG PET acquisition in radiotherapy treatment position and 3 CT acquisitions (expiration, inspiration, and mid breath-hold) on the same day. All scans were registered with rigid and nonrigid procedures, resulting in 6 fused datasets: rigid inspiration, rigid expiration, rigid mid breath-hold, nonrigid inspiration, nonrigid expiration, and nonrigid mid breath-hold. The quality of alignment was assessed by 3 experienced readers at 8 anatomic landmarks: lung apices, aortic arch, heart, spine, sternum, carina, diaphragm, and tumor using an alignment score ranging from 1 (no alignment) to 5 (exact alignment). Results: Nonrigid PET/CT showed better alignment than rigid PET/CT (3.5 +/- 0.7 vs. 3.3 +/- 0.7, P < 0.001). Regarding the breathing maneuver, no difference between nonrigid mid breath-hold and rigid mid breath-hold was observed. In contrast, the alignment quality significantly improved from rigid expiration to nonrigid expiration (3.4 +/- 0.7 vs. 3.6 +/- 0.7, P < 0.001) and from rigid inspiration to nonrigid inspiration (3.1 +/- 0.7 vs. 3.3 +/- 0.7, P < 0.001). With regard to individual landmarks, an improvement in fusion quality through the use of nonrigid registration was obvious at the lung apices, carina, and aortic arch. Conclusion: The alignment quality of thoracic F-18-FDG PET/CT exhibits a marked dependence on the breathing maneuver performed during the CT acquisition, as demonstrated in an intraindividual comparison. Nonrigid registration is a significant improvement over rigid registration if the CT is performed during full inspiration or full expiration. The best fusion results are obtained with the CT performed at mid breath-hold using rigid registration, without an improvement using nonrigid algorithms.

C1 [Grgic, Aleksandar; Nestle, Ursula; Schaefer-Schuler, Andrea; Ballek, Elena; Kirsch, Carl-Martin; Hellwig, Dirk] Univ Saarland, Dept Nucl Med, Med Ctr, D-66421 Homburg, Germany.

[Nestle, Ursula] Univ Hosp Freiburg, Dept Radiooncol, Freiburg, Germany.

[Kremp, Stephanie; Fleckenstein, Jochen; Ruebe, Christian] Univ Saarland, Dept Radiooncol, Med Ctr, D-66421 Homburg, Germany.

RP Grgic, A (通讯作者)，Univ Saarland, Dept Nucl Med, Med Ctr, Kirrbergerstr 1,Gebaude 50, D-66421 Homburg, Germany.

EM aleksandar.grgic@uks.eu

RI Hellwig, Dirk/O-8617-2019; Nestle, Ursula/ABG-2339-2021; Hellwig,

Dirk/A-4128-2008

OI Hellwig, Dirk/0000-0002-3056-0143;

CR Aquino SL, 2003, J COMPUT ASSIST TOMO, V27, P479, DOI 10.1097/00004728-200307000-00004

Beyer T, 2000, J NUCL MED, V41, P1369

Beyer T, 2003, EUR J NUCL MED MOL I, V30, P588, DOI 10.1007/s00259-002-1097-6

Bilfinger Thomas V, 2003, Respir Care Clin N Am, V9, P141, DOI 10.1016/S1078-5337(02)00086-2

Bridges RL, 2009, J NUCL MED, V50, P835, DOI 10.2967/jnumed.108.055574

Fitton I, 2008, INT J RADIAT ONCOL, V70, P1403, DOI 10.1016/j.ijrobp.2007.08.063

Fleiss J. L, 1981, STAT METHODS RATES P

Gilman MD, 2007, J COMPUT ASSIST TOMO, V31, P395, DOI 10.1097/01.rct.0000237817.18678.9c

Gilman MD, 2006, AM J ROENTGENOL, V187, P1357, DOI 10.2214/AJR.05.1427

Goerres GW, 2002, EUR J NUCL MED MOL I, V29, P351, DOI 10.1007/s00259-001-0710-4

Gould KL, 2007, J NUCL MED, V48, P1112, DOI 10.2967/jnumed.107.039792

Grgic A, 2009, INT J RADIAT ONCOL, V73, P103, DOI 10.1016/j.ijrobp.2008.03.063

Halpern BS, 2005, CHEST, V128, P2289, DOI 10.1016/S0012-3692(15)52634-2

Hellwig D, 2009, NUKLEARMED-NUCL MED, V48, P59, DOI 10.3413/nukmed-0217

Ireland RH, 2007, INT J RADIAT ONCOL, V68, P952, DOI 10.1016/j.ijrobp.2007.02.017

Jemal A, 2008, JNCI-J NATL CANCER I, V100, P1672, DOI 10.1093/jnci/djn389

Krishnasetty V, 2005, RADIOLOGY, V237, P635, DOI 10.1148/radiol.2372041719

Lamare F, 2007, PHYS MED BIOL, V52, P121, DOI 10.1088/0031-9155/52/1/009

Moreno A, 2008, COMPUT AIDED SURG, V13, P281, DOI 10.3109/10929080802431980

Nehmeh SA, 2002, J NUCL MED, V43, P876

PELIZZARI CA, 1989, J COMPUT ASSIST TOMO, V13, P20, DOI 10.1097/00004728-198901000-00004

Pietrzyk U, 2005, NUKLEARMED-NUCL MED, V44, pS13

Schaefer A, 2008, EUR J NUCL MED MOL I, V35, P1989, DOI 10.1007/s00259-008-0875-1

Shekhar R, 2005, J NUCL MED, V46, P1488

Slomka PJ, 2003, J NUCL MED, V44, P1156

Ukena D, 2004, LUNG CANCER, V45, pS75, DOI 10.1016/j.lungcan.2004.07.989

Weigert M, 2008, Z MED PHYS, V18, P59, DOI 10.1016/j.zemedi.2007.07.004

West J, 1997, J COMPUT ASSIST TOMO, V21, P554, DOI 10.1097/00004728-199707000-00007

Wolz G, 2007, NUKLEARMED-NUCL MED, V46, P43, DOI 10.1055/s-0037-1616625

Wolz G, 2007, INT J COMPUT ASS RAD, V2, P183, DOI 10.1007/s11548-007-0128-y

NR 30

TC 17

Z9 17

U1 0

U2 2

PU SOC NUCLEAR MEDICINE INC

PI RESTON

PA 1850 SAMUEL MORSE DR, RESTON, VA 20190-5316 USA

SN 0161-5505

J9 J NUCL MED

JI J. Nucl. Med.

PD DEC

PY 2009

VL 50

IS 12

BP 1921

EP 1926

DI 10.2967/jnumed.109.065649

PG 6

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 529YM

UT WOS:000272555300006

PM 19910420

OA Bronze

DA 2022-08-24

ER

PT J

AU Hosny, A

Parmar, C

Coroller, TP

Grossmann, P

Zeleznik, R

Kumar, A

Bussink, J

Gillies, RJ

Mak, RH

Aerts, HJWL

AF Hosny, Ahmed

Parmar, Chintan

Coroller, Thibaud P.

Grossmann, Patrick

Zeleznik, Roman

Kumar, Avnish

Bussink, Johan

Gillies, Robert J.

Mak, Raymond H.

Aerts, Hugo J. W. L.

TI Deep learning for lung cancer prognostication: A retrospective

multi-cohort radiomics study

SO PLOS MEDICINE

LA English

DT Article

ID CONVOLUTIONAL NEURAL-NETWORKS; PHENOTYPE FEATURES; TUMOR MEASUREMENTS;

SURVIVAL; BIOMARKERS; LOCATION; CLASSIFICATION; VARIABILITY; EDITION;

PACKAGE

AB Background

Non-small-cell lung cancer (NSCLC) patients often demonstrate varying clinical courses and outcomes, even within the same tumor stage. This study explores deep learning applications in medical imaging allowing for the automated quantification of radiographic characteristics and potentially improving patient stratification.

Methods and findings

We performed an integrative analysis on 7 independent datasets across 5 institutions totaling 1,194 NSCLC patients (age median = 68.3 years [range 32.5-93.3], survival median = 1.7 years [range 0.0-11.7]). Using external validation in computed tomography (CT) data, we identified prognostic signatures using a 3D convolutional neural network (CNN) for patients treated with radiotherapy (n = 771, age median = 68.0 years [range 32.5-93.3], survival median = 1.3 years [range 0.0-11.7]). We then employed a transfer learning approach to achieve the same for surgery patients (n = 391, age median = 69.1 years [range 37.2-88.0], survival median = 3.1 years [range 0.0-8.8]). We found that the CNN predictions were significantly associated with 2-year overall survival from the start of respective treatment for radiotherapy (area under the receiver operating characteristic curve [AUC] = 0.70 [95% CI 0.63-0.78], p < 0.001) and surgery (AUC = 0.71 [95% CI 0.60-0.82], p < 0.001) patients. The CNN was also able to significantly stratify patients into low and high mortality risk groups in both the radiotherapy (p < 0.001) and surgery (p = 0.03) datasets. Additionally, the CNN was found to significantly outperform random forest models built on clinical parameters-including age, sex, and tumor node metastasis stage-as well as demonstrate high robustness against test-retest (intraclass correlation coefficient = 0.91) and inter-reader (Spearman's rank-order correlation = 0.88) variations. To gain a better understanding of the characteristics captured by the CNN, we identified regions with the most contribution towards predictions and highlighted the importance of tumor-surrounding tissue in patient stratification. We also present preliminary findings on the biological basis of the captured phenotypes as being linked to cell cycle and transcriptional processes. Limitations include the retrospective nature of this study as well as the opaque black box nature of deep learning networks.

Conclusions

Our results provide evidence that deep learning networks may be used for mortality risk stratification based on standard-of-care CT images from NSCLC patients. This evidence motivates future research into better deciphering the clinical and biological basis of deep learning networks as well as validation in prospective data.

C1 [Hosny, Ahmed; Parmar, Chintan; Coroller, Thibaud P.; Grossmann, Patrick; Zeleznik, Roman; Kumar, Avnish; Aerts, Hugo J. W. L.] Harvard Med Sch, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiat Oncol, Boston, MA 02115 USA.

[Bussink, Johan] Radboud Univ Nijmegen, Med Ctr, Dept Radiat Oncol, Nijmegen, Netherlands.

[Gillies, Robert J.] H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Physiol, Tampa, FL USA.

[Mak, Raymond H.; Aerts, Hugo J. W. L.] Harvard Med Sch, Brigham & Womens Hosp, Dept Radiol, Boston, MA 02115 USA.

RP Aerts, HJWL (通讯作者)，Harvard Med Sch, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiat Oncol, Boston, MA 02115 USA.; Aerts, HJWL (通讯作者)，Harvard Med Sch, Brigham & Womens Hosp, Dept Radiol, Boston, MA 02115 USA.

EM Hugo\_Aerts@dfci.harvard.edu

RI parmar, chintan/J-2977-2019; Aerts, Hugo/ABF-2821-2020; Bussink,

Jan/N-3584-2014

OI parmar, chintan/0000-0002-2140-814X; Aerts, Hugo/0000-0002-2122-2003;

Gillies, Robert/0000-0002-8888-7747; Kumar, Avnish/0000-0001-5882-748X;

Mak, Raymond/0000-0002-8754-0565; Bussink, Johan/0000-0002-5751-4796;

Coroller, Thibaud/0000-0001-7662-8724

FU National Institute of Health [NIH-USA U24CA194354, NIH-USA U01CA190234];

NATIONAL CANCER INSTITUTE [U24CA194354, U01CA190234] Funding Source: NIH

RePORTER

FX Authors acknowledge financial support from the National Institute of

Health (NIH-USA U24CA194354, and NIH-USA U01CA190234);

https://grants.nih.gov/funding/index.htm.The funders had no role in

study design, data collection and analysis, decision to publish, or

preparation of the manuscript.

CR Abadi Martin, 2016, arXiv

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ahrendt SA, 2003, J NATL CANCER I, V95, P961, DOI 10.1093/jnci/95.13.961

ALBERTI W, 1995, BRIT MED J, V311, P899

American Cancer Society, 2017, CANC FACTS FIG 2016

Amin MB, 2017, CA-CANCER J CLIN, V67, P93, DOI 10.3322/caac.21388

Arriagada R, 2010, J CLIN ONCOL, V28, P35, DOI 10.1200/JCO.2009.23.2272

Bai HX, 2016, BRIT J RADIOL, V89, DOI 10.1259/bjr.20151030

BENJAMINI Y, 1995, J R STAT SOC B, V57, P289, DOI 10.1111/j.2517-6161.1995.tb02031.x

Burotto M, 2014, J THORAC ONCOL, V9, P1609, DOI 10.1097/JTO.0000000000000302

Burrell RA, 2013, NATURE, V501, P338, DOI 10.1038/nature12625

Carneiro G, 2017, I S BIOMED IMAGING, P130, DOI 10.1109/ISBI.2017.7950485

Cistaro A, 2013, RADIOL ONCOL, V47, P219, DOI 10.2478/raon-2013-0023

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Cruz-Roa A, 2017, SCI REP-UK, V7, DOI 10.1038/srep46450

De Jay N, 2013, BIOINFORMATICS, V29, P2365, DOI 10.1093/bioinformatics/btt383

Egeblad M, 2010, DEV CELL, V18, P884, DOI 10.1016/j.devcel.2010.05.012

El-Hachem N, 2016, ENVIRON HEALTH PERSP, V124, P313, DOI 10.1289/ehp.1409157

ESR, 2011, INSIGHTS IMAGING, V2, P621, DOI 10.1007/s13244-011-0125-0

Esteva A, 2017, NATURE, V542, P115, DOI 10.1038/nature21056

Finlayson S. G., 2018, ARXIV PREPRINT ARXIV

Forsberg D, 2017, J DIGIT IMAGING, V30, P406, DOI 10.1007/s10278-017-9945-x

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Ganeshan B, 2010, CANCER IMAGING, V10, P137, DOI 10.1102/1470-7330.2010.0021

Ghafoorian M, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-05300-5

Ghafoorian M, 2017, NEUROIMAGE-CLIN, V14, P391, DOI 10.1016/j.nicl.2017.01.033

Gospodarowicz MK, 2004, CANCER, V100, P1, DOI 10.1002/cncr.11898

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

Grossmann P, 2016, BMC CANCER, V16, DOI 10.1186/s12885-016-2659-5

Gulshan V, 2016, JAMA-J AM MED ASSOC, V316, P2402, DOI 10.1001/jama.2016.17216

Hammernik K., 2017, BILDVERARBEITUNG MED, V2017, P92, DOI DOI 10.1007/978-3-662-54345-0\_25

Hoang T, 2005, J CLIN ONCOL, V23, P175, DOI 10.1200/JCO.2005.04.177

Hosny A, 2018, NAT REV CANCER, V18, P500, DOI 10.1038/s41568-018-0016-5

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Ioffe S., 2015, P INT C MACH LEARN L, V37, P448, DOI 10.5555/3045118.3045167

Irizarry RA, 2003, BIOSTATISTICS, V4, P249, DOI 10.1093/biostatistics/4.2.249

Kim H, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0187500

Kingma D, 2014, ARXIV

Kooi T, 2017, MED IMAGE ANAL, V35, P303, DOI 10.1016/j.media.2016.07.007

Kotikalapudi R, 2018, KERAS VIS

Krizhevsky A., 2012, ADV NEURAL INFORM PR, V25, DOI DOI 10.1145/3065386

Kuhn M, 2008, J STAT SOFTW, V28, P1, DOI 10.18637/jss.v028.i05

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lao JW, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-10649-8

Liberzon A, 2011, BIOINFORMATICS, V27, P1739, DOI 10.1093/bioinformatics/btr260

Litjens G, 2017, MED IMAGE ANAL, V42, P60, DOI 10.1016/j.media.2017.07.005

Long J, 2015, PROC CVPR IEEE, P3431, DOI 10.1109/CVPR.2015.7298965

Lundstrom CF, 2017, RADIOLOGY, V285, P12, DOI 10.1148/radiol.2017170062

Maas A.L., 2013, P ICML, V30, P3

Miao S, 2016, IEEE T MED IMAGING, V35, P1352, DOI 10.1109/TMI.2016.2521800

Milletari F, 2016, INT CONF 3D VISION, P565, DOI 10.1109/3DV.2016.79

Mirsadraee S, 2012, WORLD J RADIOL, V4, P128, DOI 10.4329/wjr.v4.i4.128

Molina JR, 2008, MAYO CLIN PROC, V83, P584, DOI 10.4065/83.5.584

Ng A. Y, 2004, PROC 21 INT C MACH L, P78, DOI DOI 10.1145/1015330.1015435

Ngiam J., P 28 INT C MACH LEAR, P689, DOI DOI 10.5555/3104482.3104569

Oberije C, 2014, RADIOTHER ONCOL, V112, P37, DOI 10.1016/j.radonc.2014.04.012

OECD iLibrary, 2018, HLTH EQ COMP TOM CT

OECD iLibrary, 2018, HLTH CAR US COMP TOM

Oikonomou A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-22357-y

Oxnard GR, 2011, J CLIN ONCOL, V29, P3114, DOI 10.1200/JCO.2010.33.7071

Pan SJ, 2010, IEEE T KNOWL DATA EN, V22, P1345, DOI 10.1109/TKDE.2009.191

Pan YH, 2015, IEEE ENG MED BIO, P699, DOI 10.1109/EMBC.2015.7318458

Parkin DM, 2005, CA-CANCER J CLIN, V55, P74, DOI 10.3322/canjclin.55.2.74

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

Paul R, 2016, TOMOGRAPHY, V2, P388, DOI 10.18383/j.tom.2016.00211

Pepek JM, 2011, J THORAC ONCOL, V6, P757, DOI 10.1097/JTO.0b013e31821038c0

Prechelt L, 1998, LECT NOTES COMPUT SC, V1524, P55

Schroder MS, 2011, BIOINFORMATICS, V27, P3206, DOI 10.1093/bioinformatics/btr511

Sculier JP, 2008, J THORAC ONCOL, V3, P457, DOI 10.1097/JTO.0b013e31816de2b8

Selvaraju RR, 2020, INT J COMPUT VISION, V128, P336, DOI 10.1007/s11263-019-01228-7

Shien K, 2017, J THORAC DIS, V9, pE489, DOI 10.21037/jtd.2017.03.183

Shwartz-Ziv Ravid, 2017, ARXIV170300810

Srivastava N, 2014, J MACH LEARN RES, V15, P1929

Subramanian A, 2005, P NATL ACAD SCI USA, V102, P15545, DOI 10.1073/pnas.0506580102

Thakur MK, 2016, SEMIN RESP CRIT CARE, V37, P760, DOI 10.1055/s-0036-1592337

Uramoto H, 2014, TRANSL LUNG CANCER R, V3, P242, DOI 10.3978/j.issn.2218-6751.2013.12.05

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Wang XQ, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-04963-4

Wu CF, 2015, MEDICINE, V94, DOI 10.1097/MD.0000000000001337

Yang X, 2017, NEUROIMAGE, V158, P378, DOI 10.1016/j.neuroimage.2017.07.008

Yuan X, 2017, ARXIV171207107

Zappa C, 2016, TRANSL LUNG CANCER R, V5, P288, DOI 10.21037/tlcr.2016.06.07

Zhang B, 2017, CANCER LETT, V403, P21, DOI 10.1016/j.canlet.2017.06.004

Zhang J, 2012, J CLIN ONCOL, V30, DOI 10.1200/jco.2012.30.30\_suppl.81

Zhang QS, 2018, FRONT INFORM TECH EL, V19, P27, DOI 10.1631/FITEE.1700808

Zhao BS, 2009, RADIOLOGY, V252, P263, DOI 10.1148/radiol.2522081593

Zheng YF, 2015, LECT NOTES COMPUT SC, V9349, P565, DOI 10.1007/978-3-319-24553-9\_69

NR 89

TC 212

Z9 222

U1 21

U2 70

PU PUBLIC LIBRARY SCIENCE

PI SAN FRANCISCO

PA 1160 BATTERY STREET, STE 100, SAN FRANCISCO, CA 94111 USA

SN 1549-1277

EI 1549-1676

J9 PLOS MED

JI PLos Med.

PD NOV

PY 2018

VL 15

IS 11

AR e1002711

DI 10.1371/journal.pmed.1002711

PG 25

WC Medicine, General & Internal

WE Science Citation Index Expanded (SCI-EXPANDED)

SC General & Internal Medicine

GA HC5FB

UT WOS:000451827800025

PM 30500819

OA gold, Green Published, Green Submitted

DA 2022-08-24

ER

PT J

AU Huang, ZH

Hu, C

Chi, CX

Jiang, Z

Tong, YX

Zhao, CL

AF Huang, Zhangheng

Hu, Chuan

Chi, Changxing

Jiang, Zhe

Tong, Yuexin

Zhao, Chengliang

TI An Artificial Intelligence Model for Predicting 1-Year Survival of Bone

Metastases in Non-Small-Cell Lung Cancer Patients Based on XGBoost

Algorithm

SO BIOMED RESEARCH INTERNATIONAL

LA English

DT Article

ID PROGNOSTIC-FACTORS; MULTICENTER

AB Non-small-cell lung cancer (NSCLC) patients often develop bone metastases (BM), and the overall survival for these patients is usually perishing. However, a model with high accuracy for predicting the survival of NSCLC with BM is still lacking. Here, we aimed to establish a model based on artificial intelligence for predicting the 1-year survival rate of NSCLC with BM by using extreme gradient boosting (XGBoost), a large-scale machine learning algorithm. We selected NSCLC patients with BM between 2010 and 2015 from the Surveillance, Epidemiology, and End Results database. In total, 5973 cases were enrolled and divided into the training (n = 4183) and validation (n = 1790) sets. XGBoost, random forest, support vector machine, and logistic algorithms were used to generate predictive models. Receiver operating characteristic curves were used to evaluate and compare the predictive performance of each model. The parameters including tumor size, age, race, sex, primary site, histological subtype, grade, laterality, T stage, N stage, surgery, radiotherapy, chemotherapy, distant metastases to other sites (lung, brain, and liver), and marital status were selected to construct all predictive models. The XGBoost model had a better performance in both training and validation sets as compared with other models in terms of accuracy. Our data suggested that the XGBoost model is the most precise and personalized tool for predicting the 1-year survival rate for NSCLC patients with BM. This model can help the clinicians to design more rational and effective therapeutic strategies.

C1 [Huang, Zhangheng; Hu, Chuan; Tong, Yuexin; Zhao, Chengliang] Chengde Med Univ, Affiliated Hosp, Dept Spine Surg, Chengde, Hebei, Peoples R China.

[Hu, Chuan] Qingdao Univ, Dept Orthoped, Affiliated Hosp, Qingdao, Shandong, Peoples R China.

[Chi, Changxing] Kunming Med Univ, Dept Radiotherapy, Affiliated Hosp 3, Kunming, Yunnan, Peoples R China.

[Jiang, Zhe] Jilin Univ, Sch Publ Hlth, Changchun, Jilin, Peoples R China.

RP Zhao, CL (通讯作者)，Chengde Med Univ, Affiliated Hosp, Dept Spine Surg, Chengde, Hebei, Peoples R China.

EM 38221965@qq.com

CR Altorki NK, 2019, NAT REV CANCER, V19, P9, DOI 10.1038/s41568-018-0081-9

Asamura H, 2008, J THORAC ONCOL, V3, P46, DOI 10.1097/JTO.0b013e31815e8577

Balachandran VP, 2015, LANCET ONCOL, V16, pE173, DOI 10.1016/S1470-2045(14)71116-7

Cappuzzo F, 2010, LANCET ONCOL, V11, P521, DOI 10.1016/S1470-2045(10)70112-1

Chansky K, 2009, J THORAC ONCOL, V4, P792, DOI 10.1097/JTO.0b013e3181a7716e

Chen LL, 2009, BRIT J CANCER, V101, P749, DOI 10.1038/sj.bjc.6605214

Cho BC, 2019, ANTICANCER RES, V39, P1403, DOI 10.21873/anticanres.13255

Choi SW, 2019, HEALTHC INFORM RES, V25, P305, DOI 10.4258/hir.2019.25.4.305

Decroisette C, 2011, J THORAC ONCOL, V6, P576, DOI 10.1097/JTO.0b013e318206a1e3

Deng JQ, 2018, CANCER MANAG RES, V10, P6143, DOI 10.2147/CMAR.S183878

Esposito M, 2014, PHARMACOL THERAPEUT, V141, P222, DOI 10.1016/j.pharmthera.2013.10.006

Fukui T, 2015, GEN THORAC CARDIOVAS, V63, P507, DOI 10.1007/s11748-015-0564-5

Hu CA, 2020, BMJ OPEN, V10, DOI 10.1136/bmjopen-2019-033898

Kazem MA, 2017, SURG-J R COLL SURG E, V15, P93, DOI 10.1016/j.surge.2016.06.002

Lababede O, 2018, ONCOLOGIST, V23, P844, DOI 10.1634/theoncologist.2017-0659

Langley RR, 2011, INT J CANCER, V128, P2527, DOI 10.1002/ijc.26031

LeVasseur N, 2016, CANCER TREAT REV, V50, P183, DOI 10.1016/j.ctrv.2016.09.013

Li H, 2019, EUR J CARDIO-THORAC, V55, P1121, DOI 10.1093/ejcts/ezy439

Liu WM, 2018, CLIN EXP METASTAS, V35, P753, DOI 10.1007/s10585-018-9943-5

Morgensztern D, 2010, J THORAC ONCOL, V5, P29, DOI 10.1097/JTO.0b013e3181c5920c

Ogunleye A, 2020, IEEE ACM T COMPUT BI, V17, P2131, DOI 10.1109/TCBB.2019.2911071

Pruksakorn D, 2018, J BONE ONCOL, V10, P1, DOI 10.1016/j.jbo.2017.10.001

Riihimaki M, 2014, LUNG CANCER, V86, P78, DOI 10.1016/j.lungcan.2014.07.020

Sathiakumar Nalini, 2013, Lung India, V30, P20, DOI 10.4103/0970-2113.106127

Sculier JP, 2008, J THORAC ONCOL, V3, P457, DOI 10.1097/JTO.0b013e31816de2b8

Song Q, 2019, J CANCER RES CLIN, V145, P737, DOI 10.1007/s00432-018-02826-7

Sugiura H, 2008, CLIN ORTHOP RELAT R, V466, P729, DOI 10.1007/s11999-007-0051-0

Tamayo D, 2016, ASTROPHYS J LETT, V832, DOI 10.3847/2041-8205/832/2/L22

Thatcher N, 2005, LANCET, V366, P1527, DOI 10.1016/S0140-6736(05)67625-8

Torlay L, 2017, Brain Inform, V4, P159, DOI 10.1007/s40708-017-0065-7

Wang B, 2019, J BONE ONCOL, V17, DOI 10.1016/j.jbo.2019.100251

Wang Y, 2019, FUTURE ONCOL, V15, P3395, DOI 10.2217/fon-2019-0007

Zhang L, 2017, MED SCI MONITOR, V23, DOI 10.12659/MSM.902971

Zheng XQ, 2019, TRANSL LUNG CANCER R, V8, P367, DOI 10.21037/tlcr.2019.08.16

NR 34

TC 9

Z9 9

U1 1

U2 6

PU HINDAWI LTD

PI LONDON

PA ADAM HOUSE, 3RD FLR, 1 FITZROY SQ, LONDON, W1T 5HF, ENGLAND

SN 2314-6133

EI 2314-6141

J9 BIOMED RES INT

JI Biomed Res. Int.

PD JUN 28

PY 2020

VL 2020

AR 3462363

DI 10.1155/2020/3462363

PG 13

WC Biotechnology & Applied Microbiology; Medicine, Research & Experimental

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Biotechnology & Applied Microbiology; Research & Experimental Medicine

GA MQ3MC

UT WOS:000552799900003

PM 32685470

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Li, HM

Galperin-Aizenberg, M

Pryma, D

Simone, CB

Fan, Y

AF Li, Hongming

Galperin-Aizenberg, Maya

Pryma, Daniel

Simone, Charles B., II

Fan, Yong

TI Unsupervised machine learning of radiomic features for predicting

treatment response and overall survival of early stage non-small cell

lung cancer patients treated with stereotactic body radiation therapy

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Unsupervised machine learning; Radiomics; Non-small cell lung cancer;

Stereotactic body radiation therapy

ID FDG-PET; QUANTITATIVE IMAGE; BIOMARKERS; SIGNATURE; EVENTS

AB Background and purpose: To predict treatment response and survival of NSCLC patients receiving stereotactic body radiation therapy (SBRT), we develop an unsupervised machine learning method for stratifying patients and extracting meta-features simultaneously based on imaging data.

Material and methods: This study was performed based on an F-18-FDG-PET dataset of 100 consecutive patients who were treated with SBRT for early stage NSCLC. Each patient's tumor was characterized by 722 radiomic features. An unsupervised two-way clustering method was used to identify groups of patients and radiomic features simultaneously. The groups of patients were compared in terms of survival and freedom from nodal failure. Meta-features were computed for building survival models to predict survival and free of nodal failure.

Results: Differences were found between 2 groups of patients when the patients were clustered into 3 groups in terms of both survival (p = 0.003) and freedom from nodal failure (p = 0.038). Average concordance measures for predicting survival and nodal failure were 0.640 +/- 0.029 and 0.664 +/- 0.063 respectively, better than those obtained by prediction models built upon clinical variables (p < 0.04).

Conclusions: The evaluation results demonstrate that our method allows us to stratify patients and predict survival and freedom from nodal failure with better performance than current alternative methods. (C) 2018 Elsevier B.V. All rights reserved.

C1 [Li, Hongming; Galperin-Aizenberg, Maya; Pryma, Daniel; Fan, Yong] Univ Penn, Dept Radiol, Perelman Sch Med, Philadelphia, PA 19104 USA.

[Simone, Charles B., II] Univ Maryland, Sch Med, Maryland Proton Treatment Ctr, Baltimore, MD 21201 USA.

RP Fan, Y (通讯作者)，Richards Bldg,7th Floor,RM D703, Philadelphia, PA 19104 USA.

EM yong.fan@ieee.org

RI Fan, Yong/O-4412-2014

OI Fan, Yong/0000-0001-9869-4685; Simone, Charles/0000-0002-0867-3694

FU National Institutes of Health [CA223358, CA189523, EB022573, DK114786,

DA039215, DA039002]; Precision Lung Radiotherapy Grant of the University

of Pennsylvania; NATIONAL CANCER INSTITUTE [R21CA223358, U24CA189523]

Funding Source: NIH RePORTER; NATIONAL INSTITUTE OF BIOMEDICAL IMAGING

AND BIOENGINEERING [R01EB022573] Funding Source: NIH RePORTER; NATIONAL

INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES [P50DK114786]

Funding Source: NIH RePORTER; NATIONAL INSTITUTE ON DRUG ABUSE

[R01DA039215, U54DA039002] Funding Source: NIH RePORTER

FX This work was supported in part by National Institutes of Health grants

[grant numbers CA223358, CA189523, EB022573, DK114786, DA039215, and

DA039002] and Precision Lung Radiotherapy Grant of the University of

Pennsylvania.

CR Austin PC, 2017, J CLIN EPIDEMIOL, V83, P75, DOI 10.1016/j.jclinepi.2016.11.017

Chen BJ, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0885-x

Cistaro A, 2013, RADIOL ONCOL, V47, P219, DOI 10.2478/raon-2013-0023

Constanzo J, 2017, TRANSL LUNG CANCER R, V6, P635, DOI 10.21037/tlcr.2017.09.07

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Davatzikos C, 2018, J MED IMAGING, V5, DOI 10.1117/1.JMI.5.1.011018

Demsar J, 2006, J MACH LEARN RES, V7, P1

Desseroit MC, 2016, EUR J NUCL MED MOL I, V43, P1477, DOI 10.1007/s00259-016-3325-5

Emaminejad N, 2016, IEEE T BIO-MED ENG, V63, P1034, DOI 10.1109/TBME.2015.2477688

Fu LP, 2012, PLOS ONE, V7, DOI 10.1371/journal.pone.0050914

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Grady L, 2006, IEEE T PATTERN ANAL, V28, P1768, DOI 10.1109/TPAMI.2006.233

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

Hatt M, 2017, EUR J NUCL MED MOL I, V44, P151, DOI 10.1007/s00259-016-3427-0

Hawkins SH, 2014, IEEE ACCESS, V2, P1418, DOI 10.1109/ACCESS.2014.2373335

Hotelling H, 1933, J EDUC PSYCHOL, V24, P417, DOI 10.1037/h0071325

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

KAPLAN EL, 1958, J AM STAT ASSOC, V53, P457, DOI 10.2307/2281868

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Leijenaar RTH, 2015, SCI REP-UK, V5, DOI 10.1038/srep11075

Li H, 2017, INT J RADIAT ONCOL, V99, pS34, DOI 10.1016/j.ijrobp.2017.06.092

Li H, 2011, SEGMENTATION BRAIN T, P606

Li HM, 2012, 2012 9TH IEEE INTERNATIONAL SYMPOSIUM ON BIOMEDICAL IMAGING (ISBI), P1715, DOI 10.1109/ISBI.2012.6235910

Li Q, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0892-y

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

Lian CF, 2016, MED IMAGE ANAL, V32, P257, DOI 10.1016/j.media.2016.05.007

Liu Y, 2016, CLIN LUNG CANCER, V17, P441, DOI 10.1016/j.cllc.2016.02.001

Lovinfosse P, 2016, EUR J NUCL MED MOL I, V43, P1453, DOI 10.1007/s00259-016-3314-8

MANTEL NATHAN, 1966, CANCERCHEMOTHERAP REP, V50, P163

Ogundimu EO, 2016, J CLIN EPIDEMIOL, V76, P175, DOI 10.1016/j.jclinepi.2016.02.031

Park H, 2006, PROC 12 ACM SIGKDD I, P126

Peng H., 2016, P 25 INT JOINT C ART, P1918

Peng HY, 2017, AAAI CONF ARTIF INTE, P2471

Peng HY, 2017, INFORM SCIENCES, V418, P652, DOI 10.1016/j.ins.2017.08.036

Scrivener M, 2016, TRANSL CANCER RES, V5, P398, DOI 10.21037/tcr.2016.06.18

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

Vallieres M, 2018, J NUCL MED, V59, P189, DOI 10.2967/jnumed.117.200501

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Wu J, 2017, CLIN CANCER RES, V23, P3334, DOI 10.1158/1078-0432.CCR-16-2415

Wu J, 2016, RADIOLOGY, V281, P270, DOI 10.1148/radiol.2016151829

Yu W, 2017, INT J RAD ONCOL BIOL

Zwanenburg A, 2016, RADOLOGY, DOI DOI 10.1148/RADIOL.2020191145

NR 47

TC 43

Z9 48

U1 0

U2 10

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD NOV

PY 2018

VL 129

IS 2

SI SI

BP 218

EP 226

DI 10.1016/j.radonc.2018.06.025

PG 9

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA HD1LK

UT WOS:000452271400004

PM 30473058

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Hao, HX

Zhou, ZG

Li, SL

Maquilan, G

Folkert, MR

Iyengar, P

Westover, KD

Albuquerque, K

Liu, F

Choy, H

Timmerman, R

Yang, L

Wang, J

AF Hao, Hongxia

Zhou, Zhiguo

Li, Shulong

Maquilan, Genevieve

Folkert, Michael R.

Iyengar, Puneeth

Westover, Kenneth D.

Albuquerque, Kevin

Liu, Fang

Choy, Hak

Timmerman, Robert

Yang, Lin

Wang, Jing

TI Shell feature: a new radiomics descriptor for predicting distant failure

after radiotherapy in non-small cell lung cancer and cervix cancer

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE NSCLC; cervix cancer; radiomics; distant failure; shell

ID GYNECOLOGIC-ONCOLOGY-GROUP; RADIATION-THERAPY; METASTASIS; CARCINOMA;

CLASSIFICATION; INVASION; OUTCOMES; CHEMOTHERAPY; HYDROXYUREA; CISPLATIN

AB Distant failure is the main cause of human cancer-related mortalities. To develop a model for predicting distant failure in non-small cell lung cancer (NSCLC) and cervix cancer (CC) patients, a shell feature, consisting of outer voxels around the tumor boundary, was constructed using pre-treatment positron emission tomography (PET) images from 48 NSCLC patients received stereotactic body radiation therapy and 52 CC patients underwent external beam radiation therapy and concurrent chemotherapy followed with high-dose-rate intracavitary brachytherapy. The hypothesis behind this feature is that non-invasive and invasive tumors may have different morphologic patterns in the tumor periphery, in turn reflecting the differences in radiological presentations in the PET images. The utility of the shell was evaluated by the support vector machine classifier in comparison with intensity, geometry, gray level co-occurrence matrix-based texture, neighborhood gray tone difference matrix-based texture, and a combination of these four features. The results were assessed in terms of accuracy, sensitivity, specificity, and AUC. Collectively, the shell feature showed better predictive performance than all the other features for distant failure prediction in both NSCLC and CC cohorts.

C1 [Hao, Hongxia; Liu, Fang] Xidian Univ, Sch Comp Sci & Technol, Xian 710071, Shaanxi, Peoples R China.

[Hao, Hongxia; Liu, Fang] Xidian Univ, Ministr Educ, Key Lab Intelligent Percept & Image Understandin, Xian 710071, Shaanxi, Peoples R China.

[Zhou, Zhiguo; Maquilan, Genevieve; Folkert, Michael R.; Iyengar, Puneeth; Westover, Kenneth D.; Albuquerque, Kevin; Choy, Hak; Timmerman, Robert; Wang, Jing] Univ Texas Southwestern Med Ctr Dallas, Dept Radiat Oncol, Dallas, TX 75235 USA.

[Li, Shulong] Southern Med Univ, Sch Biomed Engn, Guangzhou 510515, Guangdong, Peoples R China.

[Yang, Lin] Chinese Acad Med Sci, Canc Hosp, Natl Canc Ctr, Dept Pathol, Beijing 100021, Peoples R China.

RP Wang, J (通讯作者)，Univ Texas Southwestern Med Ctr Dallas, Dept Radiat Oncol, Dallas, TX 75235 USA.

EM Jing.Wang@utsouthwestern.edu

RI Yang, Lin/J-6807-2019; Li, Shulong/AAK-9054-2020; Wang,

Jing/N-7332-2019; Westover, Ken/AAZ-1795-2020; Hao,

Hongxia/AAO-7462-2020

OI Yang, Lin/0000-0002-7594-3770; Westover, Ken/0000-0003-3653-5923; Wang,

Jing/0000-0002-8491-4146

FU American Cancer Society [ACS-IRG-02-196]; US National Institutes of

Health [5P30CA142543]; NATIONAL CANCER INSTITUTE [P30CA142543] Funding

Source: NIH RePORTER; NATIONAL INSTITUTE OF BIOMEDICAL IMAGING AND

BIOENGINEERING [R01EB020366] Funding Source: NIH RePORTER

FX This work was supported in part by the American Cancer Society

(ACS-IRG-02-196) and US National Institutes of Health (5P30CA142543).

The authors would like to thank Dr Damiana Chiavolini for providing

helpful suggestions and editing the manuscript.

CR Almangush A, 2014, HEAD NECK-J SCI SPEC, V36, P811, DOI 10.1002/hed.23380

Braumann UD, 2005, IEEE T MED IMAGING, V24, P1286, DOI 10.1109/TMI.2005.855437

Chaffer CL, 2011, SCIENCE, V331, P1559, DOI 10.1126/science.1203543

Chang C.-C., 2011, ACM T INTEL SYST TEC, V2, DOI DOI 10.1145/1961189.1961199

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Chetty IJ, 2013, RADIOTHER ONCOL, V109, P498, DOI 10.1016/j.radonc.2013.10.012

Cook GJR, 2014, CLIN TRANSL IMAGING, V2, P269, DOI 10.1007/s40336-014-0064-0

Dan GA, 2016, J CLIN MED, V5, P51

Gu S., 2014, ADV NEURAL INFORM PR, P793

Huang BX, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0166311

Huang MY, 2017, SCI REP-UK, V7, DOI 10.1038/srep39880

Kadota K, 2014, J THORAC ONCOL, V9, P1126, DOI 10.1097/JTO.0000000000000253

Khamis H, 2017, MED IMAGE ANAL, V36, P15, DOI 10.1016/j.media.2016.10.007

Kidd EA, 2010, INT J RADIAT ONCOL, V77, P1085, DOI 10.1016/j.ijrobp.2009.06.041

KOELZER VH, 2014, FRONT ONCOL, V4

Koelzer VH, 2016, HUM PATHOL, V47, P4, DOI 10.1016/j.humpath.2015.08.007

Lennon FE, 2015, NAT REV CLIN ONCOL, V12, P664, DOI 10.1038/nrclinonc.2015.108

Lin C.-J., 2003, TECH REP

Lu SH, 2017, J THORAC ONCOL, V12, P223, DOI 10.1016/j.jtho.2016.09.129

Lugli A, 2017, MODERN PATHOL, V30, P1299, DOI 10.1038/modpathol.2017.46

Mehlen P, 2006, NAT REV CANCER, V6, P449, DOI 10.1038/nrc1886

Meijering EHW, 2001, MED IMAGE ANAL, V5, P111, DOI 10.1016/S1361-8415(00)00040-2

Mezheyeuski A, 2016, SCI REP-UK, V6, DOI 10.1038/srep36149

Nogami Y, 2014, ANTICANCER RES, V34, P585

Onozato ML, 2013, AM J SURG PATHOL, V37, P287, DOI 10.1097/PAS.0b013e31826885fb

Plaks V, 2013, SCIENCE, V341, P1186, DOI 10.1126/science.1235226

Quail DF, 2013, NAT MED, V19, P1423, DOI 10.1038/nm.3394

Robertson-Tessi M, 2015, CANCER RES, V75, P1567, DOI 10.1158/0008-5472.CAN-14-1428

Rose PG, 2007, J CLIN ONCOL, V25, P2804, DOI 10.1200/JCO.2006.09.4532

Saha PK, 2015, IEEE T MED IMAGING, V34, P1940, DOI 10.1109/TMI.2015.2417112

Schmid MP, 2014, GYNECOL ONCOL, V133, P256, DOI 10.1016/j.ygyno.2014.02.004

Suykens JAK, 1999, NEURAL PROCESS LETT, V9, P293, DOI 10.1023/A:1018628609742

Taira T, 2012, LUNG CANCER, V76, P423, DOI 10.1016/j.lungcan.2011.11.010

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Travis WD, 2015, J THORAC ONCOL, V10, P1243, DOI 10.1097/JTO.0000000000000630

Valastyan S, 2011, CELL, V147, P275, DOI 10.1016/j.cell.2011.09.024

van Baardwijk A, 2008, RADIOTHER ONCOL, V87, P55, DOI 10.1016/j.radonc.2008.02.002

Whitney CW, 1999, J CLIN ONCOL, V17, P1339, DOI 10.1200/JCO.1999.17.5.1339

Wood SL, 2014, CANCER TREAT REV, V40, P558, DOI 10.1016/j.ctrv.2013.10.001

Wu J, 2016, RADIOLOGY, V281, P270, DOI 10.1148/radiol.2016151829

Yamaguchi Y, 2010, J THORAC ONCOL, V5, P1361, DOI 10.1097/JTO.0b013e3181eaf2f3

Zhou ZG, 2013, COMPUT BIOL MED, V43, P1462, DOI 10.1016/j.compbiomed.2013.07.023

Zhou ZG, 2017, PHYS MED BIOL, V62, P4460, DOI 10.1088/1361-6560/aa6ae5

Zuluaga MA, 2015, MED IMAGE ANAL, V26, P185, DOI 10.1016/j.media.2015.09.001

NR 44

TC 36

Z9 38

U1 0

U2 20

PU IOP PUBLISHING LTD

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD MAY

PY 2018

VL 63

IS 9

AR 095007

DI 10.1088/1361-6560/aabb5e

PG 17

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA GE7PL

UT WOS:000431425200002

PM 29616661

OA Green Submitted, Green Accepted

DA 2022-08-24

ER

PT J

AU Leijenaar, RTH

Carvalho, S

Velazquez, ER

Van Elmpt, WJC

Parmar, C

Hoekstra, OS

Hoekstra, CJ

Boellaard, R

Dekker, ALAJ

Gillies, RJ

Aerts, HJWL

Lambin, P

AF Leijenaar, Ralph T. H.

Carvalho, Sara

Velazquez, Emmanuel Rios

Van Elmpt, Wouter J. C.

Parmar, Chintan

Hoekstra, Otto S.

Hoekstra, Corneline J.

Boellaard, Ronald

Dekker, Andre L. A. J.

Gillies, Robert J.

Aerts, Hugo J. W. L.

Lambin, Philippe

TI Stability of FDG-PET Radiomics features: An integrated analysis of

test-retest and inter-observer variability

SO ACTA ONCOLOGICA

LA English

DT Article

ID CELL LUNG-CANCER; STANDARDIZED UPTAKE VALUE; RESPONSE ASSESSMENT;

TEXTURAL FEATURES; F-18-FDG PET; RADIOTHERAPY; IMAGES; TUMOR;

REPEATABILITY; CT

AB Purpose. Besides basic measurements as maximum standardized uptake value (SUV)(max) or SUVmean derived from 18F-FDG positron emission tomography (PET) scans, more advanced quantitative imaging features (i.e. "Radiomics" features) are increasingly investigated for treatment monitoring, outcome prediction, or as potential biomarkers. With these prospected applications of Radiomics features, it is a requisite that they provide robust and reliable measurements. The aim of our study was therefore to perform an integrated stability analysis of a large number of PET-derived features in non-small cell lung carcinoma (NSCLC), based on both a test-retest and an inter-observer setup. Methods. Eleven NSCLC patients were included in the test-retest cohort. Patients underwent repeated PET imaging within a one day interval, before any treatment was delivered. Lesions were delineated by applying a threshold of 50% of the maximum uptake value within the tumor. Twenty-three NSCLC patients were included in the inter-observer cohort. Patients underwent a diagnostic whole body PET-computed tomography (CT). Lesions were manually delineated based on fused PET-CT, using a standardized clinical delineation protocol. Delineation was performed independently by five observers, blinded to each other. Fifteen first order statistics, 39 descriptors of intensity volume histograms, eight geometric features and 44 textural features were extracted. For every feature, test-retest and inter-observer stability was assessed with the intra-class correlation coefficient (ICC) and the coefficient of variability, normalized to mean and range. Similarity between test-retest and inter-observer stability rankings of features was assessed with Spearman's rank correlation coefficient. Results. Results showed that the majority of assessed features had both a high test-retest (71%) and inter-observer (91%) stability in terms of their ICC. Overall, features more stable in repeated PET imaging were also found to be more robust against inter-observer variability. Conclusion. Results suggest that further research of quantitative imaging features is warranted with respect to more advanced applications of PET imaging as being used for treatment monitoring, outcome prediction or imaging biomarkers.

C1 [Leijenaar, Ralph T. H.; Carvalho, Sara; Velazquez, Emmanuel Rios; Van Elmpt, Wouter J. C.; Parmar, Chintan; Dekker, Andre L. A. J.; Aerts, Hugo J. W. L.; Lambin, Philippe] MUMC, Dept Radiat Oncol MAASTRO, GROW Sch Oncol & Dev Biol, Maastricht, Netherlands.

[Hoekstra, Otto S.; Boellaard, Ronald] Vrije Univ Amsterdam Med Ctr, Dept Radiol & Nucl Med, Amsterdam, Netherlands.

[Hoekstra, Corneline J.] Jeroen Bosch Med Ctr, Dept Nucl Med, Shertogenbosch, Netherlands.

[Gillies, Robert J.] Univ S Florida, Coll Med, H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Imaging & Metab, Tampa, FL 33612 USA.

[Aerts, Hugo J. W. L.] Harvard Univ, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiat Oncol,Med Sch, Boston, MA 02115 USA.

[Aerts, Hugo J. W. L.] Harvard Univ, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiol,Med Sch, Boston, MA 02115 USA.

RP Leijenaar, RTH (通讯作者)，MAASTRO Clin, Dr Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

EM ralph.leijenaar@maastro.nl

RI Dekker, Andre/AAE-4830-2019; parmar, chintan/J-2977-2019; Aerts,

Hugo/ABF-2821-2020; Aerts, Hugo/P-6350-2015

OI Dekker, Andre/0000-0002-0422-7996; parmar, chintan/0000-0002-2140-814X;

Aerts, Hugo/0000-0002-2122-2003; Aerts, Hugo/0000-0002-2122-2003;

Boellaard, Ronald/0000-0002-0313-5686; Gillies,

Robert/0000-0002-8888-7747; Lambin, Philippe/0000-0001-7961-0191

FU QuIC-ConCePT project; EFPI A companies; Innovative Medicine Initiative

Joint Undertaking (IMI JU) [115151]; National Institute of Health

[NIH-USA U01 CA 143062-01]; CTMM framework (AIRFORCE project) [030-103];

EU; euroCAT; Kankeronderzoekfonds Limburg from the Health Foundation

Limburg; Dutch Cancer Society [KWF UM 2011-5020, KWF UM 2009-4454];

NATIONAL CANCER INSTITUTE [U01CA143062] Funding Source: NIH RePORTER

FX Authors acknowledge financial support from the QuIC-ConCePT project,

which is partly funded by EFPI A companies and the Innovative Medicine

Initiative Joint Undertaking (IMI JU) under Grant Agreement No. 115151.

Authors also acknowledge financial support from the National Institute

of Health (NIH-USA U01 CA 143062-01, Radiomics of NSCLC), the CTMM

framework (AIRFORCE project, grant 030-103), EU 6th and 7th framework

program (EUROXY, METOXIA, EURECA, ART-FORCE), euroCAT (IVA

Interreg-www.eurocat.info), Kankeronderzoekfonds Limburg from the Health

Foundation Limburg and the Dutch Cancer Society (KWF UM 2011-5020, KWF

UM 2009-4454).

CR Bland JM, 2007, J BIOPHARM STAT, V17, P571, DOI 10.1080/10543400701329422

Buckler AJ, 2011, RADIOLOGY, V259, P875, DOI 10.1148/radiol.10100800

Cheebsumon P, 2012, EJNMMI RES, V2, DOI 10.1186/2191-219X-2-56

de Langen AJ, 2012, J NUCL MED, V53, P701, DOI 10.2967/jnumed.111.095299

De Ruysscher D, 2012, LUNG CANCER, V75, P141, DOI 10.1016/j.lungcan.2011.07.018

Deasy JO, 2003, MED PHYS, V30, P979, DOI 10.1118/1.1568978

El Naqa I, 2009, PATTERN RECOGN, V42, P1162, DOI 10.1016/j.patcog.2008.08.011

Frings V, 2010, J NUCL MED, V51, P1870, DOI 10.2967/jnumed.110.077255

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lin P, 2011, RADIOTHER ONCOL, V101, P284, DOI 10.1016/j.radonc.2011.06.030

SHROUT PE, 1979, PSYCHOL BULL, V86, P420, DOI 10.1037/0033-2909.86.2.420

Takeda A, 2011, RADIOTHER ONCOL, V101, P291, DOI 10.1016/j.radonc.2011.08.008

Thie JA, 2004, J NUCL MED, V45, P1431

Tixier F, 2012, J NUCL MED, V53, P693, DOI 10.2967/jnumed.111.099127

Tixier F, 2011, J NUCL MED, V52, P369, DOI 10.2967/jnumed.110.082404

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

Van Elmpt W, 2011, Q J NUCL MED MOL IM, V55, P648

van Elmpt W, 2012, J NUCL MED, V53, P1514, DOI 10.2967/jnumed.111.102566

Velazquez ER, 2010, ACTA ONCOL, V49, P1033, DOI 10.3109/0284186X.2010.498441

NR 25

TC 287

Z9 297

U1 1

U2 71

PU INFORMA HEALTHCARE

PI LONDON

PA TELEPHONE HOUSE, 69-77 PAUL STREET, LONDON EC2A 4LQ, ENGLAND

SN 0284-186X

J9 ACTA ONCOL

JI Acta Oncol.

PD OCT

PY 2013

VL 52

IS 7

BP 1391

EP 1397

DI 10.3109/0284186X.2013.812798

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA 223AU

UT WOS:000324776100020

PM 24047337

OA Green Accepted, Green Published, Bronze

DA 2022-08-24

ER

PT J

AU Grgic, A

Ballek, E

Fleckenstein, J

Moca, N

Kremp, S

Schaefer, A

Kuhnigk, JM

Rube, C

Kirsch, CM

Hellwig, D

AF Grgic, Aleksandar

Ballek, Elena

Fleckenstein, Jochen

Moca, Norbert

Kremp, Stephanie

Schaefer, Andrea

Kuhnigk, Jan-Martin

Ruebe, Christian

Kirsch, Carl-Martin

Hellwig, Dirk

TI Impact of rigid and nonrigid registration on the determination of

F-18-FDG PET-based tumour volume and standardized uptake value in

patients with lung cancer

SO EUROPEAN JOURNAL OF NUCLEAR MEDICINE AND MOLECULAR IMAGING

LA English

DT Article

DE Non-small cell lung carcinoma (NSCLC); Spiral computed tomography;

Positron emission tomography; Image registration; Image analysis;

Computer-assisted

ID RESPIRATORY MOTION; IMAGE REGISTRATION; CO-REGISTRATION; FDG-PET; CT;

RADIOTHERAPY; THORAX; DELINEATION; TOMOGRAPHY

AB Assessment of the metabolically active tumour tissue by FDG PET is evolving for use in the diagnosis of non-small-cell lung cancer (NSCLC), in the planning of radiotherapy, and in follow-up and response evaluation. For exact evaluation accurate registration of PET and CT data is required. The registration process is usually based on rigid algorithms; however, nonrigid algorithms are increasingly being used. The influence of the registration method on FDG PET-based standardized uptake value (SUVmax) and metabolic tumour volume (MTV) definition has not yet been evaluated. We compared intra- and interindividual differences in SUV and MTV between rigid- and nonrigid-registered PET and CT acquired during different breathing manoeuvres.

The study group comprised 28 radiotherapy candidates with histologically proven NSCLC who underwent FDG PET acquisition and three CT acquisitions (expiration - EXP, inspiration - INS, mid-breath-hold - MID). All scans were registered with both a rigid (R) and a nonrigid (NR) procedure resulting in six fused datasets: R-INS, R-EXP, R-MID, NR-INS, NR-EXP and NR-MID. For the delineation of MTVs a contrast-oriented contouring algorithm developed in-house was used. To accelerate the delineation a semiautomatic software prototype was utilized.

Tumour mean SUVmax did not differ for R and NR registration (R 17.5 +/- 7, NR 17.4 +/- 7; p=0.2). The mean MTV was higher by 3 +/- 12 ml (p=0.02) in the NR group than in the R group, as was the mean tumour diameter (by 0.1 +/- 0.2 cm; p < 0.01). With respect to the three different breathing manoeuvres, there were no differences in MTV in the R group (p > 0.7). In intraindividual comparison there were no significant differences in MTVs concerning the registration pairs R-EXP (68 +/- 88 ml) vs. NR-EXP (69 +/- 85 ml) und R-MID (68 +/- 86 ml) vs. NR-MID (69 +/- 83 ml) (both p > 0.4). However, the MTVs were larger after NR registration during inspiration (R-INS 68 +/- 82 vs. NR-INS 78 +/- 93 ml; p=0.02).

The use of nonrigid algorithms may lead to a change in MTV, whose extent is influenced by the breathing manoeuvre on CT. Nonrigid registration methods cannot be recommended for the definition of MTV if the CT scan is performed during inspiration. The choice of registration algorithm has no significant impact on SUVmax.

C1 [Grgic, Aleksandar; Ballek, Elena; Moca, Norbert; Schaefer, Andrea; Kirsch, Carl-Martin; Hellwig, Dirk] Univ Saarland, Med Ctr, Dept Nucl Med, D-66421 Homburg, Germany.

[Fleckenstein, Jochen; Kremp, Stephanie; Ruebe, Christian] Univ Saarland, Med Ctr, Dept Radiooncol, D-66421 Homburg, Germany.

[Kuhnigk, Jan-Martin] MEVIS, Bremen, Germany.

RP Grgic, A (通讯作者)，Univ Saarland, Med Ctr, Dept Nucl Med, Geb 50, D-66421 Homburg, Germany.

EM aleksandar.grgic@uks.eu

RI Hellwig, Dirk/O-8617-2019; Hellwig, Dirk/A-4128-2008

OI Hellwig, Dirk/0000-0002-3056-0143; Kuhnigk,

Jan-Martin/0000-0001-9255-2993

CR Boellaard R, 2009, J NUCL MED, V50, p11S, DOI 10.2967/jnumed.108.057182

Czernin J, 2007, J NUCL MED, V48, p2S

Daou D, 2008, EUR J NUCL MED MOL I, V35, P1961, DOI 10.1007/s00259-008-0931-x

DICE LR, 1945, ECOLOGY, V26, P297, DOI 10.2307/1932409

Erdi YE, 2004, J NUCL MED, V45, P1287

Facey K, 2007, HEALTH TECHNOL ASSES, V11, P1

Fitton I, 2008, INT J RADIAT ONCOL, V70, P1403, DOI 10.1016/j.ijrobp.2007.08.063

Gietema HA, 2007, RADIOLOGY, V245, P888, DOI 10.1148/radiol.2452061054

Gilman MD, 2007, J COMPUT ASSIST TOMO, V31, P395, DOI 10.1097/01.rct.0000237817.18678.9c

Gilman MD, 2006, AM J ROENTGENOL, V187, P1357, DOI 10.2214/AJR.05.1427

Goerres GW, 2002, EUR J NUCL MED MOL I, V29, P351, DOI 10.1007/s00259-001-0710-4

Grgic A, 2009, INT J RADIAT ONCOL, V73, P103, DOI 10.1016/j.ijrobp.2008.03.063

Grgic A, 2010, EUR J NUCL MED MOL I, V37, P1087, DOI 10.1007/s00259-010-1387-3

Grgic A, 2009, J NUCL MED, V50, P1921, DOI 10.2967/jnumed.109.065649

Hellwig D, 2009, NUKLEARMED-NUCL MED, V48, P59, DOI 10.3413/nukmed-0217

Hellwig D, 2009, NUKLEARMEDIZIN, V48

Hicks RJ, 2009, J NUCL MED, V50, p31S, DOI 10.2967/jnumed.108.057216

Ireland RH, 2007, INT J RADIAT ONCOL, V68, P952, DOI 10.1016/j.ijrobp.2007.02.017

Krishnasetty V, 2005, RADIOLOGY, V237, P635, DOI 10.1148/radiol.2372041719

Kuhnigk JM, 2005, RADIOGRAPHICS, V25, P525, DOI 10.1148/rg.252045070

Liu C, 2009, PHYS MED BIOL, V54, P7345, DOI 10.1088/0031-9155/54/24/007

Liu HH, 2007, INT J RADIAT ONCOL, V68, P531, DOI 10.1016/j.ijrobp.2006.12.066

Lucignani G, 2009, EUR J NUCL MED MOL I, V36, P1520, DOI 10.1007/s00259-009-1214-x

Moreno A, 2008, COMPUT AIDED SURG, V13, P281, DOI 10.3109/10929080802431980

Nehmeh SA, 2004, MED PHYS, V31, P3179, DOI 10.1118/1.1809778

Nehmeh SA, 2008, SEMIN NUCL MED, V38, P167, DOI 10.1053/j.semnuclmed.2008.01.002

Nestle U, 2007, EUR J NUCL MED MOL I, V34, P453, DOI 10.1007/s00259-006-0252-x

Pietrzyk U, 2005, NUKLEARMED-NUCL MED, V44, pS13

Schaefer A, 2008, EUR J NUCL MED MOL I, V35, P1989, DOI 10.1007/s00259-008-0875-1

Shankar LK, 2006, J NUCL MED, V47, P1059

Slomka PJ, 2009, EUR J NUCL MED MOL I, V36, P44, DOI 10.1007/s00259-008-0941-8

Slomka PJ, 2003, J NUCL MED, V44, P1156

Tylski P, 2010, J NUCL MED, V51, P268, DOI 10.2967/jnumed.109.066241

Wahl RL, 2009, J NUCL MED, V50, p122S, DOI 10.2967/jnumed.108.057307

Weber WA, 2009, J NUCL MED, V50, p1S, DOI 10.2967/jnumed.108.057174

NR 35

TC 5

Z9 5

U1 0

U2 2

PU SPRINGER

PI NEW YORK

PA 233 SPRING ST, NEW YORK, NY 10013 USA

SN 1619-7070

EI 1619-7089

J9 EUR J NUCL MED MOL I

JI Eur. J. Nucl. Med. Mol. Imaging

PD MAY

PY 2011

VL 38

IS 5

BP 856

EP 864

DI 10.1007/s00259-010-1719-3

PG 9

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 745DH

UT WOS:000289144800008

PM 21258929

DA 2022-08-24

ER

PT J

AU Zhang, J

Jin, JB

Ai, Y

Zhu, KC

Xiao, CJ

Xie, CY

Jin, XC

AF Zhang, Ji

Jin, Juebin

Ai, Yao

Zhu, Kecheng

Xiao, Chengjian

Xie, Congying

Jin, Xiance

TI Computer Tomography Radiomics-Based Nomogram in the Survival Prediction

for Brain Metastases From Non-Small Cell Lung Cancer Underwent Whole

Brain Radiotherapy

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE brain metastasis; non-small cell lung cancer; whole brain radiotherapy;

overall survival; radiomics; nomogram

ID BIOMARKERS

AB Prognostic parameters and models were believed to be helpful in improving the treatment outcome for patients with brain metastasis (BM). The purpose of this study was to investigate the feasibility of computer tomography (CT) radiomics based nomogram to predict the survival of patients with BM from non-small cell lung cancer (NSCLC) treated with whole brain radiotherapy (WBRT). A total of 195 patients with BM from NSCLC who underwent WBRT from January 2012 to December 2016 were retrospectively reviewed. Radiomics features were extracted and selected from pretherapeutic CT images with least absolute shrinkage and selection operator (LASSO) regression. A nomogram was developed and evaluated by integrating radiomics features and clinical factors to predict the survival of individual patient. Five radiomics features were screened out from 105 radiomics features according to the LASSO Cox regression. According to the optimal cutoff value of radiomics score (Rad-score), patients were stratified into low-risk (Rad-score <= -0.14) and high-risk (Rad-score > -0.14) groups. Multivariable analysis indicated that sex, karnofsky performance score (KPS) and Rad-score were independent predictors for overall survival (OS). The concordance index (C-index) of the nomogram in the training cohort and validation cohort was 0.726 and 0.660, respectively. An area under curve (AUC) of 0.786 and 0.788 was achieved for the short-term and long-term survival prediction, respectively. In conclusion, the nomogram based on radiomics features from CT images and clinical factors was feasible to predict the OS of BM patients from NSCLC who underwent WBRT.

C1 [Zhang, Ji; Jin, Juebin; Ai, Yao; Zhu, Kecheng; Xiao, Chengjian; Xie, Congying; Jin, Xiance] Wenzhou Med Univ, Affiliated Hosp 1, Dept Radiotherapy Ctr, Wenzhou, Peoples R China.

[Xie, Congying] Wenzhou Med Univ, Affiliated Hosp 2, Dept Radiat & Med Oncol, Wenzhou, Peoples R China.

RP Xie, CY; Jin, XC (通讯作者)，Wenzhou Med Univ, Affiliated Hosp 1, Dept Radiotherapy Ctr, Wenzhou, Peoples R China.; Xie, CY (通讯作者)，Wenzhou Med Univ, Affiliated Hosp 2, Dept Radiat & Med Oncol, Wenzhou, Peoples R China.

EM wzxiecongying@163.com; jinxc1979@hotmail.com

FU Wenzhou Municipal Science and Technology Bureau [2018ZY016, H20180003];

National Natural Science Foundation of China [11675122]

FX This work was partially funded by the Wenzhou Municipal Science and

Technology Bureau (Nos. 2018ZY016 and H20180003) and National Natural

Science Foundation of China under Grant No. 11675122.

CR Barnholtz-Sloan JS, 2012, NEURO-ONCOLOGY, V14, P910, DOI 10.1093/neuonc/nos087

Brown PD, 2020, J CLIN ONCOL, V38, P1019, DOI 10.1200/JCO.19.02767

Cyll K, 2017, BRIT J CANCER, V117, P367, DOI 10.1038/bjc.2017.171

Della Seta M, 2019, ACTA RADIOL, V60, P1496, DOI 10.1177/0284185119831692

Diamandis EP, 2012, BMC MED, V10, DOI 10.1186/1741-7015-10-87

Gui CC, 2019, J NEURO-ONCOL, V144, P351, DOI 10.1007/s11060-019-03235-7

Huang CY, 2020, J NEURO-ONCOL, V146, P439, DOI 10.1007/s11060-019-03343-4

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Jamal-Hanjani M, 2015, CLIN CANCER RES, V21, P1258, DOI 10.1158/1078-0432.CCR-14-1429

Jenkinson MD, 2011, EUR J CANCER, V47, P649, DOI 10.1016/j.ejca.2010.11.033

Joshi R, 2016, CLIN NEUROL NEUROSUR, V147, P30, DOI 10.1016/j.clineuro.2016.05.001

Karami E, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-56185-5

Kniep HC, 2019, RADIOLOGY, V290, P479, DOI 10.1148/radiol.2018180946

Lagerwaard FJ, 1999, INT J RADIAT ONCOL, V43, P795, DOI 10.1016/S0360-3016(98)00442-8

Lee JM, 2010, ANN ONCOL, V21, P205, DOI 10.1093/annonc/mdq375

Liubota R., 2017, Experimental Oncology, V39, P75

Mulvenna P, 2016, LANCET, V388, P2004, DOI 10.1016/S0140-6736(16)30825-X

Nieder C, 2009, RADIAT ONCOL, V4, DOI 10.1186/1748-717X-4-10

Oh Y, 2009, CANCER, V115, P2930, DOI 10.1002/cncr.24333

Ostrom QT, 2015, NEURO-ONCOLOGY, V17, P1, DOI [10.1093/neuonc/nov189, 10.1093/neuonc/noaa200]

Park Y, 2015, J NEURO-ONCOL, V125, P377, DOI 10.1007/s11060-015-1926-7

Pietrantonio F, 2015, RADIOTHER ONCOL, V117, P315, DOI 10.1016/j.radonc.2015.08.023

Rades D, 2013, STRAHLENTHER ONKOL, V189, P996, DOI 10.1007/s00066-013-0442-y

Rades D, 2017, INT J GYNECOL CANCER, V27, P597, DOI 10.1097/IGC.0000000000000899

Schuette W, 2004, LUNG CANCER, V45, pS253, DOI 10.1016/j.lungcan.2004.07.967

Sehmisch L, 2017, ANTICANCER RES, V37, P249, DOI 10.21873/anticanres.11314

Silvestri GA, 2007, CHEST, V132, p178S, DOI 10.1378/chest.07-1360

SORENSEN JB, 1988, J CLIN ONCOL, V6, P1474, DOI 10.1200/JCO.1988.6.9.1474

Sperduto PW, 2008, INT J RADIAT ONCOL, V70, P510, DOI 10.1016/j.ijrobp.2007.06.074

Sperduto PW, 2010, INT J RADIAT ONCOL, V77, P655, DOI 10.1016/j.ijrobp.2009.08.025

Szopa W, 2017, BIOMED RES INT, V2017, DOI 10.1155/2017/8013575

Taimur Sadaf, 2003, Curr Oncol Rep, V5, P342, DOI 10.1007/s11912-003-0077-8

Tsao M, 2012, CANCER-AM CANCER SOC, V118, P2486, DOI 10.1002/cncr.26515

Yokoi K, 1999, CHEST, V115, P714, DOI 10.1378/chest.115.3.714

Zindler JD, 2017, RADIOTHER ONCOL, V123, P189, DOI 10.1016/j.radonc.2017.02.006

NR 35

TC 2

Z9 2

U1 1

U2 4

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD FEB 11

PY 2021

VL 10

AR 610691

DI 10.3389/fonc.2020.610691

PG 9

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA QL8UI

UT WOS:000621355600001

PM 33643912

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Fave, X

Zhang, LF

Yang, JZ

Mackin, D

Balter, P

Gomez, D

Followill, D

Jones, AK

Stingo, F

Liao, ZX

Mohan, R

Court, L

AF Fave, Xenia

Zhang, Lifei

Yang, Jinzhong

Mackin, Dennis

Balter, Peter

Gomez, Daniel

Followill, David

Jones, Aaron Kyle

Stingo, Francesco

Liao, Zhongxing

Mohan, Radhe

Court, Laurence

TI Delta-radiomics features for the prediction of patient outcomes in

non-small cell lung cancer

SO SCIENTIFIC REPORTS

LA English

DT Article

ID CT TEXTURE ANALYSIS; RESPONSE EVALUATION CRITERIA; COMPUTED-TOMOGRAPHY;

TUMOR HETEROGENEITY; SURVIVAL; RECIST; REPRODUCIBILITY; VALIDATION;

THERAPY; IMPACT

AB Radiomics is the use of quantitative imaging features extracted from medical images to characterize tumor pathology or heterogeneity. Features measured at pretreatment have successfully predicted patient outcomes in numerous cancer sites. This project was designed to determine whether radiomics features measured from non-small cell lung cancer (NSCLC) change during therapy and whether those features (delta-radiomics features) can improve prognostic models. Features were calculated from pretreatment and weekly intra-treatment computed tomography images for 107 patients with stage III NSCLC. Pretreatment images were used to determine feature-specific image preprocessing. Linear mixed-effects models were used to identify features that changed significantly with dose-fraction. Multivariate models were built for overall survival, distant metastases, and local recurrence using only clinical factors, clinical factors and pretreatment radiomics features, and clinical factors, pretreatment radiomics features, and delta-radiomics features. All of the radiomics features changed significantly during radiation therapy. For overall survival and distant metastases, pretreatment compactness improved the c-index. For local recurrence, pretreatment imaging features were not prognostic, while texture-strength measured at the end of treatment significantly stratified high-and low-risk patients. These results suggest radiomics features change due to radiation therapy and their values at the end of treatment may be indicators of tumor response.

C1 [Fave, Xenia; Zhang, Lifei; Yang, Jinzhong; Mackin, Dennis; Balter, Peter; Followill, David; Mohan, Radhe; Court, Laurence] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, 1515 Holcombe Blvd, Houston, TX 77030 USA.

[Fave, Xenia; Court, Laurence] Univ Texas Houston, Grad Sch Biomed Sci Houston, 6767 Bertner Ave, Houston, TX 77030 USA.

[Gomez, Daniel; Liao, Zhongxing] Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, 1515 Holcombe Blvd, Houston, TX 77030 USA.

[Jones, Aaron Kyle] Univ Texas MD Anderson Canc Ctr, Dept Imaging Phys, 1515 Holcombe Blvd, Houston, TX 77030 USA.

[Stingo, Francesco] Univ Florence, Dipartimento Stat Informat Applicaz G Parenti, Viale Morgagni 59, I-50134 Florence, Italy.

RP Fave, X (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, 1515 Holcombe Blvd, Houston, TX 77030 USA.; Fave, X (通讯作者)，Univ Texas Houston, Grad Sch Biomed Sci Houston, 6767 Bertner Ave, Houston, TX 77030 USA.

EM xjfave@mdanderson.org

RI Mackin, Dennis/Y-1503-2019; Stingo, Francesco/N-6514-2019

OI Stingo, Francesco/0000-0001-9150-8552; Court,

Laurence/0000-0002-3241-6145; Ray, Xenia/0000-0003-0150-0843; Yang,

Jinzhong/0000-0002-9254-4501

FU U.S.National Institutes of Health [5U19CA021239]; Cancer Prevention and

Research Institute of Texas [RP110562-P2]; NATIONAL CANCER INSTITUTE

[U19CA021239] Funding Source: NIH RePORTER

FX This project was funded in part by grant 5U19CA021239 from the U.S.

National Institutes of Health and by grant RP110562-P2 from the Cancer

Prevention and Research Institute of Texas. The authors would also like

to acknowledge Kathryn Hale for help with manuscript preparation.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

ANDERSON JR, 1983, J CLIN ONCOL, V1, P710, DOI 10.1200/JCO.1983.1.11.710

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Basu S, 2011, IEEE SYS MAN CYBERN, P1306, DOI 10.1109/ICSMC.2011.6083840

Bates D, 2015, J STAT SOFTW, V67, P1, DOI 10.18637/jss.v067.i01

BENJAMINI Y, 1995, J R STAT SOC B, V57, P289, DOI 10.1111/j.2517-6161.1995.tb02031.x

Carvalho S, 2016, RADIOTHER ONCOL, V118, pS20, DOI DOI 10.1016/S0167-8140(16)30042-1

Chalkidou A, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0124165

Chao KSC, 2007, INT J RADIAT ONCOL, V68, P1512, DOI 10.1016/j.ijrobp.2007.04.037

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Dafni U, 2011, CIRC-CARDIOVASC QUAL, V4, P363, DOI 10.1161/CIRCOUTCOMES.110.957951

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Fave X, 2016, TRANSL CANCER RES, V5, P349, DOI 10.21037/tcr.2016.07.11

Fave X, 2015, COMPUT MED IMAG GRAP, V44, P54, DOI 10.1016/j.compmedimag.2015.04.006

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Fushiki T, 2011, STAT COMPUT, V21, P137, DOI 10.1007/s11222-009-9153-8

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Ganeshan B, 2010, CANCER IMAGING, V10, P137, DOI 10.1102/1470-7330.2010.0021

Gevaert O, 2012, RADIOLOGY, V264, P387, DOI 10.1148/radiol.12111607

Goh V, 2011, RADIOLOGY, V261, P165, DOI 10.1148/radiol.11110264

HARALICK RM, 1979, P IEEE, V67, P786, DOI 10.1109/PROC.1979.11328

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

HARRELL FE, 1982, JAMA-J AM MED ASSOC, V247, P2543, DOI 10.1001/jama.247.18.2543

HILSENBECK SG, 1992, BREAST CANCER RES TR, V22, P197, DOI 10.1007/BF01840833

Hilsenbeck SG, 1996, STAT MED, V15, P103, DOI 10.1002/(SICI)1097-0258(19960115)15:1<103::AID-SIM156>3.0.CO;2-Y

Jaffe CC, 2006, J CLIN ONCOL, V24, P3245, DOI 10.1200/JCO.2006.06.5599

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Liu HH, 2007, INT J RADIAT ONCOL, V68, P531, DOI 10.1016/j.ijrobp.2006.12.066

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Miles KA, 2016, CANCER IMAGING, V16, DOI 10.1186/s40644-016-0065-5

Molina JR, 2008, MAYO CLIN PROC, V83, P584, DOI 10.4065/83.5.584

Nishino M, 2010, AM J ROENTGENOL, V195, pW221, DOI 10.2214/AJR.09.3928

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

R Core Team, 2019, R LANG ENV STAT COMP

Rao SX, 2016, UNITED EUR GASTROENT, V4, P257, DOI 10.1177/2050640615601603

Seppenwoolde Y, 2002, INT J RADIAT ONCOL, V53, P822, DOI 10.1016/S0360-3016(02)02803-1

Simon RM, 2011, BRIEF BIOINFORM, V12, P203, DOI 10.1093/bib/bbr001

The University of Texas MD Anderson Cancer Center, IM GUID AD CONF PHOT

Therneau T., 2015, SURVIVAL PACKAGE SUR

Tian F, 2015, ABDOM IMAGING, V40, P1705, DOI 10.1007/s00261-014-0318-3

Venables WN, 2002, MODERN APPL STAT S, DOI DOI 10.1007/978-0-387-21706-2

Wang H, 2005, INT J RADIAT ONCOL, V61, P725, DOI 10.1016/j.ijrobp.2004.07.677

Wang H, 2010, EUR J RADIOL, V74, P124, DOI 10.1016/j.ejrad.2009.01.024

Weiss GJ, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0100244

Wickham H, 2009, USE R, P1, DOI 10.1007/978-0-387-98141-3\_1

Win T, 2013, CLIN CANCER RES, V19, P3591, DOI 10.1158/1078-0432.CCR-12-1307

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

NR 52

TC 166

Z9 180

U1 2

U2 25

PU NATURE RESEARCH

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD APR 3

PY 2017

VL 7

AR 588

DI 10.1038/s41598-017-00665-z

PG 11

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA EQ5PV

UT WOS:000398136000001

PM 28373718

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Jiang, YQ

Gao, Q

Chen, H

Shi, XX

Wu, JB

Chen, Y

Zhang, Y

Pang, HW

Lin, S

AF Jiang, Yi-Qing

Gao, Qin

Chen, Han

Shi, Xiang-Xiang

Wu, Jing-Bo

Chen, Yue

Zhang, Yan

Pang, Hao-Wen

Lin, Sheng

TI Positron Emission Tomography-Based Short-Term Efficacy Evaluation and

Prediction in Patients With Non-Small Cell Lung Cancer Treated With

Hypo-Fractionated Radiotherapy

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE positron emission tomography; radiomics; non-small-cell lung cancer;

computed tomography; hypo-fractionated radiotherapy

ID STEREOTACTIC BODY RADIOTHERAPY; RESPONSE EVALUATION; METABOLIC BIOPSY;

FDG-PET; RADIOMICS; LESIONS; TOOL

AB Background

Positron emission tomography is known to provide more accurate estimates than computed tomography when staging non-small cell lung cancer. The aims of this prospective study were to contrast the short-term efficacy of the two imaging methods while evaluating the effects of hypo-fractionated radiotherapy in non-small cell lung cancer, and to establish a short-term efficacy prediction model based on the radiomics features of positron emission tomography.

Methods

This nonrandomized-controlled trial was conducted from March 2015 to June 2019. Thirty-one lesions of 30 patients underwent the delineation of the regions of interest on positron emission tomography and computed tomography 1 month before, and 3 months after hypo-fractionated radiotherapy. Each patient was evaluated for the differences in local objective response rate between the two images. The Kaplan Meier method was used to analyze the local objective response and subsequent survival duration of the two imaging methods. The 3D Slicer was used to extract the radiomics features based on positron emission tomography. Least absolute shrinkage and selection operator regression was used to eliminate redundant features, and logistic regression analysis was used to develop the curative-effect-predicting model, which was displayed through a radiomics nomogram. Receiver operating characteristic curve and decision curve were used to evaluate the accuracy and clinical usefulness of the prediction model.

Results

Positron emission tomography-based local objective response rate was significantly higher than that based on computed tomography [70.97% (22/31) and 12.90% (4/31), respectively (p<0.001)]. The mean survival time of responders and non-responders assessed by positron emission tomography was 28.6 months vs. 11.4 months (p=0.29), whereas that assessed by computed tomography was 24.5 months vs. 26 months (p=0.66), respectively. Three radiomics features were screened to establish a personalized prediction nomogram with high area under curve (0.94, 95% CI 0.85-0.99, p<0.001). The decision curve showed a high clinical value of the radiomics nomogram.

Conclusions

We recommend positron emission tomography for evaluating the short-term efficacy of hypo-fractionated radiotherapy in non-small cell lung cancer, and that the radiomics nomogram could be an important technique for the prediction of short-term efficacy, which might enable an improved and precise treatment.

Registration number/URL

ChiCTR1900027768/http://www.chictr.org.cn/showprojen.aspx?proj=46057

C1 [Jiang, Yi-Qing; Gao, Qin; Chen, Han; Shi, Xiang-Xiang; Wu, Jing-Bo; Pang, Hao-Wen; Lin, Sheng] Southwest Med Univ, Affiliated Hosp, Dept Oncol, Luzhou, Peoples R China.

[Chen, Yue; Zhang, Yan; Lin, Sheng] Southwest Med Univ, Nucl Med & Mol Imaging Key Lab Sichuan Prov, Affiliated Hosp, Luzhou, Peoples R China.

RP Pang, HW; Lin, S (通讯作者)，Southwest Med Univ, Affiliated Hosp, Dept Oncol, Luzhou, Peoples R China.; Lin, S (通讯作者)，Southwest Med Univ, Nucl Med & Mol Imaging Key Lab Sichuan Prov, Affiliated Hosp, Luzhou, Peoples R China.

EM haowenpang@foxmail.com; lslinsheng@163.com

FU National Natural Science Foundation of China [81201682]; Scientific

Research Foundation of the Luzhou Science and Technology Bureau

[2016LZXNYD-J05]; Southwest Medical University Foundation [201617]

FX This work was supported by the grants from the National Natural Science

Foundation of China (no. 81201682), the Scientific Research Foundation

of the Luzhou Science and Technology Bureau (no. 2016LZXNYD-J05), and

the Southwest Medical University Foundation (no. 201617).

CR Ahn HK, 2019, CLIN RADIOL, V74, P467, DOI 10.1016/j.crad.2019.02.008

Antunovic L, 2019, EUR J NUCL MED MOL I, V46, P1468, DOI 10.1007/s00259-019-04313-8

Babyak MA, 2004, PSYCHOSOM MED, V66, P411, DOI 10.1097/01.psy.0000127692.23278.a9

Baek S, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-53461-2

Balachandran VP, 2015, LANCET ONCOL, V16, pE173, DOI 10.1016/S1470-2045(14)71116-7

Beggs AD, 2002, EUR J NUCL MED MOL I, V29, P542, DOI 10.1007/s00259-001-0736-7

Birim O, 2006, EJSO-EUR J SURG ONC, V32, P12, DOI 10.1016/j.ejso.2005.10.001

Boellaard R, 2010, EUR J NUCL MED MOL I, V37, P181, DOI 10.1007/s00259-009-1297-4

Bradley J, 2012, INT J RADIAT ONCOL, V82, P435, DOI 10.1016/j.ijrobp.2010.09.033

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Chalkidou A, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0124165

Depeursinge A, 2020, ARXIV200605470

Detterbeck FC, 2017, CHEST, V151, P193, DOI 10.1016/j.chest.2016.10.010

Dunlap NE, 2012, INT J RADIAT ONCOL, V84, P1071, DOI 10.1016/j.ijrobp.2012.01.088

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Ettinger DS, 2014, J NATL COMPR CANC NE, V12, P1738, DOI 10.6004/jnccn.2014.0176

Fedorov A, 2012, MAGN RESON IMAGING, V30, P1323, DOI 10.1016/j.mri.2012.05.001

Fischer BM, 2006, LUNG CANCER, V54, P41, DOI 10.1016/j.lungcan.2006.06.012

Flechsig P, 2017, MOL IMAGING BIOL, V19, P315, DOI 10.1007/s11307-016-0996-z

Giannini V, 2019, EUR J NUCL MED MOL I, V46, P878, DOI 10.1007/s00259-018-4250-6

Gill AB, 2020, CANCERS, V12, DOI 10.3390/cancers12123493

Hain SF, 2001, EUR J NUCL MED, V28, P1336, DOI 10.1007/s002590100563

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Linda A, 2011, EUR J RADIOL, V79, P147, DOI 10.1016/j.ejrad.2009.10.029

Mac Manus MP, 2003, J CLIN ONCOL, V21, P1285, DOI 10.1200/JCO.2003.07.054

Ohri N, 2016, J NUCL MED, V57, P842, DOI 10.2967/jnumed.115.166934

Ouyang W, 2019, CANCER MED-US, V8, P4605, DOI 10.1002/cam4.2366

Pastis NJ, 2014, CHEST, V146, P406, DOI 10.1378/chest.13-2281

Peng H, 2019, CLIN CANCER RES, V25, P4271, DOI 10.1158/1078-0432.CCR-18-3065

Rajendran JG, 2006, CLIN CANCER RES, V12, P5435, DOI 10.1158/1078-0432.CCR-05-1773

Rundo L, 2017, COMPUT METH PROG BIO, V144, P77, DOI 10.1016/j.cmpb.2017.03.011

Takeda A, 2013, LUNG CANCER, V79, P248, DOI 10.1016/j.lungcan.2012.11.008

Tixier F, 2011, J NUCL MED, V52, P369, DOI 10.2967/jnumed.110.082404

Vesselle H, 2000, CLIN CANCER RES, V6, P3837

Xiang L, 2015, INT J RADIAT ONCOL, V92, P1027, DOI 10.1016/j.ijrobp.2015.04.019

Young H, 1999, EUR J CANCER, V35, P1773, DOI 10.1016/S0959-8049(99)00229-4

Yu W, 2018, INT J RADIAT ONCOL, V102, P1090, DOI 10.1016/j.ijrobp.2017.10.046

Yuan M, 2017, EUR RADIOL, V27, P4857, DOI 10.1007/s00330-017-4855-3

Zwanenburg A., 2016, IMAGE BIOMARKER STAN

Zwanenburg A, 2020, RADIOLOGY, V295, P328, DOI 10.1148/radiol.2020191145

NR 41

TC 1

Z9 1

U1 4

U2 7

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD FEB 25

PY 2021

VL 11

AR 590836

DI 10.3389/fonc.2021.590836

PG 10

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA QU5VI

UT WOS:000627349000001

PM 33718144

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Kawahara, D

Imano, N

Nishioka, R

Ogawa, K

Kimura, T

Nakashima, T

Iwamoto, H

Fujitaka, K

Hattori, N

Nagata, Y

AF Kawahara, Daisuke

Imano, Nobuki

Nishioka, Riku

Ogawa, Kouta

Kimura, Tomoki

Nakashima, Taku

Iwamoto, Hiroshi

Fujitaka, Kazunori

Hattori, Noboru

Nagata, Yasushi

TI Prediction of radiation pneumonitis after definitive radiotherapy for

locally advanced non-small cell lung cancer using multi-region radiomics

analysis

SO SCIENTIFIC REPORTS

LA English

DT Article

ID THERAPY; SELECTION

AB To predict grade >= 2 radiation pneumonitis (RP) in patients with locally advanced non-small cell lung cancer (NSCLC) using multi-region radiomics analysis. Data from 77 patients with NSCLC who underwent definitive radiotherapy between 2008 and 2018 were analyzed. Radiomic feature extraction from the whole lung (whole-lung radiomics analysis) and imaging- and dosimetric-based segmentation (multi-region radiomics analysis) were performed. Patients with RP grade >= 2 or < 2 were classified. Predictors were selected with least absolute shrinkage and selection operator logistic regression and the model was built with neural network classifiers. A total of 49,383 radiomics features per patient image were extracted from the radiotherapy planning computed tomography. We identified 4 features and 13 radiomics features in the whole-lung and multi-region radiomics analysis for classification, respectively. The accuracy and area under the curve (AUC) without the synthetic minority over-sampling technique (SMOTE) were 60.8%, and 0.62 for whole-lung and 80.1%, and 0.84 for multi-region radiomics analysis. These were improved 1.7% for whole-lung and 2.1% for multi-region radiomics analysis with the SMOTE. The developed multi-region radiomics analysis can help predict grade >= 2 RP. The radiomics features in the median- and high-dose regions, and the local intensity roughness and variation were important factors in predicting grade >= 2 RP.

C1 [Kawahara, Daisuke; Imano, Nobuki; Nagata, Yasushi] Hiroshima Univ, Grad Sch Biomed Hlth Sci, Dept Radiat Oncol, 1-3-2 Kagamiyama, Hiroshima 7348551, Japan.

[Nishioka, Riku] Hiroshima Univ, Grad Sch Biomed & Hlth Sci, Med & Dent Sci Course, Hiroshima, Japan.

[Ogawa, Kouta] Hiroshima Univ, Sch Med, Hiroshima, Japan.

[Kimura, Tomoki] Kochi Univ, Kochi Med Sch, Dept Radiol, Div Radiat Oncol, Kochi, Japan.

[Nakashima, Taku; Iwamoto, Hiroshi; Fujitaka, Kazunori; Hattori, Noboru] Hiroshima Univ, Grad Sch Biomed Hlth Sci, Dept Mol & Internal Med, Hiroshima, Japan.

[Nagata, Yasushi] Hiroshima High Precis Radiotherapy Canc Ctr, Hiroshima, Japan.

RP Kawahara, D (通讯作者)，Hiroshima Univ, Grad Sch Biomed Hlth Sci, Dept Radiat Oncol, 1-3-2 Kagamiyama, Hiroshima 7348551, Japan.

EM daika99@hiroshima-u.ac.jp

RI Nakashima, Taku/D-1517-2011

OI Nakashima, Taku/0000-0002-0035-674X

CR Allen AM, 2006, INT J RADIAT ONCOL, V65, P640, DOI 10.1016/j.ijrobp.2006.03.012

Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Blagus R, 2013, BMC BIOINFORMATICS, V14, DOI 10.1186/1471-2105-14-106

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Dang J, 2013, ACTA ONCOL, V52, P1175, DOI 10.3109/0284186X.2012.747696

Gierada DS, 2000, CHEST, V117, P991, DOI 10.1378/chest.117.4.991

Hao HX, 2018, PHYS MED BIOL, V63, DOI 10.1088/1361-6560/aabb5e

Imano N, 2019, J THORAC ONCOL, V14, pS635, DOI 10.1016/j.jtho.2019.08.1338

Jin HK, 2009, RADIOTHER ONCOL, V91, P427, DOI 10.1016/j.radonc.2008.09.009

Kickingereder P, 2016, RADIOLOGY, V281, P907, DOI 10.1148/radiol.2016161382

Krafft SP, 2018, MED PHYS, V45, P5317, DOI 10.1002/mp.13150

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Liang B, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00269

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

National Cancer Institute, COMMON TERMINOLOGY C

Nie P, 2020, CANCER IMAGING, V20, DOI 10.1186/s40644-020-00297-z

Park YW, 2019, EUR RADIOL, V29, P4068, DOI 10.1007/s00330-018-5830-3

Rice DC, 2007, INT J RADIAT ONCOL, V69, P350, DOI 10.1016/j.ijrobp.2007.03.011

Shi SM, 2017, TECHNOL CANCER RES T, V16, P316, DOI 10.1177/1533034616661665

Simone CB, 2017, SEMIN RADIAT ONCOL, V27, P370, DOI 10.1016/j.semradonc.2017.04.009

Sura S, 2008, RADIOTHER ONCOL, V87, P17, DOI 10.1016/j.radonc.2008.02.005

Tibshirani R, 2011, J R STAT SOC B, V73, P273, DOI 10.1111/j.1467-9868.2011.00771.x

Tucker SL, 2008, INT J RADIAT ONCOL, V72, P568, DOI 10.1016/j.ijrobp.2008.04.053

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Xie CY, 2019, EBIOMEDICINE, V44, P289, DOI 10.1016/j.ebiom.2019.05.023

Yao B, 2016, NIGER J CLIN PRACT, V19, P25, DOI 10.4103/1119-3077.173709

Yom SS, 2007, INT J RADIAT ONCOL, V68, P94, DOI 10.1016/j.ijrobp.2006.12.031

Zhang JX, 2013, LANCET ONCOL, V14, P1295, DOI 10.1016/S1470-2045(13)70491-1

NR 28

TC 1

Z9 1

U1 1

U2 5

PU NATURE PORTFOLIO

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD AUG 10

PY 2021

VL 11

IS 1

AR 16232

DI 10.1038/s41598-021-95643-x

PG 9

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA TY6PJ

UT WOS:000683904100015

PM 34376721

OA Green Submitted, gold, Green Published

DA 2022-08-24

ER

PT J

AU van Timmeren, JE

Leijenaar, RTH

van Elmpt, W

Reymen, B

Oberije, C

Monshouwer, R

Bussink, J

Brink, C

Hansen, O

Lambin, P

AF van Timmeren, Janna E.

Leijenaar, Ralph T. H.

van Elmpt, Wouter

Reymen, Bart

Oberije, Cary

Monshouwer, Rene

Bussink, Johan

Brink, Carsten

Hansen, Olfred

Lambin, Philippe

TI Survival prediction of non-small cell lung cancer patients using

radiomics analyses of cone-beam CT images

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Radiomics; Computed tomography; Cone-beam CT; Non-small cell lung

cancer; Survival prediction

ID COMPUTED-TOMOGRAPHY; RADIATION-THERAPY; PROGNOSTIC VALUE; TUMOR

PHENOTYPE; FEATURES; REPRODUCIBILITY; TEXTURE; CARCINOMA; RADIOTHERAPY;

VALIDATION

AB Background and purpose: In this study we investigated the interchangeability of planning CT and cone beam CT (CBCT) extracted radiomic features. Furthermore, a previously described CT based prognostic radiomic signature for non-small cell lung cancer (NSCLC) patients using CBCT based features was validated.

Material and methods: One training dataset of 132 and two validation datasets of 62 and 94 stage I-IV NSCLC patients were included. Interchangeability was assessed by performing a linear regression on CT and CBCT extracted features. A two-step correction was applied prior to model validation of a previously published radiomic signature.

Results: 13.3% (149 out of 1119) of the radiomic features, including all features of the previously published radiomic signature, showed an R-2 above 0.85 between intermodal imaging techniques. For the radiomic signature, Kaplan-Meier curves were significantly different between groups with high and low prognostic value for both modalities. Harrell's concordance index was 0.69 for CT and 0.66 for CBCT models for dataset 1.

Conclusions: The results show that a subset of radiomic features extracted from CT and CBCT images are interchangeable using simple linear regression. Moreover, a previously developed radiomics signature has prognostic value for overall survival in three CBCT cohorts, showing the potential of CBCT radiomics to be used as prognostic imaging biomarker. (C) 2017 The Authors. Published by Elsevier Ireland Ltd.

C1 [van Timmeren, Janna E.; Leijenaar, Ralph T. H.; van Elmpt, Wouter; Reymen, Bart; Oberije, Cary; Lambin, Philippe] Maastricht Univ, Med Ctr, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Maastricht, Netherlands.

[Monshouwer, Rene; Bussink, Johan] Radboud Univ Nijmegen, Med Ctr, Dept Radiat Oncol, Nijmegen, Netherlands.

[Brink, Carsten; Hansen, Olfred] Univ Southern Denmark, Inst Clin Res, Odense, Denmark.

[Brink, Carsten; Hansen, Olfred] Odense Univ Hosp, Lab Radiat Phys, Odense, Denmark.

[Hansen, Olfred] Odense Univ Hosp, Dept Oncol, Odense, Denmark.

RP van Timmeren, JE (通讯作者)，Maastricht Univ, Med Ctr, GROW Sch Oncol & Dev Biol, MAASTRO Clin,Dept Radiat Oncol, Dr Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

EM janita.vantimmeren@maastro.nl

RI Monshouwer, R./L-4527-2015; Bussink, Jan/N-3584-2014; Oberije,

Cary/ABA-6178-2020; van Timmeren, Janita/AAL-4456-2020; Hansen,

Olfred/D-1432-2012

OI Oberije, Cary/0000-0003-0749-5117; van Timmeren,

Janita/0000-0002-8166-6853; Hansen, Olfred/0000-0003-0396-1424; Bussink,

Johan/0000-0002-5751-4796; Brink, Carsten/0000-0003-3906-1962; Lambin,

Philippe/0000-0001-7961-0191

FU ERC [694812 - Hypoximmuno]; QuIC-ConCePT project; EFPI A companies

[115151]; Innovative Medicine Initiative Joint Undertaking (IMI JU)

[115151]; Dutch Technology Foundation STW [10696 DuCAT, P14-19 Radiomics

STRaTegy]; Technology Programme of the Ministry of Economic Affairs; EU

7th framework program (ARTFORCE) [257144]; EU 7th framework program

(REQUITE) [601826]; SME Phase 2 (EU) [673780 - RAIL]; European Program

H2020-2015-17 (BD2Decide) [PHC30-689715]; European Program H2020-2015-17

(ImmunoSABR) [733008]; Interreg V-A Euregio Meuse-Rhine

("Eura-diomics"); Kankeronderzoekfonds Limburg from Health Foundation

Limburg; Alpe d'HuZes-KWF (DESIGN); EUROSTARS (DART); Dutch Cancer

Society

FX This work was supported by the ERC advanced grant (ERC-ADG-2015, no

694812 - Hypoximmuno) and the QuIC-ConCePT project, which is partly

funded by EFPI A companies and the Innovative Medicine Initiative Joint

Undertaking (IMI JU) under Grant Agreement No. 115151. This research is

also supported by the Dutch Technology Foundation STW (grant no 10696

DuCAT & no P14-19 Radiomics STRaTegy), which is the applied science

division of NWO, and the Technology Programme of the Ministry of

Economic Affairs. Authors also acknowledge financial support from the EU

7th framework program (ARTFORCE - no 257144, REQUITE - no 601826), SME

Phase 2 (EU proposal 673780 - RAIL), the European Program H2020-2015-17

(BD2Decide - PHC30-689715 and ImmunoSABR - no 733008), Interreg V-A

Euregio Meuse-Rhine ("Eura-diomics"), Kankeronderzoekfonds Limburg from

the Health Foundation Limburg, Alpe d'HuZes-KWF (DESIGN), EUROSTARS

(DART) and the Dutch Cancer Society. Authors thank the contribution of

Anisha Gogineni for editing.

CR Aerts HJWL, 2016, SCI REP-UK, V6, DOI 10.1038/srep33860

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Antunes J, 2016, TRANSL ONCOL, V9, P155, DOI 10.1016/j.tranon.2016.01.008

Balagurunathan Y, 2014, J DIGIT IMAGING, V27, P805, DOI 10.1007/s10278-014-9716-x

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Bernchou U, 2015, RADIOTHER ONCOL, V117, P17, DOI 10.1016/j.radonc.2015.07.021

Bertelsen A, 2011, RADIOTHER ONCOL, V100, P351, DOI 10.1016/j.radonc.2011.08.012

Brink C, 2014, INT J RADIAT ONCOL, V89, P916, DOI 10.1016/j.ijrobp.2014.03.038

Cardiac CT, 2016, IMAGING DIAGNOSIS CA

Carvalho S, 2013, ACTA ONCOL, V52, P1398, DOI 10.3109/0284186X.2013.812795

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

Ferlay J, 2015, INT J CANCER, V136, pE359, DOI 10.1002/ijc.29210

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Jaffray DA, 2002, INT J RADIAT ONCOL, V53, P1337, DOI 10.1016/S0360-3016(02)02884-5

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2016, ADV DRUG DELIV REV

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lee S, 2015, J APPL CLIN MED PHYS, V16, P195, DOI 10.1120/jacmp.v16i6.5620

Leijenaar RTH, 2015, ACTA ONCOL, V54, P1423, DOI 10.3109/0284186X.2015.1061214

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Moteabbed M, 2015, MED PHYS, V42, P196, DOI 10.1118/1.4903292

Oberije C, 2015, INT J RADIAT ONCOL, V92, P935, DOI 10.1016/j.ijrobp.2015.02.048

Oberije C, 2014, RADIOTHER ONCOL, V112, P37, DOI 10.1016/j.radonc.2014.04.012

Royston P., 2013, BMC MED RES METHODOL, V13, p1

Torre LA, 2015, CA-CANCER J CLIN, V65, P87, DOI 10.3322/caac.21262

van Timmeren JE, 2017, DATA SURVIVAL PREDIC

Veiga C, 2014, MED PHYS, V41, DOI 10.1118/1.4864240

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

NR 35

TC 99

Z9 99

U1 0

U2 12

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD JUN

PY 2017

VL 123

IS 3

BP 363

EP 369

DI 10.1016/j.radonc.2017.04.016

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA EZ9IL

UT WOS:000405043400004

PM 28506693

OA hybrid, Green Published

DA 2022-08-24

ER

PT J

AU Chang, RS

Qi, SL

Yue, Y

Zhang, XY

Song, JD

Qian, W

AF Chang, Runsheng

Qi, Shouliang

Yue, Yong

Zhang, Xiaoye

Song, Jiangdian

Qian, Wei

TI Predictive Radiomic Models for the Chemotherapy Response in

Non-Small-Cell Lung Cancer based on Computerized-Tomography Images

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE lung cancer; radiomics; CT images; chemotherapy response; machine

learning

ID PHASE-III; RADIATION-THERAPY; HETEROGENEITY; CISPLATIN; SURVIVAL;

INFORMATION; TRIAL

AB The heterogeneity and complexity of non-small cell lung cancer (NSCLC) tumors mean that NSCLC patients at the same stage can have different chemotherapy prognoses. Accurate predictive models could recognize NSCLC patients likely to respond to chemotherapy so that they can be given personalized and effective treatment. We propose to identify predictive imaging biomarkers from pre-treatment CT images and construct a radiomic model that can predict the chemotherapy response in NSCLC. This single-center cohort study included 280 NSCLC patients who received first-line chemotherapy treatment. Non-contrast CT images were taken before and after the chemotherapy, and clinical information were collected. Based on the Response Evaluation Criteria in Solid Tumors and clinical criteria, the responses were classified into two categories: response (n = 145) and progression (n = 135), then all data were divided into two cohorts: training cohort (224 patients) and independent test cohort (56 patients). In total, 1629 features characterizing the tumor phenotype were extracted from a cube containing the tumor lesion cropped from the pre-chemotherapy CT images. After dimensionality reduction, predictive models of the chemotherapy response of NSCLC with different feature selection methods and different machine-learning classifiers (support vector machine, random forest, and logistic regression) were constructed. For the independent test cohort, the predictive model based on a random-forest classifier with 20 radiomic features achieved the best performance, with an accuracy of 85.7% and an area under the receiver operating characteristic curve of 0.941 (95% confidence interval, 0.898-0.982). Of the 20 selected features, four were first-order statistics of image intensity and the others were texture features. For nine features, there were significant differences between the response and progression groups (p < 0.001). In the response group, three features, indicating heterogeneity, were overrepresented and one feature indicating homogeneity was underrepresented. The proposed radiomic model with pre-chemotherapy CT features can predict the chemotherapy response of patients with non-small cell lung cancer. This radiomic model can help to stratify patients with NSCLC, thereby offering the prospect of better treatment.

C1 [Chang, Runsheng; Qi, Shouliang; Song, Jiangdian] Northeastern Univ, Coll Med & Biol Informat Engn, Shenyang, Peoples R China.

[Qi, Shouliang] Northeastern Univ, Key Lab Intelligent Comp Med Image, Minist Educ, Shenyang, Peoples R China.

[Yue, Yong] China Med Univ, Dept Radiol, Shengjing Hosp, Shenyang, Peoples R China.

[Zhang, Xiaoye] China Med Univ, Dept Oncol, Shengjing Hosp, Shenyang, Peoples R China.

[Qian, Wei] Univ Texas El Paso, Dept Elect & Comp Engn, El Paso, TX 79968 USA.

RP Qi, SL (通讯作者)，Northeastern Univ, Coll Med & Biol Informat Engn, Shenyang, Peoples R China.; Qi, SL (通讯作者)，Northeastern Univ, Key Lab Intelligent Comp Med Image, Minist Educ, Shenyang, Peoples R China.

EM qisl@bmie.neu.edu.cn

FU National Natural Science Foundation of China [82072008, 81671773,

61672146]; Fundamental Research Funds for the Central Universities

[N2124006-3]

FX This study was supported by the National Natural Science Foundation of

China (Grant number: 82072008, 81671773, 61672146) and the Fundamental

Research Funds for the Central Universities (Grant number: N2124006-3).

CR Aberle DR, 2011, NEW ENGL J MED, V365, P395, DOI 10.1056/NEJMoa1102873

Algohary A, 2020, CANCERS, V12, DOI 10.3390/cancers12082200

Avanzo M, 2017, PHYS MEDICA, V38, P122, DOI 10.1016/j.ejmp.2017.05.071

Bashir U, 2016, AM J ROENTGENOL, V207, P534, DOI 10.2214/AJR.15.15864

Braman NM, 2017, BREAST CANCER RES, V19, DOI 10.1186/s13058-017-0846-1

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Chen AT, 2020, I S BIOMED IMAGING, P678, DOI 10.1109/ISBI45749.2020.9098561

Chetan MR, 2021, EUR RADIOL, V31, P1049, DOI 10.1007/s00330-020-07141-9

Choy H, 2015, LUNG CANCER, V87, P232, DOI 10.1016/j.lungcan.2014.12.003

Deyiaene M, 2019, IEEE ENG MED BIO, P2580, DOI 10.1109/EMBC.2019.8856582

Dong D, 2020, ANN ONCOL, V31, P912, DOI 10.1016/j.annonc.2020.04.003

Dong D, 2019, ANN ONCOL, V30, P431, DOI 10.1093/annonc/mdz001

Ettinger DS, 2013, J NATL COMPR CANC NE, V11, P645, DOI 10.6004/jnccn.2013.0084

Fedorov A, 2012, MAGN RESON IMAGING, V30, P1323, DOI 10.1016/j.mri.2012.05.001

Gatsonis CA, 2011, RADIOLOGY, V258, P243, DOI 10.1148/radiol.10091808

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

Hosny A, 2018, PLOS MED, V15, DOI 10.1371/journal.pmed.1002711

Hosny A, 2018, NAT REV CANCER, V18, P500, DOI 10.1038/s41568-018-0016-5

Jamal-Hanjani M, 2017, NEW ENGL J MED, V376, P2109, DOI 10.1056/NEJMoa1616288

Junttila MR, 2013, NATURE, V501, P346, DOI 10.1038/nature12626

Khorrami M, 2019, RADIOL-ARTIF INTELL, V1, DOI 10.1148/ryai.2019180012

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Lou B, 2019, LANCET DIGIT HEALTH, V1, pE136, DOI 10.1016/S2589-7500(19)30058-5

O'Connor JPB, 2017, SEMIN CELL DEV BIOL, V64, P48, DOI 10.1016/j.semcdb.2016.10.001

O'Connor JPB, 2015, CLIN CANCER RES, V21, P249, DOI 10.1158/1078-0432.CCR-14-0990

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

Paul R, 2016, TOMOGRAPHY, V2, P388, DOI 10.18383/j.tom.2016.00211

Paz-Ares LG, 2013, J CLIN ONCOL, V31, P2895, DOI 10.1200/JCO.2012.47.1102

Peng HC, 2005, IEEE T PATTERN ANAL, V27, P1226, DOI 10.1109/TPAMI.2005.159

Rigatti Steven J, 2017, J Insur Med, V47, P31, DOI 10.17849/insm-47-01-31-39.1

Scagliotti GV, 2008, J CLIN ONCOL, V26, P3543, DOI 10.1200/JCO.2007.15.0375

Schiller JH, 2002, NEW ENGL J MED, V346, P92, DOI 10.1056/NEJMoa011954

Schwartz LH, 2016, EUR J CANCER, V62, P132, DOI 10.1016/j.ejca.2016.03.081

Seki S, 2020, MAGN RESON MED SCI, V19, P29, DOI 10.2463/mrms.mp.2018-0158

Senan S, 2016, J CLIN ONCOL, V34, P953, DOI 10.1200/JCO.2015.64.8824

Siegel RL, 2022, CA-CANCER J CLIN, V72, P7, DOI [10.3322/caac.21332, 10.3322/caac.21708, 10.3322/caac.21551]

Song JD, 2018, CLIN CANCER RES, V24, P3583, DOI 10.1158/1078-0432.CCR-17-2507

Torre LA, 2016, ADV EXP MED BIOL, V893, P1, DOI 10.1007/978-3-319-24223-1\_1

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Velazquez ER, 2017, CANCER RES, V77, P3922, DOI 10.1158/0008-5472.CAN-17-0122

Wang X, 2020, PHYS MED BIOL, V65, DOI 10.1088/1361-6560/ab6e51

Win T, 2013, CLIN CANCER RES, V19, P3591, DOI 10.1158/1078-0432.CCR-12-1307

Xu YW, 2019, CLIN CANCER RES, V25, P3266, DOI 10.1158/1078-0432.CCR-18-2495

Zhao XZ, 2018, INT J COMPUT ASS RAD, V13, P585, DOI 10.1007/s11548-017-1696-0

Zhao Zhujiang, 2010, J Biomed Biotechnol, V2010, P737535, DOI 10.1155/2010/737535

Zhou QF, 2016, KNOWL-BASED SYST, V95, P1, DOI 10.1016/j.knosys.2015.11.010

Zhou QF, 2014, MECH SYST SIGNAL PR, V46, P82, DOI 10.1016/j.ymssp.2013.12.013

NR 50

TC 5

Z9 5

U1 2

U2 3

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD JUL 7

PY 2021

VL 11

AR 646190

DI 10.3389/fonc.2021.646190

PG 13

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA TR5FI

UT WOS:000678989400001

PM 34307127

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Zarinshenas, R

Ladbury, C

McGee, H

Raz, D

Erhunmwunsee, L

Pathak, R

Glaser, S

Salgia, R

Williams, T

Amini, A

AF Zarinshenas, Reza

Ladbury, Colton

McGee, Heather

Raz, Dan

Erhunmwunsee, Loretta

Pathak, Ranjan

Glaser, Scott

Salgia, Ravi

Williams, Terence

Amini, Arya

TI Machine learning to refine prognostic and predictive nodal burden

thresholds for post-operative radiotherapy in completely resected stage

III-N2 non-small cell lung cancer

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Machine learning; Big data; NCDB; PORT; NSCLC

ID LYMPH-NODES; ADJUVANT CHEMOTHERAPY; RADIATION-THERAPY; SURVIVAL;

ASSOCIATION; NUMBER; IMPACT

AB Background: The role of post-operative radiotherapy (PORT) for completely resected N2 non-small-cell lung cancer (NSCLC) is controversial in light of recent randomized data. We sought to utilize machine learning to identify a subset of patients who may still benefit from PORT based on extent of nodal involvement. Materials/Methods: Patients with completely resected N2 NSCLC were identified in the National Cancer Database. We trained a machine-learning based model of overall survival (OS). SHapley Additive exPlanation (SHAP) values were used to identify prognostic and predictive thresholds of number of positive lymph nodes (LNs) involved and lymph node ratio (LNR). Cox proportional hazards regression was used for confirmatory analysis. Results: A total of 16,789 patients with completely resected N2 NSCLC were identified. Using the SHAP values, we identified thresholds of 3+ positive LNs and a LNR of 0.34+. On multivariate analysis, PORT was not significantly associated with OS (p = 0.111). However, on subset analysis of patients with 3+ positive LNs, PORT improved OS (HR: 0.91; 95% CI: 0.86-0.97; p = 0.002). On a separate subset analysis in patients with a LNR of 0.34+, PORT improved OS (HR: 0.90; 95% CI: 0.85-0.96; p = 0.001). Patients with 3+ positive lymph nodes had a 5-year OS of 38% with PORT compared to 31% without PORT. Patient with positive lymph node ratio 0.34+ had a 5-year OS of 38% with PORT compared to 29% without PORT. Conclusions: Patients with a high lymph node burden or lymph node ratio may present a subpopulation of patients who could benefit from PORT. To our knowledge, this is the first study to use machine learning algorithms to address this question with a large national dataset. These findings address an important question in the field of thoracic oncology and warrant further investigation in prospective studies.(c) 2022 Elsevier B.V. All rights reserved. Radiotherapy and Oncology 173 (2022) 10-18

C1 [Zarinshenas, Reza; Ladbury, Colton; McGee, Heather; Glaser, Scott; Williams, Terence; Amini, Arya] City Hope Natl Med Ctr, Dept Radiat Oncol, Ft Lauderdale, FL USA.

[Raz, Dan; Erhunmwunsee, Loretta] City Hope Natl Med Ctr, Dept Surg, Ft Lauderdale, FL USA.

[Erhunmwunsee, Loretta] City Hope Natl Med Ctr, Dept Populat Sci, Ft Lauderdale, FL USA.

[Pathak, Ranjan; Salgia, Ravi] City Hope Natl Med Ctr, Dept Med Oncol, Duarte, CA USA.

[Amini, Arya] City Hope Natl Med Ctr Radiat Oncol, 1500 E Duarte Rd, Duarte, CA 91010 USA.

RP Amini, A (通讯作者)，City Hope Natl Med Ctr Radiat Oncol, 1500 E Duarte Rd, Duarte, CA 91010 USA.

EM aamini@coh.org

CR Bilimoria KY, 2008, ANN SURG ONCOL, V15, P683, DOI 10.1245/s10434-007-9747-3

Billiet C, 2014, RADIOTHER ONCOL, V110, P3, DOI 10.1016/j.radonc.2013.08.011

Burdett S, 1998, LANCET, V352, P257

Corso CD, 2015, J THORAC ONCOL, V10, P148, DOI 10.1097/JTO.0000000000000406

Dai HH, 2011, ONCOLOGIST, V16, P641, DOI 10.1634/theoncologist.2010-0343

Douillard JY, 2008, INT J RADIAT ONCOL, V72, P695, DOI 10.1016/j.ijrobp.2008.01.044

Fukui T, 2006, J THORAC ONCOL, V1, P120, DOI 10.1097/01243894-200602000-00004

HARRELL FE, 1984, STAT MED, V3, P143, DOI 10.1002/sim.4780030207

HARRELL FE, 1982, JAMA-J AM MED ASSOC, V247, P2543, DOI 10.1001/jama.247.18.2543

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Hui ZG, 2021, JAMA ONCOL, V7, P1178, DOI 10.1001/jamaoncol.2021.1910

Hui ZG, 2015, THORAC CANCER, V6, P346, DOI 10.1111/1759-7714.12186

Lally BE, 2006, J CLIN ONCOL, V24, P2998, DOI 10.1200/JCO.2005.04.6110

Le Pechoux C, 2021, LANCET ONCOL

Lee JG, 2008, ANN THORAC SURG, V85, P211, DOI 10.1016/j.athoracsur.2007.08.020

Li R, 2020, JCO CLIN CANCER INFO, V4, P637, DOI 10.1200/CCI.20.00002

Lundberg SM, 2018, NAT BIOMED ENG, V2, P749, DOI 10.1038/s41551-018-0304-0

Matsuguma Haruhisa, 2008, Interact Cardiovasc Thorac Surg, V7, P573, DOI 10.1510/icvts.2007.174342

Mikell JL, 2015, J THORAC ONCOL, V10, P462, DOI 10.1097/JTO.0000000000000411

Moncada-Torres A, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-021-86327-7

Patel SH, 2014, LUNG CANCER, V84, P156, DOI 10.1016/j.lungcan.2014.02.016

Robinson CG, 2015, J CLIN ONCOL, V33, P870, DOI 10.1200/JCO.2014.58.5380

Sakib N, 2018, NUCL MED COMMUN, V39, P51, DOI 10.1097/MNM.0000000000000764

Shinde A, 2019, LUNG CANCER, V133, P136, DOI 10.1016/j.lungcan.2019.05.020

Suzuki K, 1999, J THORAC CARDIOV SUR, V118, P145, DOI 10.1016/S0022-5223(99)70153-4

Urban D, 2013, J THORAC ONCOL, V8, P940, DOI 10.1097/JTO.0b013e318292c53e

Wei SH, 2011, J THORAC ONCOL, V6, P310, DOI 10.1097/JTO.0b013e3181ff9b45

Xu YJ, 2018, ONCOL LETT, V15, P2641, DOI 10.3892/ol.2017.7601

NR 28

TC 0

Z9 0

U1 1

U2 1

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD AUG

PY 2022

VL 173

BP 10

EP 18

DI 10.1016/j.radonc.2022.05.019

PG 9

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA 1Z2XE

UT WOS:000808692500002

PM 35618098

DA 2022-08-24

ER

PT J

AU Krarup, MMK

Nygard, L

Vogelius, IR

Andersen, FL

Cook, G

Goh, V

Fischer, BM

AF Krarup, Marie Manon Krebs

Nygard, Lotte

Vogelius, Ivan Richter

Andersen, Flemming Littrup

Cook, Gary

Goh, Vicky

Fischer, Barbara Malene

TI Heterogeneity in tumours: Validating the use of radiomic features on

F-18-FDG PET/CT scans of lung cancer patients as a prognostic tool

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Positron Emission Tomography Computed; Tomography; Carcinoma, Non Small

Cell Lung; Prognosis; Texture features; Heterogeneity; Radiomics

ID TEXTURAL FEATURES; FDG-PET; ESOPHAGEAL CANCER; IMAGES; RECONSTRUCTION;

ASPHERICITY; IMPACT; VOLUME; QUANTIFICATION; PREDICTION

AB Aim: The aim was to validate promising radiomic features (RFs)(1) on F-18-flourodeoxyglucose positron emission tomography/computed tomography-scans (F-18-FDG PET/CT) of non-small cell lung cancer (NSCLC) patients undergoing definitive chemo-radiotherapy.

Methods: F-18-FDG PET/CT scans performed for radiotherapy (RT) planning were retrieved. Auto-segmentation with visual adaption was used to define the primary tumour on PET images. Six preselected prognostic and reproducible PET texture -and shape-features were calculated using texture respectively shape analysis. The correlation between these RFs and metabolic active tumour volume (MTV)(3), gross tumour volume (GTV)(4) and maximum and mean of standardized uptake value (SUV)(5) was tested with a Spearman's Rank test. The prognostic value of RFs was tested in a univariate cox regression analysis and a multivariate cox regression analysis with GTV, clinical stage and histology. P-value <= 0.05 were considered significant.

Results: Image analysis was performed for 233 patients: 145 males and 88 females, mean age of 65.7 and clinical stage II-IV. Mean GTV was 129.87 cm(3) (SD 130.30 cm(3)). Texture and shape-features correlated more strongly to MTV and GTV compared to SUV-measurements. Four RFs predicted PFS in the univariate analysis. No RFs predicted PFS in the multivariate analysis, whereas GTV and clinical stage predicted PFS (p = 0.001 and p = 0.008 respectively).

Conclusion: The pre-selected RFs were insignificant in predicting PFS in combination with GTV, clinical stage and histology. These results might be due to variations in technical parameters. However, it is relevant to question whether RFs are stable enough to provide clinically useful information. (C) 2019 Elsevier B.V. All rights reserved.

C1 [Krarup, Marie Manon Krebs; Andersen, Flemming Littrup; Fischer, Barbara Malene] Rigshosp, Dept Clin Physiol Nucl Med & PET, Copenhagen, Denmark.

[Nygard, Lotte; Vogelius, Ivan Richter] Rigshosp, Dept Oncol, Copenhagen, Denmark.

[Vogelius, Ivan Richter] Univ Copenhagen, Fac Hlth & Med Sci, Copenhagen, Denmark.

[Cook, Gary; Goh, Vicky; Fischer, Barbara Malene] Kings Coll London, St Thomas Hosp, Sch Biomed Engn & Imaging Sci, PET Ctr, Westminster Bridge Rd, London SE1 7EH, England.

RP Krarup, MMK (通讯作者)，Copenhagen Univ Hosp, Rigshosp, Dept Clin Physiol Nucl Med & PET, Copenhagen, Denmark.

EM marie.manon.krebs.krarup.01@regionh.dk; lotte.nygaard@regionh.dk;

ivan.richter.vogelius@regionh.dk; flemming.andersen@regionh.dk;

gary.cook@kcl.ac.uk; vicky.goh@kcl.ac.uk; malene.fischer@kcl.ac.uk

OI Krarup, Marie Manon Krebs/0000-0001-5670-3280; Vogelius, Ivan

Richter/0000-0002-8877-1218; Goh, Vicky/0000-0002-2321-8091; Andersen,

Flemming Littrup/0000-0003-2821-1849; Cook, Gary/0000-0002-8732-8134;

Fischer, Barbara Malene/0000-0002-6065-3375

FU Danish Capital Region; Scandinavian Society of Clinical Physiology and

Nuclear Medicine (SSCPNM)

FX The study was supported with funds from the Danish Capital Region,

(administered by the Department of Clinical Medicine, University of

Copenhagen) earmarked for research with an international focus. The

Scandinavian Society of Clinical Physiology and Nuclear Medicine

(SSCPNM) supported us with a travel grand. The sponsors had no

involvement in the study or in the decision to submit the article for

publication.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

[Anonymous], 2014, REV MAN REVMAN

[Anonymous], [No title captured]

[Anonymous], 2018, TEXTURE USER GUIDE L

Apostolova I, 2016, EUR J NUCL MED MOL I, V43, P2360, DOI 10.1007/s00259-016-3452-z

Apostolova I, 2014, BMC CANCER, V14, DOI 10.1186/1471-2407-14-896

Apostolova I, 2014, EUR RADIOL, V24, P2077, DOI 10.1007/s00330-014-3269-8

Bailly C, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0159984

Beukinga RJ, 2017, J NUCL MED, V58, P723, DOI 10.2967/jnumed.116.180299

Brooks FJ, 2014, J NUCL MED, V55, P37, DOI 10.2967/jnumed.112.116715

Chalkidou A, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0124165

Choi ER, 2016, ONCOTARGET, V7, P67302, DOI 10.18632/oncotarget.11693

Cook GJR, 2018, INT J RADIAT ONCOL, V102, P1083, DOI 10.1016/j.ijrobp.2017.12.268

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Davnall F, 2012, INSIGHTS IMAGING, V3, P573, DOI 10.1007/s13244-012-0196-6

Desseroit MC, 2016, EUR J NUCL MED MOL I, V43, P1477, DOI 10.1007/s00259-016-3325-5

Dong XZ, 2015, J MED IMAG RADIAT ON, V59, P338, DOI 10.1111/1754-9485.12289

Doumou G, 2015, EUR RADIOL, V25, P2805, DOI 10.1007/s00330-015-3681-8

Fried DV, 2016, RADIOLOGY, V278, P214, DOI 10.1148/radiol.2015142920

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Han S, 2018, ANN NUCL MED, V32, P602, DOI 10.1007/s12149-018-1281-9

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Hatt M, 2018, EUR J NUCL MED MOL I, V45, P630, DOI 10.1007/s00259-017-3865-3

Hatt M, 2017, EUR J NUCL MED MOL I, V44, P151, DOI 10.1007/s00259-016-3427-0

Hatt M, 2015, J NUCL MED, V56, P38, DOI 10.2967/jnumed.114.144055

Hatt M, 2013, EUR J NUCL MED MOL I, V40, P1662, DOI 10.1007/s00259-013-2486-8

Hatt M, 2011, EUR J NUCL MED MOL I, V38, P663, DOI 10.1007/s00259-010-1688-6

Hofheinz F, 2015, EUR J NUCL MED MOL I, V42, P429, DOI 10.1007/s00259-014-2953-x

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Larue RTHM, 2017, BRIT J RADIOL, V90, DOI 10.1259/bjr.20160665

Lasnon C, 2016, EUR J NUCL MED MOL I, V43, P2324, DOI 10.1007/s00259-016-3441-2

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Lemarignier C, 2017, EUR J NUCL MED MOL I, V44, P1145, DOI 10.1007/s00259-017-3641-4

Lovinfosse P, 2016, EUR J NUCL MED MOL I, V43, P1453, DOI 10.1007/s00259-016-3314-8

Nakajo M, 2017, EUR J NUCL MED MOL I, V44, P206, DOI 10.1007/s00259-016-3506-2

Nioche C, 2018, CANCER RES, V78, P4786, DOI 10.1158/0008-5472.CAN-18-0125

Nyflot MJ, 2015, J MED IMAGING, V2, DOI 10.1117/1.JMI.2.4.041002

Nygard L, 2016, RADIOTHER ONCOL, V118, P460, DOI 10.1016/j.radonc.2016.01.009

Orlhac F, 2018, J NUCL MED, V59, P1321, DOI 10.2967/jnumed.117.199935

Orlhac F, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0145063

Orlhac F, 2014, J NUCL MED, V55, P414, DOI 10.2967/jnumed.113.129858

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Pyka T, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0407-7

Reuze S, 2018, INT J RADIAT ONCOL, V102, P1117, DOI 10.1016/j.ijrobp.2018.05.022

Reuze S, 2017, ONCOTARGET, V8, P43169, DOI 10.18632/oncotarget.17856

Sollini M, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00426-y

TAYLOR R, 1990, J DIAGN MED SONOG, V6, P35, DOI 10.1177/875647939000600106

Tixier F, 2014, J NUCL MED, V55, P1235, DOI 10.2967/jnumed.113.133389

Tixier F, 2012, J NUCL MED, V53, P693, DOI 10.2967/jnumed.111.099127

van Velden FHP, 2016, MOL IMAGING BIOL, V18, P788, DOI 10.1007/s11307-016-0940-2

Yan JH, 2015, J NUCL MED, V56, P1667, DOI 10.2967/jnumed.115.156927

NR 53

TC 22

Z9 23

U1 2

U2 8

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD MAR

PY 2020

VL 144

BP 72

EP 78

DI 10.1016/j.radonc.2019.10.012

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA KU2GK

UT WOS:000519526500011

PM 31733491

DA 2022-08-24

ER

PT J

AU Yang, H

Wang, L

Shao, GL

Dong, BQ

Wang, F

Wei, YG

Li, P

Chen, HY

Chen, WJ

Zheng, Y

He, YW

Zhao, YK

Du, XH

Sun, XJ

Wang, Z

Wang, YZ

Zhou, X

Lai, XJ

Feng, W

Shen, LM

Qiu, GQ

Ji, YL

Chen, JX

Jiang, YH

Liu, JS

Zeng, J

Wang, CC

Zhao, Q

Yang, X

Hu, X

Ma, HL

Chen, QX

Chen, M

Jiang, HT

Xu, YJ

AF Yang, Hong

Wang, Lin

Shao, Guoliang

Dong, Baiqiang

Wang, Fang

Wei, Yuguo

Li, Pu

Chen, Haiyan

Chen, Wujie

Zheng, Yao

He, Yiwei

Zhao, Yankun

Du, Xianghui

Sun, Xiaojiang

Wang, Zhun

Wang, Yuezhen

Zhou, Xia

Lai, Xiaojing

Feng, Wei

Shen, Liming

Qiu, Guoqing

Ji, Yongling

Chen, Jianxiang

Jiang, Youhua

Liu, Jinshi

Zeng, Jian

Wang, Changchun

Zhao, Qiang

Yang, Xun

Hu, Xiao

Ma, Honglian

Chen, Qixun

Chen, Ming

Jiang, Haitao

Xu, Yujin

TI A combined predictive model based on radiomics features and clinical

factors for disease progression in early-stage non-small cell lung

cancer treated with stereotactic ablative radiotherapy

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE non-small cell lung cancer; stereotactic ablative radiotherapy;

progression; radiomics; predictive model

ID BODY RADIATION-THERAPY; PHASE-II TRIAL; LOCAL RECURRENCE; OUTCOMES;

SURVIVAL; SURGERY; SABR; SBRT

AB PurposeTo accurately assess disease progression after Stereotactic Ablative Radiotherapy (SABR) of early-stage Non-Small Cell Lung Cancer (NSCLC), a combined predictive model based on pre-treatment CT radiomics features and clinical factors was established. MethodsThis study retrospectively analyzed the data of 96 patients with early-stage NSCLC treated with SABR. Clinical factors included general information (e.g. gender, age, KPS, Charlson score, lung function, smoking status), pre-treatment lesion status (e.g. diameter, location, pathological type, T stage), radiation parameters (biological effective dose, BED), the type of peritumoral radiation-induced lung injury (RILI). Independent risk factors were screened by logistic regression analysis. Radiomics features were extracted from pre-treatment CT. The minimum Redundancy Maximum Relevance (mRMR) and the Least Absolute Shrinkage and Selection Operator (LASSO) were adopted for the dimensionality reduction and feature selection. According to the weight coefficient of the features, the Radscore was calculated, and the radiomics model was constructed. Multiple logistic regression analysis was applied to establish the combined model based on radiomics features and clinical factors. Receiver Operating Characteristic (ROC) curve, DeLong test, Hosmer-Lemeshow test, and Decision Curve Analysis (DCA) were used to evaluate the model's diagnostic efficiency and clinical practicability. ResultsWith the median follow-up of 59.1 months, 29 patients developed progression and 67 remained good controlled within two years. Among the clinical factors, the type of peritumoral RILI was the only independent risk factor for progression (P< 0.05). Eleven features were selected from 1781 features to construct a radiomics model. For predicting disease progression after SABR, the Area Under the Curve (AUC) of training and validation cohorts in the radiomics model was 0.88 (95%CI 0.80-0.96) and 0.80 (95%CI 0.62-0.98), and AUC of training and validation cohorts in the combined model were 0.88 (95%CI 0.81-0.96) and 0.81 (95%CI 0.62-0.99). Both the radiomics and the combined models have good prediction efficiency in the training and validation cohorts. Still, DeLong test shows that there is no difference between them. ConclusionsCompared with the clinical model, the radiomics model and the combined model can better predict the disease progression of early-stage NSCLC after SABR, which might contribute to individualized follow-up plans and treatment strategies.

C1 [Yang, Hong; Shao, Guoliang; Wang, Fang; Chen, Haiyan; Chen, Wujie; Zheng, Yao; He, Yiwei; Zhao, Yankun; Jiang, Haitao] Univ Chinese Acad Sci, Canc Hosp, Zhejiang Canc Hosp, Inst Basic Med & Canc IBMC,Dept Radiol,Chinese Aca, Hangzhou, Peoples R China.

[Wang, Lin] Shaoxing Univ, Sch Med, Shaoxing, Peoples R China.

[Dong, Baiqiang; Chen, Ming] Sun Yat sen Univ, Collaborat Innovat Ctr Canc Med, Canc Ctr, Dept Radiat Oncol,tate Key Lab Oncol South China,, Guangzhou, Peoples R China.

[Wei, Yuguo] Precis Hlth Inst, Gen Elect GE Healthcare, Hangzhou, Peoples R China.

[Li, Pu] Univ Chinese Acad Sci, Canc Hosp, Zhejiang Canc Hosp, Inst Basic Med & Canc IBMC,Dept Radiat Phys,Chines, Hangzhou, Peoples R China.

[Du, Xianghui; Sun, Xiaojiang; Wang, Zhun; Wang, Yuezhen; Zhou, Xia; Lai, Xiaojing; Feng, Wei; Shen, Liming; Qiu, Guoqing; Ji, Yongling; Chen, Jianxiang; Hu, Xiao; Ma, Honglian; Xu, Yujin] Univ Chinese Acad Sci, Canc Hosp, Zhejiang Canc Hosp, Inst Basic Med & Canc IBMC,Chinese Acad Sci,Dept, Hangzhou, Peoples R China.

[Jiang, Youhua; Liu, Jinshi; Zeng, Jian; Wang, Changchun; Zhao, Qiang; Yang, Xun; Chen, Qixun] Univ Chinese Acad Sci, Canc Hosp, Zhejiang Canc Hosp, Inst Basic Med & Canc IBMC,Chinese Acad Sci,Dept T, Hangzhou, Peoples R China.

RP Jiang, HT (通讯作者)，Univ Chinese Acad Sci, Canc Hosp, Zhejiang Canc Hosp, Inst Basic Med & Canc IBMC,Dept Radiol,Chinese Aca, Hangzhou, Peoples R China.; Xu, YJ (通讯作者)，Univ Chinese Acad Sci, Canc Hosp, Zhejiang Canc Hosp, Inst Basic Med & Canc IBMC,Chinese Acad Sci,Dept, Hangzhou, Peoples R China.

EM jianght@zjcc.org.cn; xuyj@zjcc.org.cn

FU Medical and Health Research Project of Zhejiang Province; Beijing Xisike

Clinical Oncology Research Foundation; Beijing Science and Technology

Innovation Medical Development Foundation; [2020KY486]; [2020KY079];

[Y-2019AZMS-0061]; [KC2021-JX-0186-63]

FX Funding This study was supported by grants from Medical and Health

Research Project of Zhejiang Province (Grant Number: 2020KY486 ;

2020KY079); Beijing Xisike Clinical Oncology Research Foundation

(Y-2019AZMS-0061); and Beijing Science and Technology Innovation Medical

Development Foundation (KC2021-JX-0186-63).

CR Abel S, 2019, LUNG CANCER, V128, P127, DOI 10.1016/j.lungcan.2018.12.022

Ardakani AA, 2022, COMPUT METH PROG BIO, V215, DOI 10.1016/j.cmpb.2021.106609

Avanzo M, 2017, PHYS MEDICA, V38, P122, DOI 10.1016/j.ejmp.2017.05.071

Baumann P, 2009, J CLIN ONCOL, V27, P3290, DOI 10.1200/JCO.2008.21.5681

Bhatt AD, 2015, AM J CLIN ONCOL-CANC, V38, P41, DOI 10.1097/COC.0b013e318287bd7f

Chang JY, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-152

Chicas-Sett R, 2019, INT J MOL SCI, V20, DOI 10.3390/ijms20092173

Dahele M, 2011, J THORAC ONCOL, V6, P1221, DOI 10.1097/JTO.0b013e318219aac5

Grills IS, 2010, J CLIN ONCOL, V28, P928, DOI 10.1200/JCO.2009.25.0928

Grills IS, 2012, J THORAC ONCOL, V7, P1382, DOI 10.1097/JTO.0b013e318260e00d

Halpenny D, 2015, CLIN IMAG, V39, P254, DOI 10.1016/j.clinimag.2014.12.005

Huang K, 2012, RADIOTHER ONCOL, V102, P335, DOI 10.1016/j.radonc.2011.12.018

Kadoya N, 2020, MED PHYS, V47, P2197, DOI 10.1002/mp.14104

Kang JJ, 2020, INT J RADIAT ONCOL, V106, P90, DOI 10.1016/j.ijrobp.2019.09.037

Kato S, 2010, JPN J RADIOL, V28, P259, DOI 10.1007/s11604-009-0415-3

Klement RJ, 2014, INT J RADIAT ONCOL, V88, P732, DOI 10.1016/j.ijrobp.2013.11.216

Lafata KJ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf5a5

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

Limkin EJ, 2017, ANN ONCOL, V28, P1191, DOI 10.1093/annonc/mdx034

Liu J, 2019, MED PHYS, V46, P3091, DOI 10.1002/mp.13551

Luo LM, 2022, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.819047

Ma LF, 2016, THORAC CANCER, V7, P442, DOI 10.1111/1759-7714.12352

Onishi H, 2004, CANCER-AM CANCER SOC, V101, P1623, DOI 10.1002/cncr.20539

Palma DA, 2011, INT J RADIAT ONCOL, V80, P506, DOI 10.1016/j.ijrobp.2010.02.032

Rossi G, 2021, CANCER RES, V81, P724, DOI 10.1158/0008-5472.CAN-20-0999

Scott WJ, 2007, CHEST, V132, p234S, DOI 10.1378/chest.07-1378

Senthi S, 2012, LANCET ONCOL, V13, P802, DOI 10.1016/S1470-2045(12)70242-5

Sung H, 2021, CA-CANCER J CLIN, V71, P209, DOI 10.3322/caac.21660

Timmerman RD, 2014, INT J RADIAT ONCOL, V90, pS30, DOI 10.1016/j.ijrobp.2014.05.135

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

van Timmeren JE, 2019, RADIOTHER ONCOL, V136, P78, DOI 10.1016/j.radonc.2019.03.032

Yang Y, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.746785

Zheng XP, 2014, INT J RADIAT ONCOL, V90, P603, DOI 10.1016/j.ijrobp.2014.05.055

NR 34

TC 0

Z9 0

U1 0

U2 0

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD AUG 2

PY 2022

VL 12

AR 967360

DI 10.3389/fonc.2022.967360

PG 13

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA 3U6AW

UT WOS:000841052800001

PM 35982975

OA Green Accepted, gold

DA 2022-08-24

ER

PT J

AU Moran, A

Wang, YC

Dyer, BA

Yip, SSF

Daly, ME

Yamamoto, T

AF Moran, Angel

Wang, Yichuan

Dyer, Brandon A.

Yip, Stephen S. F.

Daly, Megan E.

Yamamoto, Tokihiro

TI Prognostic Value of Computed Tomography and/or F-18-Fluorodeoxyglucose

Positron Emission Tomography Radiomics Features in Locally Advanced

Non-small Cell Lung Cancer

SO CLINICAL LUNG CANCER

LA English

DT Article

DE Carcinoma; Chemoradiotherapy; Imaging; Survival analysis; Texture

features

ID STANDARDIZED UPTAKE VALUES; FDG-PET; TEXTURAL FEATURES; TUMOR

CHARACTERISTICS; F-18-FDG PET; RADIOTHERAPY; HETEROGENEITY; PREDICTION;

RECONSTRUCTION; ACQUISITION

AB We compared the prognostic value of computed tomography (CT) and F-18-fluorodeoxyglucose positron emission tomography (PET) radiomics features for patients with locally advanced non-small cell lung cancer treated with chemoradiotherapy. This 39-patient study demonstrated that adding PET radiomics features to conventional factors significantly improved the prognostic value versus conventional factors alone; adding CT radiomics features did not improve accuracy.

Introduction: We investigated whether adding computed tomography (CT) and/or F-18-fluorodeoxyglucose (F-18-FDG) PET radiomics features to conventional prognostic factors (CPFs) improves prognostic value in locally advanced nonsmall cell lung cancer (NSCLC). Materials and Methods: We retrospectively identified 39 cases with stage III NSCLC who received chemoradiotherapy and underwent planning CT and staging F-18-FDG PET scans. Seven CPFs were recorded. Feature selection was performed on 48 CT and 49 PET extracted radiomics features. A penalized multivariate Cox proportional hazards model was used to generate models for overall survival based on CPFs alone, CPFs with CT features, CPFs with PET features, and CPFs with CT and PET features. Linear predictors generated and categorized into 2 risk groups for which Kaplan-Meier survival cur ves were calculated. A log-rank test was performed to quantify the discrimination between the groups and calculated the Harrell's C-index to quantify the discriminatory power. A likelihood ratio test was performed to determine whether adding CT and/or PET features to CPFs improved model performance. Results: All 4 models significantly discriminated between the 2 risk groups. The discriminatory power was significantly increased when CPFs were combined with PET features (C-index 0.82; likelihood ratio test P<.01) or with both CT and PET features (0.83; P<.01) compared with CPFs alone (0.68). There was no significant improvement when CPFs were combined with CT features (0.68). Conclusion: Adding PET radiomics features to CPFs yielded a significant improvement in the prognostic value in locally advanced NSCLC; adding CT features did not. (C) 2021 Elsevier Inc. All rights reserved.

C1 [Moran, Angel; Daly, Megan E.; Yamamoto, Tokihiro] Univ Calif Davis, Sch Med, Dept Radiat Oncol, 4501 X St, Sacramento, CA 95817 USA.

[Wang, Yichuan] Univ Calif Davis, Dept Stat, Davis, CA 95616 USA.

[Dyer, Brandon A.] Univ Washington, Sch Med, Dept Radiat Oncol, Seattle, WA USA.

[Yip, Stephen S. F.] AIQ Solut Inc, Madison, WI USA.

RP Yamamoto, T (通讯作者)，Univ Calif Davis, Sch Med, Dept Radiat Oncol, 4501 X St, Sacramento, CA 95817 USA.

EM toyamamoto@ucdavis.edu

FU Radiological Society of North America (RSNA) Research Medical Student

Grant; National Institutes of Health (NIH)/National Cancer Institute

(NCI) [K12 CA138464]; NIH/National Center for Advancing Translational

Sciences [UL1 TR001860]

FX This study was supported in part by the Radiological Society of North

America (RSNA) Research Medical Student Grant (A.M.), National

Institutes of Health (NIH)/National Cancer Institute (NCI) grant K12

CA138464 (M.E.D), and NIH/National Center for Advancing Translational

Sciences grant UL1 TR001860.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

Berghmans T, 2008, J THORAC ONCOL, V3, P6, DOI 10.1097/JTO.0b013e31815e6d6b

Berghmans Thierry, 2011, Ther Adv Med Oncol, V3, P127, DOI 10.1177/1758834011401951

Boellaard R, 2009, J NUCL MED, V50, p11S, DOI 10.2967/jnumed.108.057182

Bogowicz M, 2017, ACTA ONCOL, V56, P1531, DOI 10.1080/0284186X.2017.1346382

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Brooks FJ, 2013, RADIAT ONCOL, V8, DOI 10.1186/1748-717X-8-294

Brooks FJ, 2011, RADIAT ONCOL, V6, DOI 10.1186/1748-717X-6-69

Chicklore S, 2013, EUR J NUCL MED MOL I, V40, P133, DOI 10.1007/s00259-012-2247-0

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Dong XZ, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0157836

Fang YHD, 2014, BIOMED RES INT, V2014, DOI 10.1155/2014/248505

Fried DV, 2016, RADIOLOGY, V278, P214, DOI 10.1148/radiol.2015142920

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Gould MK, 2003, ANN INTERN MED, V139, P879, DOI 10.7326/0003-4819-139-11-200311180-00013

Groheux D, 2015, EUR J NUCL MED MOL I, V42, P1682, DOI 10.1007/s00259-015-3110-x

Grove O, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0118261

Hatt M, 2017, EUR J NUCL MED MOL I, V44, P151, DOI 10.1007/s00259-016-3427-0

Jeraj R, 2015, J NUCL MED, V56, P1752, DOI 10.2967/jnumed.114.141424

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

LECHEVALIER T, 1991, JNCI-J NATL CANCER I, V83, P417, DOI 10.1093/jnci/83.6.417

Lemarignier C, 2017, EUR J NUCL MED MOL I, V44, P1145, DOI 10.1007/s00259-017-3641-4

LOWE VJ, 1995, J NUCL MED, V36, P883

O'Rourke N, 2010, COCHRANE DB SYST REV, DOI 10.1002/14651858.CD002140.pub3

PEREZ CA, 1987, CANCER, V59, P1874, DOI 10.1002/1097-0142(19870601)59:11<1874::AID-CNCR2820591106>3.0.CO;2-Z

Siegel RL., 2020, CA-CANCER J CLIN, V70, P7, DOI [DOI 10.3322/caac.21551, 10.3322/caac.21590]

Silvestri GA, 2007, CHEST, V132, p178S, DOI 10.1378/chest.07-1360

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

Wahl RL, 2009, J NUCL MED, V50, p122S, DOI 10.2967/jnumed.108.057307

Westerterp M, 2007, EUR J NUCL MED MOL I, V34, P392, DOI 10.1007/s00259-006-0224-1

Yip S, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0115510

Yip SSF, 2016, PHYS MED BIOL, V61, pR150, DOI 10.1088/0031-9155/61/13/R150

ZASADNY KR, 1993, RADIOLOGY, V189, P847, DOI 10.1148/radiology.189.3.8234714

NR 39

TC 1

Z9 1

U1 0

U2 0

PU CIG MEDIA GROUP, LP

PI DALLAS

PA 3500 MAPLE AVENUE, STE 750, DALLAS, TX 75219-3931 USA

SN 1525-7304

EI 1938-0690

J9 CLIN LUNG CANCER

JI Clin. Lung Cancer

PD SEP

PY 2021

VL 22

IS 5

BP 461

EP 468

DI 10.1016/j.cllc.2021.03.015

EA SEP 2021

PG 8

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA XN1VD

UT WOS:000729299500010

DA 2022-08-24

ER

PT J

AU Luo, Y

El Naqa, I

McShan, DL

Ray, D

Lohse, I

Matuszak, MM

Owen, D

Jolly, S

Lawrence, TS

Kong, FM

Ten Haken, RK

AF Luo, Yi

El Naqa, Issam

McShan, Daniel L.

Ray, Dipankar

Lohse, Ines

Matuszak, Martha M.

Owen, Dawn

Jolly, Shruti

Lawrence, Theodore S.

Kong, Feng-Ming (Spring)

Ten Haken, Randall K.

TI Unraveling biophysical interactions of radiation pneumonitis in

non-small-cell lung cancer via Bayesian network analysis

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Lung cancer; Radiation pneumonitis; Bayesian network analysis;

Biophysical interactions

ID BREAST-CANCER; RISK; THERAPY; RADIOTHERAPY; MICROARRAY; EXPRESSION;

PREDICTION; PARAMETERS; RESPONSES; TOXICITY

AB Background: In non-small-cell lung cancer radiotherapy, radiation pneumonitis >= grade 2 (RP2) depends on patients' dosimetric, clinical, biological and genomic characteristics.

Methods: We developed a Bayesian network (BN) approach to explore its potential for interpreting biophysical signaling pathways influencing RP2 from a heterogeneous dataset including single nucleotide polymorphisms, micro RNAs, cytokines, clinical data, and radiation treatment plans before and during the course of radiotherapy. Model building utilized 79 patients (21 with RP2) with complete data, and model testing used 50 additional patients with incomplete data. A developed large-scale Markov blanket approach selected relevant predictors. Resampling by k-fold cross-validation determined the optimal BN structure. Area under the receiver-operating characteristics curve (AUC) measured performance.

Results: Pre- and during-treatment BNs identified biophysical signaling pathways from the patients' relevant variables to RP2 risk. Internal cross-validation for the pre-BN yielded an AUC = 0.82 which improved to 0.87 by incorporating during treatment changes. In the testing dataset, the pre- and during AUCs were 0.78 and 0.82, respectively.

Conclusions: Our developed BN approach successfully handled a high number of heterogeneous variables in a small dataset, demonstrating potential for unraveling relevant biophysical features that could enhance prediction of RP2, although the current observations would require further independent validation. (C) 2017 Elsevier B.V. All rights reserved.

C1 [Luo, Yi; El Naqa, Issam; McShan, Daniel L.; Ray, Dipankar; Lohse, Ines; Matuszak, Martha M.; Owen, Dawn; Jolly, Shruti; Lawrence, Theodore S.; Ten Haken, Randall K.] Univ Michigan, Dept Radiat Oncol, UH B2C432,SPC 5010,1500 East Med Ctr Dr, Ann Arbor, MI 48109 USA.

[Kong, Feng-Ming (Spring)] Indiana Univ, Dept Radiat Oncol, Indianapolis, IN 46204 USA.

RP Ten Haken, RK (通讯作者)，Univ Michigan, Dept Radiat Oncol, UH B2C432,SPC 5010,1500 East Med Ctr Dr, Ann Arbor, MI 48109 USA.

EM rth@med.umich.edu

RI Kong, Feng-Ming/Y-2825-2019; Naqa, Issam El/T-3066-2019

OI Kong, Feng-Ming/0000-0003-2652-098X; Naqa, Issam El/0000-0001-6023-1132;

Luo, Yi/0000-0003-2519-5900; Ten Haken, Randall/0000-0003-1331-0297

FU National Institutes of Health [P01 CA059827, R01 CA142840]; NATIONAL

CANCER INSTITUTE [P01CA059827, R01CA142840] Funding Source: NIH RePORTER

FX This work was supported by the National Institutes of Health [grant

numbers P01 CA059827, R01 CA142840]. The authors wish to thank Paul

Stanton, Nan Bi, MD, PhD, and Weili Wang MD, PhD for their work in

processing the cytokine, miRNA and SNP data. This work was presented in

part at ICTR-PHE 2016, 15-19 February 2016, CICG, Geneva, Switzerland.

CR Agrawal S, 2014, SOUTH ASIAN J CANCER, V3, P13, DOI 10.4103/2278-330X.126503

Aliferis Constantin F., 2003, AMIA ANN S P

Baumann M, 2016, NAT REV CANCER, V16, P234, DOI 10.1038/nrc.2016.18

Bentzen SM, 2000, ACTA ONCOL, V39, P337, DOI 10.1080/028418600750013113

CARSON WE, 1994, J EXP MED, V180, P1395, DOI 10.1084/jem.180.4.1395

Claude L, 2004, RADIOTHER ONCOL, V71, P175, DOI 10.1016/j.radonc.2004.02.005

Corani G, 2012, INTEL SYST REF LIBR, V23, P49

Damaraju S, 2006, CLIN CANCER RES, V12, P2545, DOI 10.1158/1078-0432.CCR-05-2703

Ebert N, 2015, RADIOTHER ONCOL, V117, P1, DOI 10.1016/j.radonc.2015.09.001

El Naqa I, 2014, WIRES DATA MIN KNOWL, V4, P327, DOI 10.1002/widm.1131

Flanders KC, 2003, AM J PATHOL, V163, P2247, DOI 10.1016/S0002-9440(10)63582-1

Friedman N, 1999, UNCERTAINTY IN ARTIFICIAL INTELLIGENCE, PROCEEDINGS, P196

Fukuyama T, 2007, CANCER SCI, V98, P1048, DOI 10.1111/j.1349-7006.2007.00507.x

Gadewadikar J., 2010, AFRICAN J MATH COMPU, V3, P225

Gevaert O, 2006, BIOINFORMATICS, V22, pE184, DOI 10.1093/bioinformatics/btl230

Guo LL, 2016, TUMOR BIOL, V37, P115, DOI 10.1007/s13277-015-4374-2

Kong FM, 2015, SEMIN RADIAT ONCOL, V25, P100, DOI 10.1016/j.semradonc.2014.12.003

Kouloulias V, 2013, ASIAN PAC J CANCER P, V14, P2717, DOI 10.7314/APJCP.2013.14.5.2717

Kwa SLS, 1998, RADIOTHER ONCOL, V48, P61, DOI 10.1016/S0167-8140(98)00020-6

Lee S, 2015, MED PHYS, V42

LOKKETANGEN A, 1995, AI COMMUN, V8, P78

Metz Charles E, 2006, J Am Coll Radiol, V3, P413, DOI 10.1016/j.jacr.2006.02.021

Park IK, 2007, MOL IMMUNOL, V44, P3283, DOI 10.1016/j.molimm.2007.02.024

Parker BJ, 2007, BMC BIOINFORMATICS, V8, DOI 10.1186/1471-2105-8-326

Pearl J., 1988, PROBABILISTIC REASON, V58, P721

Pellet JP, 2008, J MACH LEARN RES, V9, P1295

Perlich C., 2010, ACM SIGKDD EXPLOR NE, V12, P11

Provatopoulou X, 2008, ANTICANCER RES, V28, P2421

Rancati T, 2003, RADIOTHER ONCOL, V67, P275, DOI 10.1016/S0167-8140(03)00119-1

RODEMANN HP, 1995, RADIOTHER ONCOL, V35, P83, DOI 10.1016/0167-8140(95)01540-W

Rodrigues G, 2004, RADIOTHER ONCOL, V71, P127, DOI 10.1016/j.radonc.2004.02.015

Schaue D, 2012, RADIAT RES, V178, P505, DOI 10.1667/RR3031.1

Schiller TW, 2010, NEUROCOMPUTING, V73, P1861, DOI 10.1016/j.neucom.2009.09.023

Shi AH, 2010, RADIAT ONCOL, V5, DOI 10.1186/1748-717X-5-35

Slattery ML, 2011, CANCER EPIDEM BIOMAR, V20, P57, DOI 10.1158/1055-9965.EPI-10-0843

Waldmann TA, 2006, NAT REV IMMUNOL, V6, P595, DOI 10.1038/nri1901

Weng HL, 2007, J HEPATOL, V46, P295, DOI 10.1016/j.jhep.2006.09.014

NR 37

TC 38

Z9 39

U1 1

U2 13

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD APR

PY 2017

VL 123

IS 1

BP 85

EP 92

DI 10.1016/j.radonc.2017.02.004

PG 8

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA EU0RR

UT WOS:000400719500013

PM 28237401

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Cui, SN

Luo, Y

Tseng, HH

Ten Haken, RK

El Naga, I

AF Cui, Sunan

Luo, Yi

Tseng, Huan-Hsin

Ten Haken, Randall K.

El Naga, Issam

TI Combining handcrafted features with latent variables in machine learning

for prediction of radiation-induced lung damage

SO MEDICAL PHYSICS

LA English

DT Article

DE deep neural networks; feature selection; machine learning; radiotherapy

outcome modeling

ID RADIOTHERAPY OUTCOMES; FEATURE-SELECTION; NEURAL-NETWORK; DOSE-VOLUME;

PNEUMONITIS; CANCER; MODEL; IRRADIATION

AB Purpose There has been burgeoning interest in applying machine learning methods for predicting radiotherapy outcomes. However, the imbalanced ratio of a large number of variables to a limited sample size in radiation oncology constitutes a major challenge. Therefore, dimensionality reduction methods can be a key to success. The study investigates and contrasts the application of traditional machine learning methods and deep learning approaches for outcome modeling in radiotherapy. In particular, new joint architectures based on variational autoencoder (VAE) for dimensionality reduction are presented and their application is demonstrated for the prediction of lung radiation pneumonitis (RP) from a large-scale heterogeneous dataset. Methods A large-scale heterogeneous dataset containing a pool of 230 variables including clinical factors (e.g., dose, KPS, stage) and biomarkers (e.g., single nucleotide polymorphisms (SNPs), cytokines, and micro-RNAs) in a population of 106 nonsmall cell lung cancer (NSCLC) patients who received radiotherapy was used for modeling RP. Twenty-two patients had grade 2 or higher RP. Four methods were investigated, including feature selection (case A) and feature extraction (case B) with traditional machine learning methods, a VAE-MLP joint architecture (case C) with deep learning and lastly, the combination of feature selection and joint architecture (case D). For feature selection, Random forest (RF), Support Vector Machine (SVM), and multilayer perceptron (MLP) were implemented to select relevant features. Specifically, each method was run for multiple times to rank features within several cross-validated (CV) resampled sets. A collection of ranking lists were then aggregated by top 5% and Kemeny graph methods to identify the final ranking for prediction. A synthetic minority oversampling technique was applied to correct for class imbalance during this process. For deep learning, a VAE-MLP joint architecture where a VAE aimed for dimensionality reduction and an MLP aimed for classification was developed. In this architecture, reconstruction loss and prediction loss were combined into a single loss function to realize simultaneous training and weights were assigned to different classes to mitigate class imbalance. To evaluate the prediction performance and conduct comparisons, the area under receiver operating characteristic curves (AUCs) were performed for nested CVs for both handcrafted feature selections and the deep learning approach. The significance of differences in AUCs was assessed using the DeLong test of U-statistics. Results An MLP-based method using weight pruning (WP) feature selection yielded the best performance among the different hand-crafted feature selection methods (case A), reaching an AUC of 0.804 (95% CI: 0.761-0.823) with 29 top features. A VAE-MLP joint architecture (case C) achieved a comparable but slightly lower AUC of 0.781 (95% CI: 0.737-0.808) with the size of latent dimension being 2. The combination of handcrafted features (case A) and latent representation (case D) achieved a significant AUC improvement of 0.831 (95% CI: 0.805-0.863) with 22 features (P-value = 0.000642 compared with handcrafted features only (Case A) and P-value = 0.000453 compared to VAE alone (Case C)) with an MLP classifier.

Conclusion The potential for combination of traditional machine learning methods and deep learning VAE techniques has been demonstrated for dealing with limited datasets in modeling radiotherapy toxicities. Specifically, latent variables from a VAE-MLP joint architecture are able to complement handcrafted features for the prediction of RP and improve prediction over either method alone.(c) 2019 American Association of Physicists in Medicine

C1 [Cui, Sunan] Univ Michigan, Appl Phys Program, Ann Arbor, MI 48109 USA.

[Luo, Yi; Tseng, Huan-Hsin; Ten Haken, Randall K.; El Naga, Issam] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

RP Cui, SN (通讯作者)，Univ Michigan, Appl Phys Program, Ann Arbor, MI 48109 USA.

EM sunan@umich.edu

RI cui, sunan/AAA-3286-2020; Naqa, Issam El/T-3066-2019

OI cui, sunan/0000-0002-8846-9449; Naqa, Issam El/0000-0001-6023-1132

FU National Institutes of Health (NIH) [P01-CA059827, R37-CA222215];

Rackham Predoctoral fellowship; NATIONAL CANCER INSTITUTE [P01CA059827,

R37CA222215] Funding Source: NIH RePORTER

FX This work was partly supported by National Institutes of Health (NIH)

(P01-CA059827 and R37-CA222215) and Rackham Predoctoral fellowship. The

authors have no conflicts to disclose.

CR Baldi P, 2012, P ICML WORKSH UNS TR, P37

Bengio Y, 2013, IEEE T PATTERN ANAL, V35, P1798, DOI 10.1109/TPAMI.2013.50

Bentzen SM, 2000, ACTA ONCOL, V39, P337, DOI 10.1080/028418600750013113

Bentzen SM, 2010, INT J RADIAT ONCOL, V76, pS3, DOI 10.1016/j.ijrobp.2009.09.040

BREIMAN L, 2001, MACH LEARN, V0045

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Chen SF, 2007, MED PHYS, V34, P3420, DOI 10.1118/1.2759601

Chen S, 2007, MED PHYS, V34, P3808, DOI 10.1118/1.2776669

Cho K., 2014, ARXIV14061078, DOI DOI 10.3115/V1/D14-1179

Chollet F., 2015, KERAS

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

Conitzer V., 2006, AAAI, V6, P620

Damaraju S, 2006, CLIN CANCER RES, V12, P2545, DOI 10.1158/1078-0432.CCR-05-2703

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

Demler OV, 2012, STAT MED, V31, P2577, DOI 10.1002/sim.5328

El Naqa I, 2006, PHYS MED BIOL, V51, P5719, DOI 10.1088/0031-9155/51/22/001

El Naqa I, 2006, INT J RADIAT ONCOL, V64, P1275, DOI 10.1016/j.ijrobp.2005.11.022

El Naqa I., 2018, GUIDE OUTCOME MODELI

El Naqa I, 2009, PHYS MED BIOL, V54, pS9, DOI 10.1088/0031-9155/54/18/S02

Fukuyama T, 2007, CANCER SCI, V98, P1048, DOI 10.1111/j.1349-7006.2007.00507.x

Goodfellow I, 2016, ADAPT COMPUT MACH LE, P1

Guo LL, 2016, TUMOR BIOL, V37, P115, DOI 10.1007/s13277-015-4374-2

Guyon Isabelle, 2003, J MACH LEARN RES, V3, P1157, DOI DOI 10.1162/153244303322753616

Kingma D, 2014, ARXIV

Kingma DP, 2013, ARXIV PREPRINT ARXIV

Kong FM, 2007, SEMIN RADIAT ONCOL, V17, P108, DOI 10.1016/j.semradonc.2006.11.007

Kouloulias V, 2013, ASIAN PAC J CANCER P, V14, P2717, DOI 10.7314/APJCP.2013.14.5.2717

Krizhevsky A., 2012, ADV NEURAL INFORM PR, V25, DOI DOI 10.1145/3065386

KUTCHER GJ, 1989, INT J RADIAT ONCOL, V16, P1623, DOI 10.1016/0360-3016(89)90972-3

LeCun Y, 2015, NATURE, V521, P436, DOI 10.1038/nature14539

Lee S, 2015, MED PHYS, V42, P2421, DOI 10.1118/1.4915284

Lin SL, 2010, WILEY INTERDISCIP RE, V2, P555, DOI 10.1002/wics.111

Luo Y, 2017, RADIOTHER ONCOL, V123, P85, DOI 10.1016/j.radonc.2017.02.004

Lyman JT, 1985, TOLERANCE DOSES TREA, DOI [10.2172/6934260, DOI 10.2172/6934260]

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS10, DOI 10.1016/j.ijrobp.2009.07.1754

Mitchell Stuart, 2011, PULP LINEAR PROGRAMM

NIEMIERKO A, 1993, INT J RADIAT ONCOL, V25, P135, DOI 10.1016/0360-3016(93)90156-P

Pedregosa F., 2011, J MACH LEARN RES, V12, P2825

Saeys Y, 2007, BIOINFORMATICS, V23, P2507, DOI 10.1093/bioinformatics/btm344

Silver D, 2016, NATURE, V529, P484, DOI 10.1038/nature16961

Slattery ML, 2011, CANCER EPIDEM BIOMAR, V20, P57, DOI 10.1158/1055-9965.EPI-10-0843

Stavrev P, 2005, INT J RADIAT BIOL, V81, P77, DOI 10.1080/09553000400027910

Su M, 2005, MED PHYS, V32, P318, DOI 10.1118/1.1835611

Tong S, 2002, J MACH LEARN RES, V2, P45, DOI 10.1162/153244302760185243

Verikas A, 2002, PATTERN RECOGN LETT, V23, P1323, DOI 10.1016/S0167-8655(02)00081-8

Yacoub M., 1997, INTELLIGENT ENG SYST, V7, P527

Yang JB, 2009, IEEE T NEURAL NETWOR, V20, P1911, DOI 10.1109/TNN.2009.2032543

NR 47

TC 12

Z9 13

U1 5

U2 24

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD MAY

PY 2019

VL 46

IS 5

BP 2497

EP 2511

DI 10.1002/mp.13497

PG 15

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA HX7AV

UT WOS:000467556800054

PM 30891794

OA Green Published, Green Accepted

DA 2022-08-24

ER

PT J

AU Kim, MS

Park, HY

Kho, BG

Park, CK

Oh, IJ

Kim, YC

Kim, S

Yun, JS

Song, SY

Na, KJ

Jeong, JU

Yoon, MS

Ahn, SJ

Yoo, SW

Kang, SR

Kwon, SY

Bom, HS

Jang, WY

Kim, IY

Lee, JE

Jeong, WG

Kim, YH

Lee, T

Choi, YD

AF Kim, Min-Seok

Park, Ha-Young

Kho, Bo-Gun

Park, Cheol-Kyu

Oh, In-Jae

Kim, Young-Chul

Kim, Seok

Yun, Ju-Sik

Song, Sang-Yun

Na, Kook-Joo

Jeong, Jae-Uk

Yoon, Mee Sun

Ahn, Sung-Ja

Yoo, Su Woong

Kang, Sae-Ryung

Kwon, Seong Young

Bom, Hee-Seung

Jang, Woo-Youl

Kim, In-Young

Lee, Jong-Eun

Jeong, Won-Gi

Kim, Yun-Hyeon

Lee, Taebum

Choi, Yoo-Duk

TI Artificial intelligence and lung cancer treatment decision: agreement

with recommendation of multidisciplinary tumor board

SO TRANSLATIONAL LUNG CANCER RESEARCH

LA English

DT Article

DE Watson for Oncology (WFO); multidisciplinary tumor board; lung cancer

ID WATSON; EPIDEMIOLOGY; ONCOLOGY

AB Background: IBM Watson for Oncology (WFO) is a cognitive computing system helping physicians quickly identify key information in a patient's medical record, surface relevant evidence, and explore treatment options. This study assessed the possibility of using WFO for clinical treatment in lung cancer patients.

Methods: We evaluated the level of agreement between WFO and multidisciplinary team (MDT) for lung cancer. From January to December 2018, newly diagnosed lung cancer cases in Chonnam National University Hwasun Hospital were retrospectively examined using WFO version 18.4 according to four treatment categories (surgery, radiotherapy, chemoradiotherapy, and palliative care). Treatment recommendations were considered concordant if the MDT recommendations were designated 'recommended' by WFO. Concordance between MDT and WFO was analyzed by Cohen's kappa value.

Results: In total, 405 (male 340, female 65) cases with different histology (adenocarcinoma 157, squamous cell carcinoma 132, small cell carcinoma 94, others 22 cases) were enrolled. Concordance between MDT and WFO occurred in 92.4% (k=0.881, P<0.001) of all cases, and concordance differed according to clinical stages. The strength of agreement was very good in stage IV non-small cell lung carcinoma (NSCLC) (100%, k=1.000) and extensive disease small cell lung carcinoma (SCLC) (100%, k=1.000). In stage I NSCLC, the agreement strength was good (92.4%, k=0.855). The concordance was moderate in stage III NSCLC (80.8%, k=0.622) and relatively low in stage II NSCLC (83.3%, k=0.556) and limited disease SCLC (84.6%, k=0.435). There were discordant cases in surgery (7/57, 12.3%), radiotherapy (2/12, 16.7%), and chemoradiotherapy (15/129, 11.6%), but no discordance in metastatic disease patients.

Conclusions: Treatment recommendations made by WFO and MDT were highly concordant for lung cancer cases especially in metastatic stage. However, WFO was just an assisting tool in stage I-III NSCLC and limited disease SCLC; so, patient-doctor relationship and shared decision making may be more important in this stage.

C1 [Kim, Min-Seok; Park, Ha-Young; Kho, Bo-Gun; Park, Cheol-Kyu; Oh, In-Jae; Kim, Young-Chul; Kim, Seok; Yun, Ju-Sik; Song, Sang-Yun; Na, Kook-Joo; Jeong, Jae-Uk; Yoon, Mee Sun; Ahn, Sung-Ja; Yoo, Su Woong; Kang, Sae-Ryung; Kwon, Seong Young; Bom, Hee-Seung; Jang, Woo-Youl; Kim, In-Young; Jeong, Won-Gi; Choi, Yoo-Duk] Chonnam Natl Univ, Hwasun Hosp, Lung & Esophageal Canc Clin, Hwasun, South Korea.

[Kim, Min-Seok; Park, Ha-Young; Kho, Bo-Gun; Park, Cheol-Kyu; Oh, In-Jae; Kim, Young-Chul] Chonnam Natl Univ, Med Sch, Dept Internal Med, Gwangju, South Korea.

[Kim, Seok; Yun, Ju-Sik; Song, Sang-Yun; Na, Kook-Joo] Chonnam Natl Univ, Med Sch, Dept Thorac Surg, Gwangju, South Korea.

[Jeong, Jae-Uk; Yoon, Mee Sun; Ahn, Sung-Ja] Chonnam Natl Univ, Med Sch, Dept Radiat Oncol, Gwangju, South Korea.

[Yoo, Su Woong; Kang, Sae-Ryung; Kwon, Seong Young; Bom, Hee-Seung] Chonnam Natl Univ, Med Sch, Dept Nucl Med, Gwangju, South Korea.

[Jang, Woo-Youl; Kim, In-Young] Chonnam Natl Univ, Med Sch, Dept Neurosurg, Gwangju, South Korea.

[Lee, Jong-Eun; Jeong, Won-Gi; Kim, Yun-Hyeon] Chonnam Natl Univ, Med Sch, Dept Radiol, Gwangju, South Korea.

[Lee, Taebum; Choi, Yoo-Duk] Chonnam Natl Univ, Med Sch, Dept Pathol, Gwangju, South Korea.

RP Oh, IJ (通讯作者)，Chonnam Natl Univ, Hwasun Hosp, Dept Internal Med, 322 Seoyang Ro, Hwasun 58128, Jeonnam, South Korea.

EM droij@jnu.ac.kr

RI Kwon, Seong Young/AAU-3101-2021; Oh, In-Jae/AAG-5919-2020

OI Kwon, Seong Young/0000-0002-2832-896X; Oh, In-Jae/0000-0003-4837-1321

FU Chonnam National University Hwasun Hospital Institute for Biomedical

Science [HCRI19025]

FX This study was supported by grants (HCRI19025) from the Chonnam National

University Hwasun Hospital Institute for Biomedical Science.

CR Adamson AS, 2019, NEW ENGL J MED, V381, P2285, DOI 10.1056/NEJMp1907407

Ahmed MN, 2017, IEEE PULSE, V8, P4, DOI 10.1109/MPUL.2017.2678098

[Anonymous], 2017, LANCET, V390, P2739, DOI 10.1016/S0140-6736(17)31540-4

Ardila D, 2019, NAT MED, V25, P954, DOI 10.1038/s41591-019-0447-x

Chen Y, 2016, CLIN THER, V38, P688, DOI 10.1016/j.clinthera.2015.12.001

Hamet P, 2017, METABOLISM, V69, pS36, DOI 10.1016/j.metabol.2017.01.011

Han HH, 2017, MICROSURG, V37, P49, DOI 10.1002/micr.22463

Kweon Sun-Seog, 2018, Chonnam Med J, V54, P90, DOI 10.4068/cmj.2018.54.2.90

Liu CY, 2018, J MED INTERNET RES, V20, DOI 10.2196/11087

Makedon F, 2006, ONCOL REP, V15, P971, DOI 10.3892/or.15.4.971

Malin JL, 2013, J ONCOL PRACT, V9, P155, DOI 10.1200/JOP.2013.001021

Oh IJ, 2017, RADIAT ONCOL J, V35, P16, DOI 10.3857/roj.2017.00108

OKEN MM, 1982, AM J CLIN ONCOL-CANC, V5, P649, DOI 10.1097/00000421-198212000-00014

Park JY, 2016, TUBERC RESPIR DIS, V79, P58, DOI 10.4046/trd.2016.79.2.58

SCHMIDT C, 2017, JNCI J NATL CANCER I, V109, DOI DOI 10.1093/jnci/djx113

Shin A, 2017, CANCER RES TREAT, V49, P616, DOI 10.4143/crt.2016.178

Siegel RL, 2022, CA-CANCER J CLIN, V72, P7, DOI [10.3322/caac.21332, 10.3322/caac.21708, 10.3322/caac.21551]

Somashekhar SP, 2018, ANN ONCOL, V29, P418, DOI 10.1093/annonc/mdx781

Xu YW, 2019, CLIN CANCER RES, V25, P3266, DOI 10.1158/1078-0432.CCR-18-2495

Zhou N, 2019, ONCOLOGIST, V24, P812, DOI 10.1634/theoncologist.2018-0255

NR 20

TC 13

Z9 15

U1 2

U2 7

PU AME PUBL CO

PI SHATIN

PA FLAT-RM C 16F, KINGS WING PLAZA 1, NO 3 KWAN ST, SHATIN, HONG KONG

00000, PEOPLES R CHINA

SN 2218-6751

EI 2226-4477

J9 TRANSL LUNG CANCER R

JI Transl. Lung Cancer Res.

PD JUN

PY 2020

VL 9

IS 3

BP 507

EP 514

DI 10.21037/tlcr.2020.04.11

PG 8

WC Oncology; Respiratory System

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Respiratory System

GA MJ1WM

UT WOS:000547884300012

PM 32676314

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Coroller, TP

Agrawal, V

Narayan, V

Hou, Y

Grossmann, P

Lee, SW

Mak, RH

Aerts, HJWL

AF Coroller, Thibaud P.

Agrawal, Vishesh

Narayan, Vivek

Hou, Ying

Grossmann, Patrick

Lee, Stephanie W.

Mak, Raymond H.

Aerts, Hugo J. W. L.

TI Radiomic phenotype features predict pathological response in non-small

cell lung cancer

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Radiomics; Pathological response; NSCLC; Biomarkers; Quantitative

imaging

ID GROSS TUMOR VOLUME; NEOADJUVANT THERAPY; PROGNOSTIC-FACTOR; FDG-PET;

SURVIVAL; CHEMOTHERAPY; TEXTURE; RADIOTHERAPY; RESECTION; MODELS

AB Background and purpose: Radiomics can quantify tumor phenotype characteristics non-invasively by applying advanced imaging feature algorithms. In this study we assessed if pre-treatment radiomics data are able to predict pathological response after neoadjuvant chemoradiation in patients with locally advanced non-small cell lung cancer (NSCLC).

Materials and Methods: 127 NSCLC patients were included in this study. Fifteen radiomic features selected based on stability and variance were evaluated for its power to predict pathological response. Predictive power was' evaluated using area under the curve (AUC). Conventional imaging features (tumor volume and diameter) were used for comparison.

Results: Seven features were predictive for pathologic gross residual disease (AUC > 0.6, p-value < 0.05), and one for pathologic complete response (AUC = 0.63, p-value = 0.01). No conventional imaging features were predictive (range AUC = 0.51-0.59, p-value > 0.05). Tumors that did not respond well to neoadjuvant chemoradiation were more likely to present a rounder shape (spherical disproportionality, AUC = 0.63, p-value = 0.009) and heterogeneous texture (LoG 5 mm 3D - GLCM entropy, AUC = 0.61, p-value = 0.03).

Conclusion: We identified predictive radiomic features for pathological response, although no conventional features were significantly predictive. This study demonstrates that radiomics can provide valuable clinical information, and performed better than conventional imaging features. (C) 2016 Elsevier Ireland Ltd. All rights reserved.

C1 [Coroller, Thibaud P.; Agrawal, Vishesh; Narayan, Vivek; Hou, Ying; Grossmann, Patrick; Lee, Stephanie W.; Mak, Raymond H.; Aerts, Hugo J. W. L.] Harvard Med Sch, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiat Oncol, Boston, MA USA.

[Aerts, Hugo J. W. L.] Harvard Med Sch, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiol, Boston, MA USA.

RP Coroller, TP (通讯作者)，Harvard Med Sch, Brigham & Womens Hosp, Dana Farber Canc Inst, 450 Brookline Ave,JF518, Boston, MA 02115 USA.

EM tcoroller@lroc.harvard.edu

RI Aerts, Hugo/P-6350-2015; Aerts, Hugo/ABF-2821-2020

OI Aerts, Hugo/0000-0002-2122-2003; Aerts, Hugo/0000-0002-2122-2003; Mak,

Raymond/0000-0002-8754-0565; Coroller, Thibaud/0000-0001-7662-8724

FU National Institutes of Health (NIH-USA) [U24CA194354, U01CA190234]; Kaye

Scholar Award; Brigham and Women's Hospital Department of Radiation

Oncology Clinical Translational Grant; NATIONAL CANCER INSTITUTE

[U01CA190234, U24CA194354] Funding Source: NIH RePORTER

FX Authors acknowledge financial support from the National Institutes of

Health (NIH-USA U24CA194354, and NIH-USA U01CA190234). This project was

partially funded by the Kaye Scholar Award and the Brigham and Women's

Hospital Department of Radiation Oncology Clinical Translational Grant.

CR Aerts M, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms4789

Albain KS, 2009, LANCET, V374, P379, DOI 10.1016/S0140-6736(09)60737-6

Alexander BM, 2011, INT J RADIAT ONCOL, V79, P1381, DOI 10.1016/j.ijrobp.2009.12.060

Bradley JD, 2002, INT J RADIAT ONCOL, V52, P49, DOI 10.1016/S0360-3016(01)01772-2

Cerfolio RJ, 2004, ANN THORAC SURG, V78, P1903, DOI 10.1016/j.athoracsur.2004.06.102

Core Team R, 2013, R LANG ENV STAT COMP

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Edge SB, 2010, ANN SURG ONCOL, V17, P1471, DOI 10.1245/s10434-010-0985-4

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Fox MJ, 2015, J MAGN RESON IMAGING

Gentleman RC, 2004, GENOME BIOL, V5, DOI 10.1186/gb-2004-5-10-r80

Gillies RJ, 2015, RADIOLOGY, DOI DOI 10.1148/RADIOL.2015151169

Haibe-Kains B, 2008, BIOINFORMATICS, V24, P2200, DOI 10.1093/bioinformatics/btn374

Hellmann MD, 2014, LANCET ONCOL, V15, pE42, DOI 10.1016/S1470-2045(13)70334-6

Isobe K, 2012, ASIA-PAC J CLIN ONCO, V8, P260, DOI 10.1111/j.1743-7563.2012.01529.x

Kuhn M, 2008, J STAT SOFTW, V28, P1, DOI 10.18637/jss.v028.i05

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lee J, 2016, AM J NEURORADIOL, V37, P37, DOI 10.3174/ajnr.A4534

Leijenaar RTH, 2015, ACTA ONCOL, V54, P1423, DOI 10.3109/0284186X.2015.1061214

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Lubner MG, 2015, ABDOM IMAGING, V40, P2331, DOI 10.1007/s00261-015-0438-4

Mouillet G, 2012, J THORAC ONCOL, V7, P841, DOI 10.1097/JTO.0b013e31824c7d92

National Comprehensive Cancer Network, 2015, NCCN GUID NONSM CELL

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Pickles MD, 2016, INVEST RADIOL, V51, P177, DOI 10.1097/RLI.0000000000000222

Pieper S, 2004, IEEE INT S BIOMED IM, V26, P632, DOI DOI 10.1109/ISBI.2004.1398617

Poettgen C, 2007, ONCOLOGY-BASEL, V73, P316, DOI 10.1159/000134474

Ravanelli M, 2013, EUR RADIOL, V23, P3450, DOI 10.1007/s00330-013-2965-0

Schroder MS, 2011, BIOINFORMATICS, V27, P3206, DOI 10.1093/bioinformatics/btr511

Siegel R, 2014, CA-CANCER J CLIN, V64, P9, DOI [10.3322/caac.21208, 10.3322/caac.21254, 10.1001/jamaoto.2014.2530, 10.1136/bmj.g1502]

Stinchcombe TE, 2006, LUNG CANCER, V52, P67, DOI 10.1016/j.lungcan.2005.11.008

van Meerbeeck JP, 2007, JNCI-J NATL CANCER I, V99, P442, DOI 10.1093/jnci/djk093

Velazquez ER, 2012, RADIOTHER ONCOL, V105, P167, DOI 10.1016/j.radonc.2012.09.023

Werner-Wasik M, 2001, INT J RADIAT ONCOL, V51, P56, DOI 10.1016/S0360-3016(01)01615-7

Zhao BS, 2009, RADIOLOGY, V252, P263, DOI 10.1148/radiol.2522081593

NR 38

TC 193

Z9 209

U1 5

U2 64

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD JUN

PY 2016

VL 119

IS 3

BP 480

EP 486

DI 10.1016/j.radonc.2016.04.004

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA DR7JH

UT WOS:000380075400017

PM 27085484

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Bai, X

Shan, GP

Chen, M

Wang, BB

AF Bai, Xue

Shan, Guoping

Chen, Ming

Wang, Binbing

TI Approach and assessment of automated stereotactic radiotherapy planning

for early stage non-small-cell lung cancer

SO BIOMEDICAL ENGINEERING ONLINE

LA English

DT Article

DE Machine learning; Non-small-cell lung cancer radiotherapy planning;

Stereotactic body radiotherapy; Machine learning

ID MODULATED RADIATION-THERAPY; BEAM ORIENTATION OPTIMIZATION;

MULTIOBJECTIVE OPTIMIZATION; IMRT; PROSTATE; QUALITY; ARC; ALGORITHM;

SYSTEM; GENERATION

AB Background Intensity-modulated radiotherapy (IMRT) and volumetric-modulated arc therapy (VMAT) are standard physical technologies of stereotactic body radiotherapy (SBRT) that are used for patients with non-small-cell lung cancer (NSCLC). The treatment plan quality depends on the experience of the planner and is limited by planning time. An automated planning process can save time and ensure a high-quality plan. This study aimed to introduce and demonstrate an automated planning procedure for SBRT for patients with NSCLC based on machine-learning algorithms. The automated planning was conducted in two steps: (1) determining patient-specific optimized beam orientations; (2) calculating the organs at risk (OAR) dose achievable for a given patient and setting these dosimetric parameters as optimization objectives. A model was developed using data of historical expertise plans based on support vector regression. The study cohort comprised patients with NSCLC who were treated using SBRT. A training cohort (N = 125) was used to calculate the beam orientations and dosimetric parameters for the lung as functions of the geometrical feature of each case. These plan-geometry relationships were used in a validation cohort (N = 30) to automatically establish the SBRT plan. The automatically generated plans were compared with clinical plans established by an experienced planner. Results All 30 automated plans (100%) fulfilled the dose criteria for OARs and planning target volume (PTV) coverage, and were deemed acceptable according to evaluation by experienced radiation oncologists. An automated plan increased the mean maximum dose for ribs (31.6 +/- 19.9 Gy vs. 36.6 +/- 18.1 Gy, P < 0.05). The minimum, maximum, and mean dose; homogeneity index; conformation index to PTV; doses to other organs; and the total monitor units showed no significant differences between manual plans established by experts and automated plans (P > 0.05). The hands-on planning time was reduced from 40-60 min to 10-15 min. Conclusion An automated planning method using machine learning was proposed for NSCLC SBRT. Validation results showed that the proposed method decreased planning time without compromising plan quality. Plans generated by this method were acceptable for clinical use.

C1 [Bai, Xue; Shan, Guoping; Chen, Ming; Wang, Binbing] Zhejiang Canc Hosp, Zhejiang Key Lab Radiat Oncol, Dept Radiat Phys, Hangzhou 310022, Zhejiang, Peoples R China.

RP Wang, BB (通讯作者)，Zhejiang Canc Hosp, Zhejiang Key Lab Radiat Oncol, Dept Radiat Phys, Hangzhou 310022, Zhejiang, Peoples R China.

EM wangbb@zjcc.org.cn

FU National Key Research and Development Program of China [2017YFC0113201];

Zhejiang Provincial Natural Science Foundation of China [LSY19H180002];

Medical Science and Technology Program of Zhejiang Province [2017PY013,

2018PY005]; Key Laboratory of Radiation Physics and Technology (Sichuan

University), Ministry of Education [2018SCURPT09]

FX This study was supported in part by the National Key Research and

Development Program of China (2017YFC0113201), the Zhejiang Provincial

Natural Science Foundation of China (LSY19H180002), the Medical Science

and Technology Program of Zhejiang Province (2017PY013 and 2018PY005),

and the Key Laboratory of Radiation Physics and Technology (Sichuan

University), Ministry of Education (2018SCURPT09).

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Awad M., 2015, EFFICIENT LEARNING M, P39, DOI [DOI 10.1007/978-1-4302-5990-9\_4, 10.1007/978-1-4302-5990-9\_3]

Bangert M, 2010, PHYS MED BIOL, V55, P6023, DOI 10.1088/0031-9155/55/19/025

Bedford JL, 2009, MED PHYS, V36, P5128, DOI 10.1118/1.3240488

Bortfeld T, 2006, PHYS MED BIOL, V51, pR363, DOI 10.1088/0031-9155/51/13/R21

Breedveld S, 2007, PHYS MED BIOL, V52, P6339, DOI 10.1088/0031-9155/52/20/016

Breedveld S, 2012, MED PHYS, V39, P951, DOI 10.1118/1.3676689

Brock J, 2012, CLIN ONCOL-UK, V24, P68, DOI 10.1016/j.clon.2011.02.003

Cagni E, 2017, PHYS MEDICA, V36, P38, DOI 10.1016/j.ejmp.2017.03.002

Chang JY, 2015, LANCET ONCOL, V16, P630, DOI 10.1016/S1470-2045(15)70168-3

Craft D, 2007, INT J RADIAT ONCOL, V69, P1600, DOI 10.1016/j.ijrobp.2007.08.019

Das IJ, 2008, JNCI-J NATL CANCER I, V100, P300, DOI 10.1093/jnci/djn020

Fushiki T, 2011, ESTIMATION PREDICTIO, P137

Good D, 2013, INT J RADIAT ONCOL, V87, P176, DOI 10.1016/j.ijrobp.2013.03.015

Hodapp N, 2012, STRAHLENTHER ONKOL, V188, P97, DOI 10.1007/s00066-011-0015-x

Holt A, 2011, INT J RADIAT ONCOL, V81, P1560, DOI 10.1016/j.ijrobp.2010.09.014

Hou Q, 2003, MED PHYS, V30, P2360, DOI 10.1118/1.1601911

Jiang F, 2017, P 5 INT C BIOINF COM, P59, DOI [DOI 10.1145/3035012.3035022, 10.1145/3035012.3035022.]

Krayenbuehl J, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0533-2

Ma ZQ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf5da

Masi K, 2015, MED PHYS, V42, P3457, DOI 10.1118/1.4924892

Men K, 2017, MED PHYS, V44, P6377, DOI 10.1002/mp.12602

Mitchell RA, 2017, J APPL CLIN MED PHYS, V18, P18, DOI 10.1002/acm2.12006

Moore KL, 2011, INT J RADIAT ONCOL, V81, P545, DOI 10.1016/j.ijrobp.2010.11.030

Mutanga TF, 2012, INT J RADIAT ONCOL, V83, P400, DOI 10.1016/j.ijrobp.2011.05.049

Nelms BE, 2012, PRACT RADIAT ONCOL, V2, P296, DOI 10.1016/j.prro.2011.11.012

Nwankwo O, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0416-6

Nwankwo O, 2014, PHYS MED BIOL, V59, P5575, DOI 10.1088/0031-9155/59/18/5575

Otto K, 2008, MED PHYS, V35, P310, DOI 10.1118/1.2818738

Paddick I, 2000, J NEUROSURG, V93, P219, DOI 10.3171/jns.2000.93.supplement\_3.0219

Pardo-Montero J, 2010, MED PHYS, V37, P2606, DOI 10.1118/1.3427410

Pardo-Montero J, 2009, MED PHYS, V36, P3292, DOI 10.1118/1.3151806

Pedregosa F., 2011, J MACH LEARN RES, V12, P2825

Peter M, 2015, J RADIOTHER PRACT, V14, P260, DOI 10.1017/S1460396915000126

Petit SF, 2012, RADIOTHER ONCOL, V102, P38, DOI 10.1016/j.radonc.2011.05.025

Pugachev A, 2001, INT J RADIAT ONCOL, V50, P551, DOI 10.1016/S0360-3016(01)01502-4

Smola AJ, 1998, ALGORITHMICA, V22, P211, DOI 10.1007/PL00013831

Song Y, 2016, RADIOTHER ONCOL, V119, P531, DOI 10.1016/j.radonc.2016.04.010

Tol JP, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0388-6

Tol JP, 2015, INT J RADIAT ONCOL, V91, P612, DOI 10.1016/j.ijrobp.2014.11.014

van Baardwijk A, 2012, RADIOTHER ONCOL, V105, P145, DOI 10.1016/j.radonc.2012.09.008

Wang JZ, 2015, MED PHYS, V42, P1005, DOI 10.1118/1.4906252

Wang QY, 2019, J MAGN RESON IMAGING, V49, P825, DOI 10.1002/jmri.26265

Wu BB, 2013, MED PHYS, V40, DOI 10.1118/1.4788671

Wu BB, 2011, INT J RADIAT ONCOL, V79, P1241, DOI 10.1016/j.ijrobp.2010.05.026

Wu BB, 2009, MED PHYS, V36, P5497, DOI 10.1118/1.3253464

Yang YD, 2013, MED PHYS, V40, DOI 10.1118/1.4769424

Zhang XD, 2006, MED PHYS, V33, P2935, DOI 10.1118/1.2214171

Zhu XF, 2011, MED PHYS, V38, P719, DOI 10.1118/1.3539749

NR 49

TC 8

Z9 9

U1 0

U2 3

PU BMC

PI LONDON

PA CAMPUS, 4 CRINAN ST, LONDON N1 9XW, ENGLAND

EI 1475-925X

J9 BIOMED ENG ONLINE

JI Biomed. Eng. Online

PD OCT 16

PY 2019

VL 18

IS 1

AR 101

DI 10.1186/s12938-019-0721-7

PG 15

WC Engineering, Biomedical

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering

GA JE5GJ

UT WOS:000490719700002

PM 31619263

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Cui, SN

Ten Haken, RK

El Naqa, I

AF Cui, Sunan

Ten Haken, Randall K.

El Naqa, Issam

TI Integrating Multiomics Information in Deep Learning Architectures for

Joint Actuarial Outcome Prediction in Non-Small Cell Lung Cancer

Patients After Radiation Therapy

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

ID LOCAL TUMOR-CONTROL; FDG-PET; RADIOTHERAPY; MACHINE; MODEL; PNEUMONITIS;

CONCURRENT; IMPUTATION; SURVIVAL

AB Purpose: Novel actuarial deep learning neural network (ADNN) architectures are proposed for joint prediction of radiation therapy outcomes-radiation pneumonitis (RP) and local control (LC)-in stage III non-small cell lung cancer (NSCLC) patients. Unlike normal tissue complication probability/tumor control probability models that use dosimetric information solely, our proposed models consider complex interactions among multiomics information including positron emission tomography (PET) radiomics, cytokines, and miRNAs. Additional time-to-event information is also used in the actuarial prediction.

Methods and Materials: Three architectures were investigated: ADNN-DVH considered dosimetric information only; ADNN-com integrated multiomics information; and ADNN-com-joint combined RP2 (RP grade >= 2) and LC prediction. In these architectures, differential dose-volume histograms (DVHs) were fed into 1D convolutional neural networks (CNN) for extracting reduced representations. Variational encoders were used to learn representations of imaging and biological data. Reduced representations were fed into Surv-Nets to predict time-to-event probabilities for RP2 and LC independently and jointly by incorporating time information into designated loss functions.

Results: Models were evaluated on 117 retrospective patients and were independently tested on 25 newly accrued patients prospectively. A multi-institutional RTOG0617 data set of 327 patients was used for external validation. ADNN-DVH yielded cross-validated c-indexes (95% confidence intervals) of 0.660 (0.630-0.690) for RP2 prediction and 0.727 (0.700-0.753) for LC prediction, outperforming a generalized Lyman model for RP2 (0.613 [0.583-0.643]) and a generalized log-logistic model for LC (0.569 [0.545-0.594]). The independent internal test and external validation yielded similar results. ADNN-com achieved an even better performance than ADNN-DVH on both cross-validation and independent internal test. Furthermore, ADNN-com-joint, which yielded performance similar to ADNN-com, realized joint prediction with c-indexes of 0.705 (0.676-0.734) for RP2 and 0.740 (0.714-0.765) for LC and achieved an area under a free-response receiving operator characteristic curve (AU-FROC) of 0.729 (0.697-0.773) for the joint prediction of RP2 and LC.

Conclusion: Novel deep learning architectures that integrate multiomics information outperformed traditional normal tissue complication probability/tumor control probability models in actuarial prediction of RP2 and LC. (C) 2021 Elsevier Inc. All rights reserved.

C1 [Cui, Sunan; Ten Haken, Randall K.; El Naqa, Issam] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

[Cui, Sunan] Univ Michigan, Appl Phys Program, Ann Arbor, MI 48109 USA.

RP Cui, SN (通讯作者)，Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.; Cui, SN (通讯作者)，Univ Michigan, Appl Phys Program, Ann Arbor, MI 48109 USA.

EM sunan@umich.edu

RI cui, sunan/AAA-3286-2020

OI cui, sunan/0000-0002-8846-9449

FU National Institutes of Health (NIH) [P01 CA059827, R01-CA233487]

FX This work was partly supported by grants from National Institutes of

Health (NIH) grants P01 CA059827 and R01-CA233487.

CR [Anonymous], 2020, BBMLE TOOLS GEN MAXI

[Anonymous], 2008, J ICRU, V8, P31

Blagus R, 2013, BMC BIOINFORMATICS, V14, DOI 10.1186/1471-2105-14-106

Boldrini L, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00977

Bradley, CANC IMAGING ARCHIVE

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Ching T, 2018, PLOS COMPUT BIOL, V14, DOI 10.1371/journal.pcbi.1006076

Choi NC, 2002, INT J RADIAT ONCOL, V54, P1024, DOI 10.1016/S0360-3016(02)03038-9

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

COX DR, 1972, J R STAT SOC B, V34, P187

Cui SN, 2020, MED PHYS, V47, pE127, DOI 10.1002/mp.14140

Cui SN, 2019, MED PHYS, V46, P2497, DOI 10.1002/mp.13497

Cui S, 2019, IEEE T RADIAT PLASMA, V3, P242, DOI 10.1109/TRPMS.2018.2884134

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

El Naqa I., 2018, GUIDE OUTCOME MODELI

El Naqa I, 2018, MED PHYS, V45, pE834, DOI 10.1002/mp.12811

El Naqa I, 2009, PHYS MED BIOL, V54, pS9, DOI 10.1088/0031-9155/54/18/S02

Fiorino C, 2019, MODELLING RADIOTHERA

Gensheimer MF, 2019, PEERJ, V7, DOI 10.7717/peerj.6257

Grad-CAM, 2017, VISUAL EXPLANATIONS

HANLEY JA, 1982, RADIOLOGY, V143, P29, DOI 10.1148/radiology.143.1.7063747

He K., 2016, DEEP RESIDUAL LEARNI, DOI [10.1109/CVPR.2016.90, DOI 10.1109/CVPR.2016.90]

Hicks RJ, 2004, INT J RADIAT ONCOL, V60, P412, DOI 10.1016/j.ijrobp.2004.03.036

Holback C, 2016, RADIOLOGY DATA CANC

Huang G, 2017, PROC CVPR IEEE, P2261, DOI 10.1109/CVPR.2017.243

Isaksson LJ, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.00790

Jeong HJ, 2002, NUCL MED COMMUN, V23, P865, DOI 10.1097/00006231-200209000-00010

Kainthola A, 2017, FRONT IMMUNOL, V8, DOI 10.3389/fimmu.2017.00506

Kingma D, 2014, ARXIV

Klement RJ, 2014, INT J RADIAT ONCOL, V88, P732, DOI 10.1016/j.ijrobp.2013.11.216

Kong FM, 2005, INT J RADIAT ONCOL, V63, P324, DOI 10.1016/j.ijrobp.2005.02.010

Kumar P, 2016, CANC IMAGING ARCHIVE

Kundrat P, 2018, GUIDE OUTCOME MODELI

Li C, 2018, ADVERSARIAL TIME TO

Li XA, 2012, MED PHYS, V39, P1386, DOI 10.1118/1.3685447

Luo Y, 2020, MED PHYS, V47, pE178, DOI 10.1002/mp.13570

Luo Yi, 2019, BJR Open, V1, P20190021, DOI 10.1259/bjro.20190021

Luo Y, 2018, MED PHYS, V45, P3980, DOI 10.1002/mp.13029

LYMAN JT, 1985, RADIAT RES, V104, pS13, DOI 10.2307/3576626

Massa F, 2019, ADV NEURAL INFORM PR, V32

Murphy M.J., 2015, MACHINE LEARNING RAD, P3, DOI [10.1007/978-3-319-18305-3\_1, DOI 10.1007/978-3-319-18305-3\_1]

Naqa, 2018, GUIDE OUTCOME MODELI

Nguyen CD, 2017, EMERG THEMES EPIDEMI, V14, DOI 10.1186/s12982-017-0062-6

Pan SJ, 2010, IEEE T KNOWL DATA EN, V22, P1345, DOI 10.1109/TKDE.2009.191

Rahman MG, 2013, KNOWL-BASED SYST, V53, P51, DOI 10.1016/j.knosys.2013.08.023

Seppenwoolde Y, 2004, INT J RADIAT ONCOL, V60, P748, DOI 10.1016/j.ijrobp.2004.04.037

Socinski MA, 2001, CANCER, V92, P1213, DOI 10.1002/1097-0142(20010901)92:5<1213::AID-CNCR1440>3.0.CO;2-0

Tucker SL, 2008, INT J RADIAT ONCOL, V72, P568, DOI 10.1016/j.ijrobp.2008.04.053

Tyldesley S, 2001, INT J RADIAT ONCOL, V49, P973, DOI 10.1016/S0360-3016(00)01401-2

Uno H, 2011, STAT MED, V30, P1105, DOI 10.1002/sim.4154

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

Velec M, 2017, INT J RADIAT ONCOL, V97, P939, DOI 10.1016/j.ijrobp.2017.01.221

Velling M, 2014, AUTOENCODING VARIATI

Zhang SC, 2012, J SYST SOFTWARE, V85, P2541, DOI 10.1016/j.jss.2012.05.073

Zwanenburg A, 2020, RADIOLOGY, V295, P328, DOI 10.1148/radiol.2020191145

NR 57

TC 6

Z9 6

U1 2

U2 7

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD JUL 1

PY 2021

VL 110

IS 3

BP 893

EP 904

DI 10.1016/j.ijrobp.2021.01.042

EA JUN 2021

PG 12

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA SM0NA

UT WOS:000657308400038

PM 33539966

OA Bronze, Green Accepted

DA 2022-08-24

ER

PT J

AU Dercle, L

Fronheiser, M

Lu, L

Du, SY

Hayes, W

Leung, DK

Roy, A

Wilkerson, J

Guo, PZ

Fojo, AT

Schwartz, LH

Zhao, BS

AF Dercle, Laurent

Fronheiser, Matthew

Lu, Lin

Du, Shuyan

Hayes, Wendy

Leung, David K.

Roy, Amit

Wilkerson, Julia

Guo, Pingzhen

Fojo, Antonio T.

Schwartz, Lawrence H.

Zhao, Binsheng

TI Identification of Non-Small Cell Lung Cancer Sensitive to Systemic

Cancer Therapies Using Radiomics

SO CLINICAL CANCER RESEARCH

LA English

DT Article

ID FACTOR RECEPTOR MUTATION; COMPUTED-TOMOGRAPHY SCANS; VOLUMETRIC

MEASUREMENT; RESPONSE EVALUATION; CT CHARACTERISTICS; TUMOR

MEASUREMENTS; RADIATION-THERAPY; TEXTURE ANALYSIS; FEATURES; EGFR

AB Purpose: Using standard-of-care CT images obtained from patients with a diagnosis of non-small cell lung cancer (NSCLC), we defined radiomics signatures predicting the sensitivity of tumors to nivolumab, docetaxel, and gefitinib.

Experimental Design: Data were collected prospectively and analyzed retrospectively across multicenter clinical trials [nivolumab, n = 92, CheckMate017 (NCT01642004), Check-Mate063 (NCT01721759); docetaxel, n = 50, CheckMate017; gefitinib, n = 46, (NCT00588445)]. Patients were randomized to training or validation cohorts using either a 4:1 ratio (nivolumab: 72T:20V) or a 2:1 ratio (docetaxel: 32T:18V; gefitinib: 31T:15V) to ensure an adequate sample size in the validation set. Radiomics signatures were derived from quantitative analysis of early tumor changes from baseline to first on-treatment assessment. For each patient, 1,160 radiomics features were extracted from the largest measurable lung lesion. Tumors were classified as treatment sensitive or insensitive; reference standard was median progression-free survival (NCT01642004, NCT01721759) or surgery (NCT00588445). Machine learning was implemented to select up to four features to develop a radiomics signature in the training datasets and applied to each patient in the validation datasets to classify treatment sensitivity.

Results: The radiomics signatures predicted treatment sensitivity in the validation dataset of each study group with AUC (95 confidence interval): nivolumab, 0.77 (0.55-1.00); docetaxel, 0.67 (0.37-0.96); and gefitinib, 0.82 (0.53-0.97). Using serial radiographic measurements, the magnitude of exponential increase in signature features deciphering tumor volume, invasion of tumor boundaries, or tumor spatial heterogeneity was associated with shorter overall survival.

Conclusions: Radiomics signatures predicted tumor sensitivity to treatment in patients with NSCLC, offering an approach that could enhance clinical decision-making to continue systemic therapies and forecast overall survival.

C1 [Dercle, Laurent; Lu, Lin; Guo, Pingzhen; Schwartz, Lawrence H.; Zhao, Binsheng] Columbia Univ, Med Ctr, New York Presbyterian Hosp, Dept Radiol, New York, NY USA.

[Dercle, Laurent] Univ Paris Saclay, Gustave Roussy, Villejuif, France.

[Fronheiser, Matthew; Du, Shuyan; Hayes, Wendy; Leung, David K.] Bristol Myers Squibb, Translat Med, Princeton, NJ USA.

[Roy, Amit] Bristol Myers Squibb, Clin Pharmacol & Pharmacometr, Princeton, NJ USA.

[Wilkerson, Julia] NCI, NIH, Bethesda, MD 20892 USA.

[Fojo, Antonio T.] Columbia Univ, New York Presbyterian Hosp, New York, NY USA.

[Fojo, Antonio T.] James J Peters VA Med Ctr, New York, NY USA.

RP Dercle, L (通讯作者)，Columbia Univ, Med Ctr, 168th St, New York, NY 10032 USA.

EM laurent.dercle@gmail.com

RI Dercle, Laurent/C-9740-2018

OI Dercle, Laurent/0000-0002-1322-0710

FU NIH [U01 CA225431]; Bristol-Myers Squibb; Fondation Philanthropia;

Fondation Nuovo-Soldati

FX Authors acknowledge financial support from the NIH (U01 CA225431) and

Bristol-Myers Squibb. L. Dercle's work was partially funded by grants

from Fondation Philanthropia and Fondation Nuovo-Soldati. The content is

solely the responsibility of the authors and does not necessarily

represent the funding sources.

CR Aerts HJWL, 2016, SCI REP-UK, V6, DOI 10.1038/srep33860

Al-Kadi OS, 2008, IEEE T BIO-MED ENG, V55, P1822, DOI 10.1109/TBME.2008.919735

BREIMAN L, 2001, MACH LEARN, V0045

Chang K, 2016, NEURO-ONCOLOGY, V18, P1680, DOI 10.1093/neuonc/now086

Choi CM, 2015, RADIOLOGY, V275, P272, DOI 10.1148/radiol.14140848

Chow DS, 2014, AM J NEURORADIOL, V35, P498, DOI 10.3174/ajnr.A3724

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Dercle L, 2020, JNCI J NATL CANC I

Dercle L, 2017, JCO CLIN CANCER INFO, V1, DOI 10.1200/CCI.17.00108

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Emaminejad N, 2016, IEEE T BIO-MED ENG, V63, P1034, DOI 10.1109/TBME.2015.2477688

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

Grove O, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0118261

Ha R, 2016, CURR PROBL DIAGN RAD, V45, P297, DOI 10.1067/j.cpradiol.2016.02.003

Ha R, 2016, QUANT IMAG MED SURG, V6, P144, DOI 10.21037/qims.2016.03.03

Hanahan D, 2011, CELL, V144, P646, DOI 10.1016/j.cell.2011.02.013

Hsu JS, 2014, J THORAC IMAG, V29, P357, DOI 10.1097/RTI.0000000000000116

Huang Q, 2018, J MED IMAGING, V5, DOI 10.1117/1.JMI.5.1.011005

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Kadota K, 2014, AM J SURG PATHOL, V38, P1118, DOI 10.1097/PAS.0000000000000246

Kim TJ, 2016, ANN THORAC SURG, V101, P473, DOI 10.1016/j.athoracsur.2015.07.062

Koshkin VS, 2016, J CLIN ONCOL, V34, P3680, DOI 10.1200/JCO.2016.68.1858

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lee HJ, 2013, RADIOLOGY, V268, P254, DOI 10.1148/radiol.13112553

Li YJ, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-36421-0

Limkin EJ, 2017, ANN ONCOL, V28, P1191, DOI 10.1093/annonc/mdx034

Liu F, 2010, J THORAC ONCOL, V5, P879, DOI 10.1097/JTO.0b013e3181dd0ef1

Liu Y, 2016, CLIN LUNG CANCER, V17, P441, DOI 10.1016/j.cllc.2016.02.001

Liu Y, 2016, RADIOLOGY, V280, P271, DOI 10.1148/radiol.2016151455

Mattonen SA, 2016, INT J RADIAT ONCOL, V94, P1121, DOI 10.1016/j.ijrobp.2015.12.369

Novello S, 2016, ANN ONCOL, V27, pv1, DOI 10.1093/annonc/mdw326

Obuchowski NA, 2005, AM J ROENTGENOL, V184, P364, DOI 10.2214/ajr.184.2.01840364

Oxnard GR, 2011, J CLIN ONCOL, V29, P3114, DOI 10.1200/JCO.2010.33.7071

Ozkan E, 2015, AM J ROENTGENOL, V205, P1016, DOI 10.2214/AJR.14.14147

Rizzo S, 2016, EUR RADIOL, V26, P32, DOI 10.1007/s00330-015-3814-0

Seymour L, 2017, LANCET ONCOL, V18, pE143, DOI 10.1016/S1470-2045(17)30074-8

Shi Z, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00511-2

Sun R, 2018, LANCET ONCOL, V19, P1180, DOI 10.1016/S1470-2045(18)30413-3

Tan Y, 2013, MED PHYS, V40, DOI 10.1118/1.4815174

Terranova N, 2018, CPT-PHARMACOMET SYST, V7, P228, DOI 10.1002/psp4.12284

Trebeschi S, 2017, J CLIN ONCOL, V35, DOI 10.1200/JCO.2017.35.15\_suppl.e14520

Wilkerson J, 2017, LANCET ONCOL, V18, P143, DOI 10.1016/S1470-2045(16)30633-7

Wu WM, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00071

Yamamoto S, 2014, RADIOLOGY, V272, P568, DOI 10.1148/radiol.14140789

Yang Y, 2015, LUNG CANCER, V87, P272, DOI 10.1016/j.lungcan.2014.12.016

Yoon HJ, 2015, MEDICINE, V94, DOI 10.1097/MD.0000000000001753

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

Zhao BS, 2010, CLIN CANCER RES, V16, P4647, DOI 10.1158/1078-0432.CCR-10-0125

Zhao BS, 2009, RADIOLOGY, V252, P263, DOI 10.1148/radiol.2522081593

Zhou JY, 2015, EUR RADIOL, V25, P1257, DOI 10.1007/s00330-014-3516-z

NR 53

TC 44

Z9 45

U1 4

U2 14

PU AMER ASSOC CANCER RESEARCH

PI PHILADELPHIA

PA 615 CHESTNUT ST, 17TH FLOOR, PHILADELPHIA, PA 19106-4404 USA

SN 1078-0432

EI 1557-3265

J9 CLIN CANCER RES

JI Clin. Cancer Res.

PD MAY

PY 2020

VL 26

IS 9

BP 2151

EP 2162

DI 10.1158/1078-0432.CCR-19-2942

PG 12

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA LL8LT

UT WOS:000531806800010

PM 32198149

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Cheng, J

Pan, Y

Huang, W

Huang, K

Cui, YH

Hong, WH

Wang, LL

Ni, D

Tan, PX

AF Cheng, Jun

Pan, Yi

Huang, Wei

Huang, Kun

Cui, Yanhai

Hong, Wenhui

Wang, Lingling

Ni, Dong

Tan, Peixin

TI Differentiation between immune checkpoint inhibitor-related and

radiation pneumonitis in lung cancer by CT radiomics and machine

learning

SO MEDICAL PHYSICS

LA English

DT Article

DE CT radiomics; immune checkpoint inhibitor-related pneumonitis; lung

cancer; machine learning; radiation pneumonitis

ID RADIOGRAPHIC PATTERNS; RADIOTHERAPY; CHEMORADIOTHERAPY; CHEMORADIATION;

PEMBROLIZUMAB; CHEMOTHERAPY; CONCURRENT; MUTATIONS; RISK

AB Purpose Consolidation immunotherapy after completion of chemoradiotherapy has become the standard of care for unresectable locally advanced non-small cell lung cancer and can induce potentially severe and life-threatening adverse events, including both immune checkpoint inhibitor-related pneumonitis (CIP) and radiation pneumonitis (RP), which are very challenging for radiologists to diagnose. Differentiating between CIP and RP has significant implications for clinical management such as the treatments for pneumonitis and the decision to continue or restart immunotherapy. The purpose of this study is to differentiate between CIP and RP by a CT radiomics approach. Methods We retrospectively collected the CT images and clinical information of patients with pneumonitis who received immune checkpoint inhibitor (ICI) only (n = 28), radiotherapy (RT) only (n = 31), and ICI+RT (n = 14). Three kinds of radiomic features (intensity histogram, gray-level co-occurrence matrix [GLCM] based, and bag-of-words [BoW] features) were extracted from CT images, which characterize tissue texture at different scales. Classification models, including logistic regression, random forest, and linear SVM, were first developed and tested in patients who received ICI or RT only with 10-fold cross-validation and further tested in patients who received ICI+RT using clinicians' diagnosis as a reference. Results Using 10-fold cross-validation, the classification models built on the intensity histogram features, GLCM-based features, and BoW features achieved an area under curve (AUC) of 0.765, 0.848, and 0.937, respectively. The best model was then applied to the patients receiving combination treatment, achieving an AUC of 0.896. Conclusions This study demonstrates the promising potential of radiomic analysis of CT images for differentiating between CIP and RP in lung cancer, which could be a useful tool to attribute the cause of pneumonitis in patients who receive both ICI and RT.

C1 [Cheng, Jun; Hong, Wenhui; Wang, Lingling; Ni, Dong] Shenzhen Univ, Hlth Sci Ctr, Sch Biomed Engn, Natl Reg Key Technol Engn Lab Med Ultrasound,Guan, Shenzhen, Peoples R China.

[Cheng, Jun; Ni, Dong] Shenzhen Univ, Med Ultrasound Image Comp MUSIC Lab, Shenzhen, Peoples R China.

[Cheng, Jun; Ni, Dong] Shenzhen Univ, Marshall Lab Biomed Engn, Shenzhen, Peoples R China.

[Pan, Yi; Huang, Wei; Tan, Peixin] Guangdong Acad Med Sci, Guangdong Prov Peoples Hosp, Dept Radiat Oncol, Guangzhou, Peoples R China.

[Huang, Kun] Indiana Univ Sch Med, Dept Biostat & Hlth Data Sci, Indianapolis, IN 46202 USA.

[Huang, Kun] Regenstrief Inst Hlth Care, Indianapolis, IN USA.

[Cui, Yanhai] Guangdong Acad Med Sci, Guangdong Prov Peoples Hosp, Dept Radiol, Guangzhou, Peoples R China.

RP Ni, D (通讯作者)，Sch Biomed Engn, 1066 Xueyuan Ave, Shenzhen 518055, Peoples R China.; Tan, PX (通讯作者)，Dept Radiat Oncol, 106 Zhongshan 2nd Rd, Guangzhou 510080, Peoples R China.

EM nidong@szu.edu.cn; tpxsaxin@163.com

FU National Natural Science Foundation of China [61901275]; Guangzhou

Science and Technology Plan Foundation [2021-02-01-04-1002-0017];

Shenzhen University Startup Fund [2019131]; National Key R&D Program of

China [2019YFC0118300]; Shenzhen Peacock Plan [KQTD2016053112051497,

KQJSCX20180328095606003]; Medical Scientific Research Foundation of

Guangdong Province, China [B2018031, B2020024]; National Natural Science

Foundation of Guangdong Provincial People's Hospital [8210032051]

FX The authors thank Haiyan Tu, Biao Huang, and Jine Zhang from Guangdong

Provincial People's Hospital, China, for retrieving and reviewing the

chest CT scans of patients. This study was supported by National Natural

Science Foundation of China (61901275), Guangzhou Science and Technology

Plan Foundation (2021-02-01-04-1002-0017), Shenzhen University Startup

Fund (2019131), National Key R&D Program of China (2019YFC0118300),

Shenzhen Peacock Plan (KQTD2016053112051497 and

KQJSCX20180328095606003), Medical Scientific Research Foundation of

Guangdong Province, China (B2018031 and B2020024), and Supporting

start-up funds of National Natural Science Foundation of Guangdong

Provincial People's Hospital (8210032051). The funding sources have no

involvement in the study.

CR Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Beig N, 2019, RADIOLOGY, V290, P783, DOI 10.1148/radiol.2018180910

Bera Kaustav, 2018, Am Soc Clin Oncol Educ Book, V38, P1008, DOI 10.1200/EDBK\_199747

Bernchou U, 2017, RADIOTHER ONCOL, V123, P93, DOI 10.1016/j.radonc.2017.02.001

Bledsoe TJ, 2017, CLIN CHEST MED, V38, P201, DOI 10.1016/j.ccm.2016.12.004

Bradley J, 2006, CANC TREAT, V128, P43

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Brahmer JR, 2018, J CLIN ONCOL, V36, P1714, DOI 10.1200/JCO.2017.77.6385

Cadranel J, 2019, EUR RESPIR REV, V28, DOI 10.1183/16000617.0058-2019

Chen AP, 2019, AM J ROENTGENOL, V213, P134, DOI 10.2214/AJR.18.20591

Chen X, 2020, INT J RADIAT ONCOL, V108, pS163

Cheng J, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0115339

Cho JY, 2018, LUNG CANCER, V125, P150, DOI 10.1016/j.lungcan.2018.09.015

Chuzi S, 2017, CANCER MANAG RES, V9, P207, DOI 10.2147/CMAR.S136818

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Curran WJ, 2011, J NATL CANCER I, V103, P1452, DOI 10.1093/jnci/djr325

Gandhi L, 2018, NEW ENGL J MED, V378, P2078, DOI 10.1056/NEJMoa1801005

Jiang YM, 2021, ANN SURG, V274, pE1153, DOI 10.1097/SLA.0000000000003778

Khorrami M, 2019, LUNG CANCER, V135, P1, DOI 10.1016/j.lungcan.2019.06.020

Lin SH, 2020, J THORAC ONCOL, V15, P248, DOI 10.1016/j.jtho.2019.10.024

Naidoo J, 2020, CLIN LUNG CANCER, V21, pE435, DOI 10.1016/j.cllc.2020.02.025

Naidoo J, 2017, J CLIN ONCOL, V35, P709, DOI 10.1200/JCO.2016.68.2005

Nishino M, 2016, CLIN CANCER RES, V22, P6051, DOI 10.1158/1078-0432.CCR-16-1320

Nishino M, 2016, JAMA ONCOL, V2, P1607, DOI 10.1001/jamaoncol.2016.2453

Peters S, 2019, LUNG CANCER, V133, P83, DOI 10.1016/j.lungcan.2019.05.001

Reck M, 2016, NEW ENGL J MED, V375, P1823, DOI 10.1056/NEJMoa1606774

Rizzo S, 2016, EUR RADIOL, V26, P32, DOI 10.1007/s00330-015-3814-0

SAITO G, 2020, J CLIN ONCOL, V38

Schoenfeld JD, 2019, J IMMUNOTHER CANCER, V7, DOI 10.1186/s40425-019-0583-3

Shaverdian N, 2017, LANCET ONCOL, V18, P895, DOI 10.1016/S1470-2045(17)30380-7

Sun R, 2018, LANCET ONCOL, V19, P1180, DOI 10.1016/S1470-2045(18)30413-3

Thomas R, 2020, LUNG CANCER, V145, P132, DOI 10.1016/j.lungcan.2020.03.023

Tirumani SH, 2015, CANCER IMMUNOL RES, V3, P1185, DOI 10.1158/2326-6066.CIR-15-0102

Torheim T, 2014, IEEE T MED IMAGING, V33, P1648, DOI 10.1109/TMI.2014.2321024

Uthoff J, 2019, TRANSL LUNG CANCER R, V8, P979, DOI 10.21037/tlcr.2019.12.19

Velazquez ER, 2017, CANCER RES, V77, P3922, DOI 10.1158/0008-5472.CAN-17-0122

Voong KR, 2019, CLIN LUNG CANCER, V20, pE470, DOI 10.1016/j.cllc.2019.02.018

Wang SL, 2008, J THORAC ONCOL, V3, P277, DOI 10.1097/JTO.0b013e3181653ca6

Xu X, 2019, J HEPATOL, V70, P1133, DOI 10.1016/j.jhep.2019.02.023

Xu YW, 2019, CLIN CANCER RES, V25, P3266, DOI 10.1158/1078-0432.CCR-18-2495

NR 41

TC 3

Z9 3

U1 2

U2 2

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD MAR

PY 2022

VL 49

IS 3

BP 1547

EP 1558

DI 10.1002/mp.15451

EA JAN 2022

PG 12

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA ZP2EX

UT WOS:000747296500001

PM 35026041

OA Green Published, hybrid

DA 2022-08-24

ER

PT J

AU Chao, HH

Valdes, G

Luna, JM

Heskel, M

Berman, AT

Solberg, TD

Simone, CB

AF Chao, Hann-Hsiang

Valdes, Gilmer

Luna, Jose M.

Heskel, Marina

Berman, Abigail T.

Solberg, Timothy D.

Simone, Charles B.

TI Exploratory analysis using machine learning to predict for chest wall

pain in patients with stage I non-small-cell lung cancer treated with

stereotactic body radiation therapy

SO JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS

LA English

DT Article

DE chest wall pain; dosimetry; machine learning; non-small-cell lung

cancer; SBRT

ID INDUCED RIB FRACTURES; ABLATIVE RADIOTHERAPY; DECISION-SUPPORT;

RISK-FACTORS; STRATEGIES; TOXICITY

AB Background and purpose: Chest wall toxicity is observed after stereotactic body radiation therapy (SBRT) for peripherally located lung tumors. We utilize machine learning algorithms to identify toxicity predictors to develop dose volume constraints.

Materials and methods: Twenty-five patient, tumor, and dosimetric features were recorded for 197 consecutive patients with Stage I NSCLC treated with SBRT, 11 of whom (5.6%) developed CTCAEv4 grade >= 2 chest wall pain. Decision tree modeling was used to determine chest wall syndrome (CWS) thresholds for individual features. Significant features were determined using independent multivariate methods. These methods incorporate out-of-bag estimation using Random forests (RF) and bootstrapping (100 iterations) using decision trees.

Results: Univariate analysis identified rib dose to 1 cc < 4000 cGy (P = 0.01), chest wall dose to 30 cc < 1900 cGy (P = 0.035), rib Dmax < 5100 cGy (P = 0.05) and lung dose to 1000 cc < 70 cGy (P = 0.039) to be statistically significant thresholds for avoiding CWS. Subsequent multivariate analysis confirmed the importance of rib dose to 1 cc, chest wall dose to 30 cc, and rib Dmax. Using learning-curve experiments, the dataset proved to be self-consistent and provides a realistic model for CWS analysis.

Conclusions: Using machine learning algorithms in this first of its kind study, we identify robust features and cutoffs predictive for the rare clinical event of CWS. Additional data in planned subsequent multicenter studies will help increase the accuracy of multivariate analysis.

C1 [Chao, Hann-Hsiang; Valdes, Gilmer; Luna, Jose M.; Heskel, Marina; Berman, Abigail T.; Solberg, Timothy D.] Univ Penn, Dept Radiat Oncol, Philadelphia, PA 19104 USA.

[Valdes, Gilmer; Solberg, Timothy D.] Univ Calif San Francisco, Dept Radiat Oncol, San Francisco, CA 94143 USA.

[Simone, Charles B.] Univ Maryland, Sch Med, Dept Radiat Oncol, Baltimore, MD 21201 USA.

RP Simone, CB (通讯作者)，Univ Maryland, Sch Med, Dept Radiat Oncol, Baltimore, MD 21201 USA.

EM charlessimone@umm.edu

RI Luna, Jose Marcio/ABG-1296-2020

OI , Timothy/0000-0001-8829-7774; Simone, Charles/0000-0002-0867-3694;

Luna, Jose/0000-0002-5513-022X

CR Andolino DL, 2011, INT J RADIAT ONCOL, V80, P692, DOI 10.1016/j.ijrobp.2010.03.020

[Anonymous], 2001, SPRINGE SER STAT N

Aoki M, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0406-8

Asai K, 2012, INT J RADIAT ONCOL, V84, P768, DOI 10.1016/j.ijrobp.2012.01.027

Baumann BC, 2016, J SURG ONCOL, V114, P65, DOI 10.1002/jso.24268

Bongers EM, 2011, J THORAC ONCOL, V6, P2052, DOI 10.1097/JTO.0b013e3182307e74

Breiman L, 2001, MACH LEARN, V45, P27

Breiman L., 2004, 670 UC BERK

Chang JY, 2015, LANCET ONCOL, V16, P630, DOI 10.1016/S1470-2045(15)70168-3

Creach KM, 2012, RADIOTHER ONCOL, V104, P23, DOI 10.1016/j.radonc.2012.01.014

Darcy AM, 2016, JAMA-J AM MED ASSOC, V315, P551, DOI 10.1001/jama.2015.18421

Dunlap NE, 2010, INT J RADIAT ONCOL, V76, P796, DOI 10.1016/j.ijrobp.2009.02.027

El Naqa I, 2010, ACTA ONCOL, V49, P1363, DOI 10.3109/02841861003649224

Hastie T., 2009, ELEMENTS STAT LEARNI, V2nd ed.

Kim SS, 2013, LUNG CANCER, V79, P161, DOI 10.1016/j.lungcan.2012.10.011

Kimsey F, 2016, SEMIN RADIAT ONCOL, V26, P129, DOI 10.1016/j.semradonc.2015.11.003

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lo SS, 2013, CLIN ONCOL-UK, V25, P378, DOI 10.1016/j.clon.2013.01.003

Luna JM, 2017, ARXIV171106793

Mutter RW, 2012, INT J RADIAT ONCOL, V82, P1783, DOI 10.1016/j.ijrobp.2011.03.053

Nambu A, 2013, BMC CANCER, V13, DOI 10.1186/1471-2407-13-68

Nambu A, 2011, RADIAT ONCOL, V6, DOI 10.1186/1748-717X-6-137

Pettersson N, 2009, RADIOTHER ONCOL, V91, P360, DOI 10.1016/j.radonc.2009.03.022

Shirvani SM, 2012, INT J RADIAT ONCOL, V84, P1060, DOI 10.1016/j.ijrobp.2012.07.2354

Simone CB, 2015, ANN TRANSL MED, V3, DOI 10.3978/j.issn.2305-5839.2015.07.26

Simone CB, 2013, CHEST, V143, P1784, DOI 10.1378/chest.12-2580

Stam B, 2017, RADIOTHER ONCOL, V123, P176, DOI 10.1016/j.radonc.2017.01.004

Stephans KL, 2012, INT J RADIAT ONCOL, V82, P974, DOI 10.1016/j.ijrobp.2010.12.002

Taremi M, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-159

Thibault I, 2016, CLIN ONCOL-UK, V28, P28, DOI 10.1016/j.clon.2015.06.009

Valdes G, 2016, MED PHYS, V43, P4323, DOI 10.1118/1.4953835

Valdes G, 2017, RADIOTHER ONCOL, V125, P392, DOI 10.1016/j.radonc.2017.10.014

Valdes G, 2017, J APPL CLIN MED PHYS, V18, P279, DOI 10.1002/acm2.12161

Valdes G, 2016, SCI REP-UK, V6, DOI 10.1038/srep37854

Valdes G, 2016, PHYS MED BIOL, V61, P6105, DOI 10.1088/0031-9155/61/16/6105

Valdes G, 2015, J APPL CLIN MED PHYS, V16, P322, DOI 10.1120/jacmp.v16i4.5363

Verma V, 2017, CLIN LUNG CANCER, V18, P675, DOI 10.1016/j.cllc.2017.03.009

Verma V, 2017, INT J RADIAT ONCOL, V97, P362, DOI 10.1016/j.ijrobp.2016.10.041

Woody NM, 2012, INT J RADIAT ONCOL, V83, P427, DOI 10.1016/j.ijrobp.2011.06.1971

Zheng XP, 2014, INT J RADIAT ONCOL, V90, P603, DOI 10.1016/j.ijrobp.2014.05.055

NR 40

TC 8

Z9 8

U1 0

U2 7

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1526-9914

J9 J APPL CLIN MED PHYS

JI J. Appl. Clin. Med. Phys

PD SEP

PY 2018

VL 19

IS 5

BP 539

EP 546

DI 10.1002/acm2.12415

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA GS5GL

UT WOS:000443685500026

PM 29992732

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Yan, MM

Wang, WD

AF Yan, Mengmeng

Wang, Weidong

TI A radiomics model of predicting tumor volume change of patients with

stage III non-small cell lung cancer after radiotherapy

SO SCIENCE PROGRESS

LA English

DT Article

DE Radiomics; lung cancer; medical knowledge; precision medicine

AB To predict the volume change of stage III NSCLC after radiotherapy with 60 Gy.

This retrospective study included two independent cohorts, a train cohort of 192 patients, and a test cohort of 31 patients. We developed a radiomics model based on radiomics features and clinical variables. LIFEx package was used to extract radiomics texture features from CT images. The classification method was logistic regression analysis and feature selection was performed by correlation coefficients. Performance metrics of logistic regression include accuracy, precision, the receiver operating characteristic curves, and recall.

The combination features of clinical variables and radiomics can predict the tumor volume change after radiotherapy with 88.7% accuracy (88.6% precision, 88.7% recall, and 88.7% ROC area).

Radiomics features combined with medical knowledge have a great potential to predict accurately tumor volume change of stage III NSCLC after radiotherapy with 60 Gy.

C1 [Yan, Mengmeng] Urban Vocat Coll Sichuan, Chengdu, Peoples R China.

[Yan, Mengmeng] Univ Elect Sci & Technol China, Sch Med, Chengdu, Peoples R China.

[Wang, Weidong] Sichuan Canc Hosp & Inst, Dept Radiat Oncol, 55,Sect 4,South Renmin Rd, Chengdu 610041, Peoples R China.

[Wang, Weidong] Radiat Oncol Key Lab Sichuan Prov, Chengdu, Peoples R China.

RP Wang, WD (通讯作者)，Sichuan Canc Hosp & Inst, Dept Radiat Oncol, 55,Sect 4,South Renmin Rd, Chengdu 610041, Peoples R China.

EM 18380171863@163.com

FU National Key Research and Development program [2017YFC0113904]

FX The author(s) disclosed receipt of the following financial support for

the research, authorship, and/or publication of this article: This study

was supported by National Key Research and Development program

(2017YFC0113904).

CR Aerts HJWL, 2016, SCI REP-UK, V6, DOI 10.1038/srep33860

Ather S, 2020, CLIN RADIOL, V75, P13, DOI 10.1016/j.crad.2019.04.017

Avanzo M, 2020, MED PHYS, V47, pE185, DOI 10.1002/mp.13678

Avanzo M, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.00490

Avanzo M, 2020, STRAHLENTHER ONKOL, V196, P879, DOI 10.1007/s00066-020-01625-9

Buckley AM, 2020, NAT REV GASTRO HEPAT, V17, P298, DOI 10.1038/s41575-019-0247-2

Bulens P, 2020, RADIOTHER ONCOL, V142, P246, DOI 10.1016/j.radonc.2019.07.033

Costa B, 2020, EBIOMEDICINE, V51, DOI 10.1016/j.ebiom.2019.11.039

de Jong EEC, 2019, EUR J CANCER, V120, P107, DOI 10.1016/j.ejca.2019.07.023

Du Y, 2019, CANCER LETT, V466, P13, DOI 10.1016/j.canlet.2019.08.009

Ferreira JR, 2020, INT J COMPUT ASS RAD, V15, P163, DOI 10.1007/s11548-019-02093-y

Forghani R, 2019, COMPUT STRUCT BIOTEC, V17, P995, DOI 10.1016/j.csbj.2019.07.001

Fornacon-Wood I, 2020, LUNG CANCER, V146, P197, DOI 10.1016/j.lungcan.2020.05.028

Galldiks N, 2020, NEURO-ONCOLOGY, V22, P17, DOI 10.1093/neuonc/noz147

Ger RB, 2019, PLOS ONE, V14, DOI 10.1371/journal.pone.0222509

Gurtner K, 2020, INT J CANCER, V147, P472, DOI 10.1002/ijc.32598

Hyun SH, 2019, CLIN NUCL MED, V44, P956, DOI 10.1097/RLU.0000000000002810

Isaksson LJ, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.00790

Koyasu S, 2020, ANN NUCL MED, V34, P49, DOI 10.1007/s12149-019-01414-0

Lee G, 2020, KOREAN J RADIOL, V21, P159, DOI 10.3348/kjr.2019.0630

Mohammadi H, 2020, INT J RADIAT ONCOL, V106, P496, DOI 10.1016/j.ijrobp.2019.11.013

Nioche C, 2017, J NUCL MED, V58

Rogers W, 2020, BRIT J RADIOL, V93, DOI 10.1259/bjr.20190948

Sanz-Santos J, 2020, RESPIROLOGY, V25, P37, DOI 10.1111/resp.13901

Schwartz DL, 2020, HEMATOL ONCOL CLIN N, V34, P91, DOI 10.1016/j.hoc.2019.08.019

Scott JG, 2017, LANCET ONCOL, V18, P202, DOI 10.1016/S1470-2045(16)30648-9

Shboul ZA, 2019, FRONT NEUROSCI-SWITZ, V13, DOI 10.3389/fnins.2019.00966

Song WL, 2020, J MAGN RESON IMAGING, V52, P461, DOI 10.1002/jmri.26977

Tiwari P, 2020, INT J RADIAT BIOL, V96, P360, DOI 10.1080/09553002.2020.1694193

van Laar M, 2020, RADIOTHER ONCOL, V151, P152, DOI 10.1016/j.radonc.2020.07.030

Witten IH, 2011, MOR KAUF D, P1

Xiong QQ, 2020, CLIN TRANSL ONCOL, V22, P50, DOI 10.1007/s12094-019-02109-8

Yan MM, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.00602

Zhao LN, 2020, EUR RADIOL, V30, P537, DOI 10.1007/s00330-019-06211-x

Zwanenburg A, ARXIV161207003 CORN

NR 35

TC 0

Z9 0

U1 0

U2 2

PU SAGE PUBLICATIONS LTD

PI LONDON

PA 1 OLIVERS YARD, 55 CITY ROAD, LONDON EC1Y 1SP, ENGLAND

SN 0036-8504

EI 2047-7163

J9 SCI PROGRESS-UK

JI Sci. Prog.

PD JAN

PY 2021

VL 104

IS 1

AR 0036850421997295

DI 10.1177/0036850421997295

PG 10

WC Education, Scientific Disciplines; Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Education & Educational Research; Science & Technology - Other Topics

GA QV2DS

UT WOS:000627787800001

PM 33687294

OA gold

DA 2022-08-24

ER

PT J

AU Jiao, ZC

Li, HM

Xiao, Y

Dorsey, J

Simone, CB

Feigenberg, S

Kao, G

Fan, Y

AF Jiao, Zhicheng

Li, Hongming

Xiao, Ying

Dorsey, Jay

Simone, Charles B.

Feigenberg, Steven

Kao, Gary

Fan, Yong

TI Integration of Deep Learning Radiomics and Counts of Circulating Tumor

Cells Improves Prediction of Outcomes of Early Stage NSCLC Patients

Treated With Stereotactic Body Radiation Therapy

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

ID LUNG-CANCER PATIENTS; TREATMENT RESPONSE; SURVIVAL; RADIOTHERAPY;

BIOMARKERS; PROGNOSIS; SIGNATURE; MEDICINE; FEATURES; DISEASE

AB Purpose: We develop a deep learning (DL) radiomics model and integrate it with circulating tumor cell (CTC) counts as a clinically useful prognostic marker for predicting recurrence outcomes of early-stage (ES) non-small cell lung cancer (NSCLC) patients treated with stereotactic body radiation therapy (SBRT).

Methods and Materials: A cohort of 421 NSCLC patients was used to train a DL model for gleaning informative imaging features from computed tomography (CT) data. The learned imaging features were optimized on a cohort of 98 ES-NSCLC patients treated with SBRT for predicting individual patient recurrence risks by building DL models on CT data and clinical measures. These DL models were validated on the third cohort of 60 ES-NSCLC patients treated with SBRT to predict recurrent risks and stratify patients into subgroups with distinct outcomes in conjunction with CTC counts.

Results: The DL model obtained a concordance-index of 0.880 (95% confidence interval, 0.879-0.881). Patient subgroups with low and high DL risk scores had significantly different recurrence outcomes (P = 3.5e-04). The integration of DL risk scores and CTC measures identified 4 subgroups of patients with significantly different risks of recurrence (chi(2) = 20.11, P = 1.6e-04). Patients with positive CTC measures were associated with increased risks of recurrence that were significantly different from patients with negative CTC measures (P = 0.0447).

Conclusions: In this first-ever study integrating DL radiomics models and CTC counts, our results suggested that this integration improves patient stratification compared with either imagining data or CTC measures alone in predicting recurrence outcomes for patients treated with SBRT for ES-NSCLC. (C) 2021 Elsevier Inc. All rights reserved.

C1 [Jiao, Zhicheng; Li, Hongming; Fan, Yong] Univ Penn, Dept Radiol, Perelman Sch Med, Philadelphia, PA 19104 USA.

[Xiao, Ying; Dorsey, Jay; Feigenberg, Steven; Kao, Gary] Univ Penn, Dept Radiat Oncol, Perelman Sch Med, Philadelphia, PA 19104 USA.

[Simone, Charles B.] New York Proton Ctr, New York, NY USA.

[Simone, Charles B.] Mem Sloan Kettering Canc Ctr, Dept Radiat Oncol, 1275 York Ave, New York, NY 10021 USA.

RP Fan, Y (通讯作者)，Univ Penn, Dept Radiol, Perelman Sch Med, Philadelphia, PA 19104 USA.

EM yong.fan@pennmedicine.upenn.edu

FU National Cancer Institute of the National Institutes of Health

[CA223358]

FX This study was supported by the National Cancer Institute of the

National Institutes of Health under award number CA223358.

CR Aboutalib SS, 2018, CLIN CANCER RES, V24, P5902, DOI 10.1158/1078-0432.CCR-18-1115

Aceto N, 2014, CELL, V158, P1110, DOI 10.1016/j.cell.2014.07.013

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Chaudharyl K, 2018, CLIN CANCER RES, V24, P1248, DOI 10.1158/1078-0432.CCR-17-0853

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Danila DC, 2007, CLIN CANCER RES, V13, P7053, DOI 10.1158/1078-0432.CCR-07-1506

Dorsey JF, 2015, CANCER-AM CANCER SOC, V121, P139, DOI 10.1002/cncr.28975

Ettinger DS, 2012, J NATL COMPR CANC NE, V10, P1236, DOI 10.6004/jnccn.2012.0130

FLEMING TR, 1981, COMMUN STAT A-THEOR, V10, P763, DOI 10.1080/03610928108828073

Frick MA, 2020, CLIN CANCER RES, V26, P2372, DOI 10.1158/1078-0432.CCR-19-2158

Frick MA, 2018, INT J RADIAT ONCOL, V102, P536, DOI 10.1016/j.ijrobp.2018.06.041

Henschke CI, 2006, NEW ENGL J MED, V355, P1763, DOI 10.1056/NEJMoa060476

Hosny A, 2018, PLOS MED, V15, DOI 10.1371/journal.pmed.1002711

Hou JM, 2012, J CLIN ONCOL, V30, P525, DOI 10.1200/JCO.2010.33.3716

Howlander N, 2019, SEER CANC STAT REV C

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Jiao ZC, 2021, INT J RADIAT ONCOL, V109, P1647, DOI 10.1016/j.ijrobp.2020.12.014

Kang L, 2015, STAT MED, V34, P685, DOI 10.1002/sim.6370

Kapadia NS, 2017, ANN THORAC SURG, V104, P1881, DOI 10.1016/j.athoracsur.2017.06.065

Kong FM, 2017, TRANSL LUNG CANCER R, V6, P713, DOI 10.21037/tlcr.2017.09.11

Kovalchik SA, 2013, NEW ENGL J MED, V369, P245, DOI 10.1056/NEJMoa1301851

Krebs MG, 2011, J CLIN ONCOL, V29, P1556, DOI 10.1200/JCO.2010.28.7045

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

LeCun Y, 2015, NATURE, V521, P436, DOI 10.1038/nature14539

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Li HM, 2019, I S BIOMED IMAGING, P846, DOI 10.1109/ISBI.2019.8759301

Li HM, 2018, RADIOTHER ONCOL, V129, P218, DOI 10.1016/j.radonc.2018.06.025

Lim C, 2017, CURR ONCOL, V24, P103, DOI 10.3747/co.24.3495

Lin DY, 2007, LIFETIME DATA ANAL, V13, P471, DOI 10.1007/s10985-007-9048-y

Liu HF, 2020, IEEE T BIO-MED ENG, V67, P2735, DOI 10.1109/TBME.2020.2969839

MacArthur KM, 2014, CANCER RES, V74, P2152, DOI 10.1158/0008-5472.CAN-13-0813

MARTINI N, 1975, J THORAC CARDIOV SUR, V70, P606

Mukherjee P, 2020, NAT MACH INTELL, V2, P274, DOI 10.1038/s42256-020-0173-6

Palma D, 2010, J CLIN ONCOL, V28, P5153, DOI 10.1200/JCO.2010.30.0731

Pignon JP, 2008, J CLIN ONCOL, V26, P3552, DOI 10.1200/JCO.2007.13.9030

Shah JL, 2017, SEMIN RADIAT ONCOL, V27, P218, DOI 10.1016/j.semradonc.2017.03.001

Siegel RL, 2022, CA-CANCER J CLIN, V72, P7, DOI [10.3322/caac.21332, 10.3322/caac.21708, 10.3322/caac.21551]

Timmerman RD, 2018, JAMA ONCOL, V4, P1263, DOI 10.1001/jamaoncol.2018.1251

Vachani A, 2017, AM J RESP CRIT CARE, V195, P1150, DOI 10.1164/rccm.201702-0433CI

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Videtic GMM, 2017, PRACT RADIAT ONCOL, V7, P295, DOI 10.1016/j.prro.2017.04.014

Xi IL, 2020, CLIN CANCER RES, V26, P1944, DOI 10.1158/1078-0432.CCR-19-0374

Xu YW, 2019, CLIN CANCER RES, V25, P3266, DOI 10.1158/1078-0432.CCR-18-2495

Zhou B, 2016, PROC CVPR IEEE, P2921, DOI 10.1109/CVPR.2016.319

NR 44

TC 0

Z9 0

U1 4

U2 4

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD MAR 15

PY 2022

VL 112

IS 4

BP 1045

EP 1054

DI 10.1016/j.ijrobp.2021.11.006

PG 10

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA ZG5QP

UT WOS:000760312800026

PM 34775000

DA 2022-08-24

ER

PT J

AU Schildkraut, JS

Prosser, N

Savakis, A

Gomez, J

Nazareth, D

Singh, AK

Malhotra, HK

AF Schildkraut, J. S.

Prosser, N.

Savakis, A.

Gomez, J.

Nazareth, D.

Singh, A. K.

Malhotra, H. K.

TI Level-set segmentation of pulmonary nodules in megavolt electronic

portal images using a CT prior

SO MEDICAL PHYSICS

LA English

DT Article

DE level-set segmentation; electronic portal imaging device; pulmonary

nodule; computed tomography; radiation oncology; computer-aided

detection; digitally reconstructed radiograph; graphical processing unit

ID GUIDED RADIATION-THERAPY; TUMOR-TRACKING; RADIOTHERAPY; MARKERS; SYSTEM

AB Purpose: Pulmonary nodules present unique problems during radiation treatment due to nodule position uncertainty that is caused by respiration. The radiation field has to be enlarged to account for nodule motion during treatment. The purpose of this work is to provide a method of locating a pulmonary nodule in a megavolt portal image that can be used to reduce the internal target volume (ITV) during radiation therapy. A reduction in the ITV would result in a decrease in radiation toxicity to healthy tissue.

Methods: Eight patients with nonsmall cell lung cancer were used in this study. CT scans that include the pulmonary nodule were captured with a GE Healthcare LightSpeed RT 16 scanner. Megavolt portal images were acquired with a Varian Trilogy unit equipped with an AS1000 electronic portal imaging device. The nodule localization method uses grayscale morphological filtering and level-set segmentation with a prior. The treatment-time portion of the algorithm is implemented on a graphical processing unit.

Results: The method was retrospectively tested on eight cases that include a total of 151 megavolt portal image frames. The method reduced the nodule position uncertainty by an average of 40% for seven out of the eight cases. The treatment phase portion of the method has a subsecond execution time that makes it suitable for near-real-time nodule localization.

Conclusions: A method was developed to localize a pulmonary nodule in a megavolt portal image. The method uses the characteristics of the nodule in a prior CT scan to enhance the nodule in the portal image and to identify the nodule region by level-set segmentation. In a retrospective study, the method reduced the nodule position uncertainty by an average of 40% for seven out of the eight cases studied. (C) 2010 American Association of Physicists in Medicine. [DOI: 10.1118/1.3495538]

C1 [Schildkraut, J. S.] Carestream Hlth Inc, Rochester, NY 14615 USA.

[Prosser, N.; Savakis, A.] Rochester Inst Technol, Rochester, NY 14623 USA.

[Gomez, J.; Nazareth, D.; Singh, A. K.; Malhotra, H. K.] Roswell Pk Canc Ctr, Buffalo, NY 14263 USA.

RP Schildkraut, JS (通讯作者)，Carestream Hlth Inc, Rochester, NY 14615 USA.

EM jay.schildkraut@carestreamhealth.com

CR Gierga DP, 2005, INT J RADIAT ONCOL, V61, P1551, DOI 10.1016/j.ijrobp.2004.12.013

Harada T, 2002, CANCER, V95, P1720, DOI 10.1002/cncr.10856

Letourneau D, 2005, RADIOTHER ONCOL, V75, P279, DOI 10.1016/j.radonc.2005.03.001

Lin T, 2009, PHYS MED BIOL, V54, P981, DOI 10.1088/0031-9155/54/4/011

Liu HS, 2003, MED PHYS, V30, P103, DOI 10.1118/1.1533748

PLUEMPITIWIRIYA.C, 2004, P IEEE INT S BIOIMAG

SCHILDKRAUT JS, 2009, P SPIE MED IM C ORL

SCHILDKRAUT JS, 2009, P AAPM 51 ANN M AN C

SCHILDKRAUT JS, 2008, P SCI C STER BOD RAD

Shirato H, 2000, INT J RADIAT ONCOL, V48, P1187, DOI 10.1016/S0360-3016(00)00748-3

SUSSMAN M, 1994, J COMPUT PHYS, V114, P146, DOI 10.1006/jcph.1994.1155

van Ginneken B, 2001, IEEE T MED IMAGING, V20, P1228, DOI 10.1109/42.974918

Vigneault E, 1997, INT J RADIAT ONCOL, V37, P205, DOI 10.1016/S0360-3016(96)00341-0

Xing L, 2006, MED DOSIM, V31, P91, DOI 10.1016/j.meddos.2005.12.004

NR 14

TC 5

Z9 5

U1 0

U2 6

PU AMER ASSOC PHYSICISTS MEDICINE AMER INST PHYSICS

PI MELVILLE

PA STE 1 NO 1, 2 HUNTINGTON QUADRANGLE, MELVILLE, NY 11747-4502 USA

SN 0094-2405

J9 MED PHYS

JI Med. Phys.

PD NOV

PY 2010

VL 37

IS 11

BP 5703

EP 5710

DI 10.1118/1.3495538

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 674MA

UT WOS:000283747600016

PM 21158282

DA 2022-08-24

ER

PT J

AU Deist, TM

Dankers, FJWM

Valdes, G

Wijsman, R

Hsu, IC

Oberije, C

Lustberg, T

van Soest, J

Hoebers, F

Jochems, A

El Naqa, I

Wee, L

Morin, O

Raleigh, DR

Bots, W

Kaanders, JH

Belderbos, J

Kwint, M

Solberg, T

Monshouwer, R

Bussink, J

Dekker, A

Lambin, P

AF Deist, Timo M.

Dankers, Frank J. W. M.

Valdes, Gilmer

Wijsman, Robin

Hsu, I-Chow

Oberije, Cary

Lustberg, Tim

van Soest, Johan

Hoebers, Frank

Jochems, Arthur

El Naqa, Issam

Wee, Leonard

Morin, Olivier

Raleigh, David R.

Bots, Wouter

Kaanders, Johannes H.

Belderbos, Jose

Kwint, Margriet

Solberg, Timothy

Monshouwer, Rene

Bussink, Johan

Dekker, Andre

Lambin, Philippe

TI Machine learning algorithms for outcome prediction in

(chemo)radiotherapy: An empirical comparison of classifiers

SO MEDICAL PHYSICS

LA English

DT Article

DE classification; machine learning; outcome prediction; predictive

modeling; radiotherapy

ID CELL LUNG-CANCER; MODULATED RADIATION-THERAPY; ACUTE ESOPHAGEAL

TOXICITY; SURVIVAL PREDICTION; RADIOTHERAPY; MODEL; VALIDATION;

BIOMARKERS

AB PurposeMachine learning classification algorithms (classifiers) for prediction of treatment response are becoming more popular in radiotherapy literature. General Machine learning literature provides evidence in favor of some classifier families (random forest, support vector machine, gradient boosting) in terms of classification performance. The purpose of this study is to compare such classifiers specifically for (chemo)radiotherapy datasets and to estimate their average discriminative performance for radiation treatment outcome prediction.

MethodsWe collected 12 datasets (3496 patients) from prior studies on post-(chemo)radiotherapy toxicity, survival, or tumor control with clinical, dosimetric, or blood biomarker features from multiple institutions and for different tumor sites, that is, (non-)small-cell lung cancer, head and neck cancer, and meningioma. Six common classification algorithms with built-in feature selection (decision tree, random forest, neural network, support vector machine, elastic net logistic regression, LogitBoost) were applied on each dataset using the popular open-source R package caret. The R code and documentation for the analysis are available online (). All classifiers were run on each dataset in a 100-repeated nested fivefold cross-validation with hyperparameter tuning. Performance metrics (AUC, calibration slope and intercept, accuracy, Cohen's kappa, and Brier score) were computed. We ranked classifiers by AUC to determine which classifier is likely to also perform well in future studies. We simulated the benefit for potential investigators to select a certain classifier for a new dataset based on our study (pre-selection based on other datasets) or estimating the best classifier for a dataset (set-specific selection based on information from the new dataset) compared with uninformed classifier selection (random selection).

ResultsRandom forest (best in 6/12 datasets) and elastic net logistic regression (best in 4/12 datasets) showed the overall best discrimination, but there was no single best classifier across datasets. Both classifiers had a median AUC rank of 2. Preselection and set-specific selection yielded a significant average AUC improvement of 0.02 and 0.02 over random selection with an average AUC rank improvement of 0.42 and 0.66, respectively.

ConclusionRandom forest and elastic net logistic regression yield higher discriminative performance in (chemo)radiotherapy outcome and toxicity prediction than other studied classifiers. Thus, one of these two classifiers should be the first choice for investigators when building classification models or to benchmark one's own modeling results against. Our results also show that an informed preselection of classifiers based on existing datasets can improve discrimination over random selection.

C1 [Deist, Timo M.; Jochems, Arthur; Lambin, Philippe] Maastricht Univ, Med Ctr, Sch Oncol & Dev Biol, D Lab Decis Support Precis Med,GROW, Univ Singel 40, NL-6229 ER Maastricht, Netherlands.

[Deist, Timo M.; Dankers, Frank J. W. M.; Oberije, Cary; Jochems, Arthur] Maastricht Univ, Med Ctr, Sch Oncol & Dev Biol, Dept Radiat Oncol,GROW, Maastricht, Netherlands.

[Dankers, Frank J. W. M.; Wijsman, Robin; Bots, Wouter; Kaanders, Johannes H.; Monshouwer, Rene; Bussink, Johan] Radboud Univ Nijmegen, Med Ctr, Dept Radiat Oncol, Nijmegen, Netherlands.

[Valdes, Gilmer; Hsu, I-Chow; Morin, Olivier; Raleigh, David R.; Solberg, Timothy] Univ Calif San Francisco, Dept Radiat Oncol, San Francisco, CA USA.

[Lustberg, Tim; van Soest, Johan; Hoebers, Frank; Dekker, Andre] Maastricht Univ, Med Ctr, Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO,GROW, Maastricht, Netherlands.

[El Naqa, Issam] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

[Belderbos, Jose; Kwint, Margriet] Antoni van Leeuwenhoek Hosp, Netherlands Canc Inst, Dept Radiat Oncol, Amsterdam, Netherlands.

[Bots, Wouter] Inst Hyperbar Oxygen IvHG, Arnhem, Netherlands.

RP Deist, TM (通讯作者)，Maastricht Univ, Med Ctr, Sch Oncol & Dev Biol, D Lab Decis Support Precis Med,GROW, Univ Singel 40, NL-6229 ER Maastricht, Netherlands.; Deist, TM (通讯作者)，Maastricht Univ, Med Ctr, Sch Oncol & Dev Biol, Dept Radiat Oncol,GROW, Maastricht, Netherlands.

EM t.deist@maastrichtuniversity.nl

RI Naqa, Issam El/T-3066-2019; Monshouwer, R./L-4527-2015; Dekker,

Andre/AAE-4830-2019; Wee, Leonard/AAH-3548-2019; Oberije,

Cary/ABA-6178-2020; Dankers, Frank/M-6658-2015; Bussink, Jan/N-3584-2014

OI Naqa, Issam El/0000-0001-6023-1132; Dekker, Andre/0000-0002-0422-7996;

Wee, Leonard/0000-0003-1612-9055; Oberije, Cary/0000-0003-0749-5117; ,

Timothy/0000-0001-8829-7774; Hoebers, Frank/0000-0002-4317-9181;

Bussink, Johan/0000-0002-5751-4796; van Soest,

Johan/0000-0003-2548-0330; Lambin, Philippe/0000-0001-7961-0191

FU ERC [694812 - Hypoximmuno]; QuIC-ConCePT project; Innovative Medicine

Initiative Joint Undertaking (IMI JU) [115151]; Dutch Technology

Foundation STW [10696 DuCAT, P14-19 Radiomics STRaTegy]; Technology

Programme of the Ministry of Economic Affairs; EU 7th Framework Program

(ARTFORCE) [257144]; EU 7th Framework Program (REQUITE) [601826]; SME

Phase 2 (RAIL) [673780]; EURO-STARS (SeDI); European Program H2020

(BD2Decide) [PHC30-689715]; European Program H2020 (Immuno-SABR)

[733008]; European Program H2020 (PREDICT - ITN) [766276]; European

Program H2020 (CLEARLY) [TRANSCAN-FP-045]; Interreg V-A Euregio

Meuse-Rhine ("Euradiomics"); Kankeronderzoekfonds Limburg from the

Health Foundation Limburg; Alpe d'HuZes-KWF (DESIGN); Zuyderland-MAASTRO

grant; Dutch Cancer Society; KWF-TraIT2HealthRI; Province

Limburg-LIME-Personal Health Train; NFU-Data4LifeSciences; Varian

Medical Systems-SAGE ROO; EURO-STARS (CloudAtlas); EURO-STARS (DART);

EURO-STARS (DECIDE); NATIONAL CANCER INSTITUTE [P01CA059827] Funding

Source: NIH RePORTER

FX Authors acknowledge financial support from ERC advanced grant

(ERC-ADG-2015, no. 694812 - Hypoximmuno) and the QuIC-ConCePT project,

which is partly funded by EFPIa companies and the Innovative Medicine

Initiative Joint Undertaking (IMI JU) under grant agreement no. 115151.

This research is also supported by the Dutch Technology Foundation STW

(grant no. 10696 DuCAT & no. P14-19 Radiomics STRaTegy), which is the

applied science division of NWO, and the Technology Programme of the

Ministry of Economic Affairs. Authors also acknowledge financial support

from the EU 7th Framework Program (ARTFORCE - no. 257144, REQUITE - no.

601826), SME Phase 2 (RAIL - no. 673780), EURO-STARS (SeDI, CloudAtlas,

DART, DECIDE), the European Program H2020 (BD2Decide - PHC30-689715,

Immuno-SABR - no. 733008, PREDICT - ITN - no. 766276, CLEARLY -

TRANSCAN-FP-045), Interreg V-A Euregio Meuse-Rhine ("Euradiomics"),

Kankeronderzoekfonds Limburg from the Health Foundation Limburg, Alpe

d'HuZes-KWF (DESIGN), the Zuyderland-MAASTRO grant and the Dutch Cancer

Society, KWF-TraIT2HealthRI, Province Limburg-LIME-Personal Health

Train, NFU-Data4LifeSciences, Varian Medical Systems-SAGE & ROO.

CR Belderbos J, 2005, RADIOTHER ONCOL, V75, P157, DOI 10.1016/j.radonc.2005.03.021

Bots WTC, 2017, HEAD NECK-J SCI SPEC, V39, P1122, DOI 10.1002/hed.24733

BREIMAN L, 2001, MACH LEARN, V0045

Caruana R, 2015, KDD'15: PROCEEDINGS OF THE 21ST ACM SIGKDD INTERNATIONAL CONFERENCE ON KNOWLEDGE DISCOVERY AND DATA MINING, P1721, DOI 10.1145/2783258.2788613

Carvalho S, 2016, DATA PROGNOSTIC VALU, DOI [10. 17195/candat. 2016. 04. 1, DOI 10.17195/CANDAT.2016.04.1]

Carvalho S, 2016, RADIOTHER ONCOL, V119, P487, DOI 10.1016/j.radonc.2016.04.024

Deist TM, CODE MACHINE LEARNIN

Egelmeer AGTM, 2011, RADIOTHER ONCOL, V100, P108, DOI 10.1016/j.radonc.2011.06.023

Fernandez-Delgado M, 2014, J MACH LEARN RES, V15, P3133

Friedman J, 2010, J STAT SOFTW, V33, P1, DOI 10.18637/jss.v033.i01

Hastie T., 2009, ELEMENTS STAT LEARNI, V2nd ed.

James G., 2013, INTRO STAT LEARNING, V112

Janssens GO, 2012, J CLIN ONCOL, V30, P1777, DOI 10.1200/JCO.2011.35.9315

Jochems A, 2017, INT J RADIAT ONCOL, V99, P344, DOI 10.1016/j.ijrobp.2017.04.021

Karatzoglou A., 2004, J STAT SOFTW, V11, P1, DOI [10.18637/jss.v011.i09, 10.18637/jss. v011.i09, DOI 10.18637/JSS.V011.I09]

Kuhn M., 2016, CARET CLASSIFICATION

Kwint M, 2012, INT J RADIAT ONCOL, V84, pE223, DOI 10.1016/j.ijrobp.2012.03.027

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lavesson N., 2006, P 21 NAT C ART INT B, P395

Lustberg T, 2016, ONCOTARGET, V7, P37288, DOI 10.18632/oncotarget.8755

Oberije C, 2015, DATA VALIDATED PREDI, DOI [10. 5072/candat. 2015. 02, DOI 10.5072/CANDAT.2015.02]

Oberije C, 2015, INT J RADIAT ONCOL, V92, P935, DOI 10.1016/j.ijrobp.2015.02.048

Olling Karina, 2018, Tech Innov Patient Support Radiat Oncol, V5, P16, DOI 10.1016/j.tipsro.2018.01.002

Olson RS, 2017, BIOCOMPUTING 2018, P192, DOI [10. 1142/9789813235533\_0018, DOI 10.1142/9789813235533\_0018]

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

Steyerberg EW, 2010, EPIDEMIOLOGY, V21, P128, DOI 10.1097/EDE.0b013e3181c30fb2

Therneau T, 2017, RPART RECURSIVE PART

Tuszynski J, 2014, CATOOLS TOOLS MOVING

Valdes G, 2016, SCI REP-UK, V6, DOI 10.1038/srep37854

Venables WN, 2002, MODERN APPL STAT S, DOI DOI 10.1007/978-0-387-21706-2

Wainer J, 2016, ARXIV160600930

Wijsman R, 2017, INT J RADIAT ONCOL, V99, P434, DOI 10.1016/j.ijrobp.2017.04.011

Wijsman R, 2015, RADIOTHER ONCOL, V117, P49, DOI 10.1016/j.radonc.2015.08.010

NR 34

TC 119

Z9 120

U1 5

U2 25

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD JUL

PY 2018

VL 45

IS 7

BP 3449

EP 3459

DI 10.1002/mp.12967

PG 11

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA GM5VJ

UT WOS:000438211400059

PM 29763967

OA Green Published, hybrid, Green Accepted

DA 2022-08-24

ER

PT J

AU Barabino, E

Rossi, G

Pamparino, S

Fiannacca, M

Caprioli, S

Fedeli, A

Zullo, L

Vagge, S

Cittadini, G

Genova, C

AF Barabino, Emanuele

Rossi, Giovanni

Pamparino, Silvia

Fiannacca, Martina

Caprioli, Simone

Fedeli, Alessandro

Zullo, Lodovica

Vagge, Stefano

Cittadini, Giuseppe

Genova, Carlo

TI Exploring Response to Immunotherapy in Non-Small Cell Lung Cancer Using

Delta-Radiomics

SO CANCERS

LA English

DT Article

DE radiomics; NSCLC; delta-radiomics; immunotherapy; antiPD1; immune

checkpoint inhibitor; predictive value

ID CRITERIA

AB Simple Summary The aim of the study is to identify radiomic features capable of predicting the response to immunotherapy. Delta-radiomics can foresees the comparison between subsequent CT scans and therefore allows to predict the changes that occurred during the treatment. In this study, the individual lesions of patients with advanced non-small cell lung cancer treated with immunotherapy were analyzed. The study aims to discover the features that predict the response to immune checkpoint inhibitors. Delta-radiomics is a branch of radiomics in which features are confronted after time or after introducing an external factor (such as treatment with chemotherapy or radiotherapy) to extrapolate prognostic data or to monitor a certain condition. Immune checkpoint inhibitors (ICIs) are currently revolutionizing the treatment of non-small cell lung cancer (NSCLC); however, there are still many issues in defining the response to therapy. Contrast-enhanced CT scans of 33 NSCLC patients treated with ICIs were analyzed; altogether, 43 lung lesions were considered. The radiomic features of the lung lesions were extracted from CT scans at baseline and at first reassessment, and their variation (delta, Delta) was calculated by means of the absolute difference and relative reduction. This variation was related to the final response of each lesion to evaluate the predictive ability of the variation itself. Twenty-seven delta features have been identified that are able to discriminate radiologic response to ICIs with statistically significant accuracy. Furthermore, the variation of nine features significantly correlates with pseudo-progression.

C1 [Barabino, Emanuele] Osped Santa Corona ASL 2 Savonese, Intervent Angiog, I-17027 Pietra Ligure, Italy.

[Rossi, Giovanni; Zullo, Lodovica] IRCCS Osped Policlin San Martino, UOC Oncol Med 2, I-16132 Genoa, Italy.

[Rossi, Giovanni] Univ Sassari, Dept Med Surg & Expt Sci, I-07100 Sassari, Italy.

[Pamparino, Silvia; Fiannacca, Martina; Caprioli, Simone] Univ Genoa, Osped Policlin San Martino, Dept Hlth Sci DISSAL, I-16128 Genoa, Italy.

[Fedeli, Alessandro] Univ Genoa, Dept Elect Elect Telecommun Engn & Naval Architec, I-16145 Genoa, Italy.

[Vagge, Stefano] IRCCS Osped Policlin San Martino, Dept Radiat Oncol, I-16132 Genoa, Italy.

[Cittadini, Giuseppe] IRCCS Osped Policlin San Martino, UO Radiol Gen, I-16132 Genoa, Italy.

[Genova, Carlo] IRCCS Osped Policlin San Martino, UOC Clin Oncol Med, I-16132 Genoa, Italy.

[Genova, Carlo] Univ Genoa, Fac Med & Chirurg, Dipartimento Med Interna & Specialita Med DiMi, I-16132 Genoa, Italy.

RP Rossi, G (通讯作者)，IRCCS Osped Policlin San Martino, UOC Oncol Med 2, I-16132 Genoa, Italy.; Rossi, G (通讯作者)，Univ Sassari, Dept Med Surg & Expt Sci, I-07100 Sassari, Italy.

EM emanuele.barabino@gmail.com; giovanni.rossi.1689@gmail.com;

pamparinosilvia@gmail.com; fiannacca.martina@tiscali.it;

simone.caprioli11@gmail.com; alessandro.fedeli@unige.it;

lodozullo@gmail.com; stefano.vagge@hsanmartino.it;

giuseppe.cittadini@hsanmartino.it; carlo.genova@hsanmartino.it

RI Genova, Carlo/J-8931-2016

OI Genova, Carlo/0000-0003-3690-8582; Caprioli, Simone/0000-0002-6017-9968;

Barabino, Emanuele/0000-0001-6407-5878; rossi,

giovanni/0000-0001-8432-5408; Pamparino, Silvia/0000-0002-5193-4490;

Zullo, Lodovica/0000-0002-1659-788X; vagge, stefano/0000-0002-8212-7069

FU Italian Ministry of Health; Bristol Myers Squibb [CA209-828]

FX Funding from the Italian Ministry of Health (5 x 1000 funds; Ricerca

Corrente 2018-2020) and Bristol Myers Squibb (CA209-828) were received

for this research.

CR Dercle L, 2020, CLIN CANCER RES, V26, P2151, DOI 10.1158/1078-0432.CCR-19-2942

Doroshow DB, 2019, CLIN CANCER RES, V25, P4592, DOI 10.1158/1078-0432.CCR-18-1538

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Fedorov A, 2012, MAGN RESON IMAGING, V30, P1323, DOI 10.1016/j.mri.2012.05.001

Flavell RR, 2020, INT J RADIAT ONCOL, V108, P242, DOI 10.1016/j.ijrobp.2020.06.025

Khorrami M, 2020, CANCER IMMUNOL RES, V8, P108, DOI 10.1158/2326-6066.CIR-19-0476

Kim Hae-Young, 2014, Restor Dent Endod, V39, P74, DOI 10.5395/rde.2014.39.1.74

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Liu Y, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.657615

Lu S, 2019, JAMA ONCOL, V5, P1195, DOI 10.1001/jamaoncol.2019.1549

Ma YQ, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.01017

Matzner-Lober E, 2018, DIAGN INTERV IMAG, V99, P269, DOI 10.1016/j.diii.2018.04.011

Miar A, 2020, CANCER RES, V80, P5245, DOI 10.1158/0008-5472.CAN-19-2306

Nardone V, 2020, MED ONCOL, V37, DOI 10.1007/s12032-020-01359-9

Nasief H, 2019, NPJ PRECIS ONCOL, V3, DOI 10.1038/s41698-019-0096-z

Plautz TE, 2019, MED PHYS, V46, P1663, DOI 10.1002/mp.13395

Ribas A, 2009, CLIN CANCER RES, V15, P7116, DOI 10.1158/1078-0432.CCR-09-2376

Rossi G, 2021, CANCER RES, V81, P724, DOI 10.1158/0008-5472.CAN-20-0999

Selno ATH, 2020, AGING-US, V12, P23478, DOI 10.18632/aging.202343

Seymour L, 2017, LANCET ONCOL, V18, pE143, DOI 10.1016/S1470-2045(17)30074-8

Tazdait M, 2018, EUR J CANCER, V88, P38, DOI 10.1016/j.ejca.2017.10.017

Testa U, 2018, CANCERS, V10, DOI 10.3390/cancers10080248

Tomaszewski MR, 2021, RADIOLOGY, V298, P505, DOI [10.1148/radiol.2021202553, 10.1148/radiol.2021219005]

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Vargha A, 1998, J EDUC BEHAV STAT, V23, P170, DOI 10.3102/10769986023002170

NR 25

TC 2

Z9 2

U1 3

U2 3

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2072-6694

J9 CANCERS

JI Cancers

PD JAN

PY 2022

VL 14

IS 2

AR 350

DI 10.3390/cancers14020350

PG 15

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA YN9AD

UT WOS:000747542300001

PM 35053513

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Chan, ST

Ruan, D

Shaverdian, N

Raghavan, G

Cao, M

Lee, P

AF Chan, Shawna T.

Ruan, Dan

Shaverdian, Narek

Raghavan, Govind

Cao, Minsong

Lee, Percy

TI Effect of Radiation Doses to the Heart on Survival for Stereotactic

Ablative Radiotherapy for Early-stage Non-Small-cell Lung Cancer: An

Artificial Neural Network Approach

SO CLINICAL LUNG CANCER

LA English

DT Article

DE Cardiac substructure dosimetry; Deep learning; Early-stage lung cancer;

Stereotactic body radiotherapy; Survivorship

ID CARDIOVASCULAR-DISEASE; CARDIAC TOXICITY; ESCALATION TRIALS;

BREAST-CANCER; LARGE COHORT; LONG-TERM; THERAPY; CONCURRENT; MORTALITY;

LYMPHOMA

AB The effect of the cardiac radiation dose in patients with early-stage non-small-cell lung cancer (NSCLC) undergoing stereotactic ablative radiotherapy is incompletely understood. In the present retrospective analysis of 112 adults, an increased cardiac radiation dose was associated with decreased survival in those with NSCLC. Radiation-induced cardiac toxicity could contribute to morbidity and mortality in those with early-stage NSCLC. Thus, efforts to minimize the cardiac radiation dose and cardiac follow-up protocols should be explored.

Introduction: The cardiac radiation dose is an important predictor of cardiac toxicity and overall survival (OS) for patients with locally advanced non-small-cell lung cancer (NSCLC). However, radiation-induced cardiac toxicity among patients with early-stage NSCLC who have undergone stereotactic ablative radiotherapy (SABR) has been less well-characterized. Our objective was to assess the associations between cardiac radiation dosimetry and OS in patients with early-stage NSCLC undergoing SABR. Materials and Methods: From 2009 to 2014, 153 patients with early-stage NSCLC had undergone SABR at a single institution. The maximum dose, mean dose, V-10Gy, V-25Gy, and V-50Gy to 15 cardiac substructures and the whole heart were analyzed for their association with OS using the Kaplan-Meier method. An artificial neural network (ANN) analysis was performed to modulate confounding behaviors of dosimetric variables to predict for OS. Results: A total of 112 patients were included in the present analysis. The right ventricle (RV) V-10Gy most negatively predicted for OS, such that patients who had received a RV V-10Gy dose < 4% had significantly longer OS than patients who had received a RV V-10Gy does > 4% (5.3 years vs. 2.4 years). On ANN analysis, 74 input features, including cardiac dosimetry parameters, predicted for survival with a test accuracy of 64.7%. A repeat ANN analysis using dosimetry to dose neutral structure confirmed the predictive power of cardiac dosimetry. Conclusion: Cardiac dosimetry to subvolumes of the heart was associated with decreased OS in patients with early-stage NSCLC undergoing SABR. These data support the importance of minimizing the radiation dose to cardiac substructures. Further prioritizing the heart as an organ at risk might be warranted. Additionally, cardiac follow-up should be considered.

C1 [Chan, Shawna T.; Ruan, Dan; Shaverdian, Narek; Raghavan, Govind; Cao, Minsong; Lee, Percy] Univ Calif Los Angeles, Sch Med, Dept Radiat Oncol, 200 Ucla Med Plaza,B265, Los Angeles, CA 90095 USA.

[Chan, Shawna T.] Univ Calif Irvine, Sch Med, Irvine, CA 92717 USA.

[Shaverdian, Narek] Mem Sloan Kettering Canc Ctr, Dept Radiat Oncol, 1275 York Ave, New York, NY 10021 USA.

[Lee, Percy] Univ Calif Los Angeles, Jonsson Comprehens Canc Ctr, Los Angeles, CA 90024 USA.

[Lee, Percy] Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Houston, TX 77030 USA.

RP Lee, P (通讯作者)，Univ Calif Los Angeles, Sch Med, Dept Radiat Oncol, 200 Ucla Med Plaza,B265, Los Angeles, CA 90095 USA.

EM percylee@mednet.ucla.edu

OI Chan, Shawna/0000-0003-0066-079X

CR Abe O, 2005, LANCET, V366, P2087

Belliere A, 2009, CANCER RADIOTHER, V13, P298, DOI 10.1016/j.canrad.2009.04.004

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Carver JR, 2007, J CLIN ONCOL, V25, P3991, DOI 10.1200/JCO.2007.10.9777

Chang JY, 2014, INT J RADIAT ONCOL, V88, P1120, DOI 10.1016/j.ijrobp.2014.01.022

Chin KM, 2005, CORONARY ARTERY DIS, V16, P13, DOI 10.1097/00019501-200502000-00003

Contreras JA, 2018, RADIOTHER ONCOL, V128, P498, DOI 10.1016/j.radonc.2018.05.017

Darby SC, 2013, NEW ENGL J MED, V368, P987, DOI 10.1056/NEJMoa1209825

Darby SC, 2010, INT J RADIAT ONCOL, V76, P656, DOI 10.1016/j.ijrobp.2009.09.064

Dess RT, 2017, J CLIN ONCOL, V35, P1395, DOI 10.1200/JCO.2016.71.6142

Evans JD, 2013, RADIOTHER ONCOL, V109, P82, DOI 10.1016/j.radonc.2013.07.021

GYENES G, 1994, INT J RADIAT ONCOL, V28, P1235, DOI 10.1016/0360-3016(94)90500-2

Hardy D, 2010, ANN ONCOL, V21, P1825, DOI 10.1093/annonc/mdq042

Hatakenaka M, 2012, INT J RADIAT ONCOL, V83, pE67, DOI 10.1016/j.ijrobp.2011.12.018

Holmes JA, 2017, JNCI CANCER SPECT, V1, DOI 10.1093/jncics/pkx003

Hooning MJ, 2007, JNCI-J NATL CANCER I, V99, P365, DOI 10.1093/jnci/djk064

Jones GC, 2015, CLIN LUNG CANCER, V16, P413, DOI 10.1016/j.cllc.2015.04.001

Kong FM, 2011, 1106ACRIN6697 RTOG

Kong FM, ATLASES ORGANS RISK

MACKAY DJC, 1992, NEURAL COMPUT, V4, P415, DOI 10.1162/neco.1992.4.3.415

Maraldo MV, 2015, LANCET HAEMATOL, V2, pE492, DOI 10.1016/S2352-3026(15)00153-2

Marks LB, 2005, INT J RADIAT ONCOL, V63, P214, DOI 10.1016/j.ijrobp.2005.01.029

McLaughlin VV, 2005, EUR RESPIR J, V25, P244, DOI 10.1183/09031936.05.00054804

MENDES LA, 1994, AM HEART J, V128, P301, DOI 10.1016/0002-8703(94)90483-9

Mieth B, 2016, SCI REP-UK, V6, DOI 10.1038/srep36671

Milano MT, 2009, RADIOTHER ONCOL, V91, P301, DOI 10.1016/j.radonc.2009.03.005

Modh A, 2014, INT J RADIAT ONCOL, V90, P1168, DOI 10.1016/j.ijrobp.2014.08.008

Nellessen U, 2010, CHEMOTHERAPY, V56, P147, DOI 10.1159/000313528

Ning MS, 2017, INT J RADIAT ONCOL, V99, P70, DOI 10.1016/j.ijrobp.2017.05.022

Raghavan G, 2018, CLIN LUNG CANCER, V19, pE759, DOI 10.1016/j.cllc.2018.05.008

Reshko LB, 2018, J THORAC DIS, V10, P2346, DOI 10.21037/jtd.2018.04.42

Rygiel K, 2017, J CANCER RES THER, V13, P186, DOI 10.4103/0973-1482.187303

Shirvani SM, 2014, JAMA SURG, V149, P1244, DOI 10.1001/jamasurg.2014.556

Stam B, 2017, RADIOTHER ONCOL, V123, P370, DOI 10.1016/j.radonc.2017.04.017

Stewart Merrill H, 2017, Curr Treat Options Cardiovasc Med, V19, P53, DOI 10.1007/s11936-017-0550-6

Tembhekar AR, 2017, CLIN LUNG CANCER, V18, P293, DOI 10.1016/j.cllc.2016.12.007

Timmerman R, 2006, ACTA ONCOL, V45, P779, DOI 10.1080/02841860600902213

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Tukenova M, 2010, J CLIN ONCOL, V28, P1308, DOI 10.1200/JCO.2008.20.2267

van Nimwegen FA, 2015, JAMA INTERN MED, V175, P1007, DOI 10.1001/jamainternmed.2015.1180

Verma V, 2018, RADIOTHER ONCOL, V128, P492, DOI 10.1016/j.radonc.2018.06.011

Videtic GMM, 2017, PRACT RADIAT ONCOL, V7, P295, DOI 10.1016/j.prro.2017.04.014

Vivekanandan S, 2017, INT J RADIAT ONCOL, V99, P51, DOI 10.1016/j.ijrobp.2017.04.026

Voelkel NF, 2006, CIRCULATION, V114, P1883, DOI 10.1161/CIRCULATIONAHA.106.632208

Wang K, 2017, RADIOTHER ONCOL, V125, P293, DOI 10.1016/j.radonc.2017.10.001

Wang K, 2017, J CLIN ONCOL, V35, P1387, DOI 10.1200/JCO.2016.70.0229

Wen SW, 2019, J INVEST SURG, V32, P27, DOI 10.1080/08941939.2017.1370519

Yu JB, 2015, CANCER-AM CANCER SOC, V121, P2341, DOI 10.1002/cncr.29359

NR 48

TC 5

Z9 5

U1 0

U2 5

PU CIG MEDIA GROUP, LP

PI DALLAS

PA 3500 MAPLE AVENUE, STE 750, DALLAS, TX 75219-3931 USA

SN 1525-7304

EI 1938-0690

J9 CLIN LUNG CANCER

JI Clin. Lung Cancer

PD MAR

PY 2020

VL 21

IS 2

BP 136

EP +

DI 10.1016/j.cllc.2019.10.010

PG 10

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA KS7GD

UT WOS:000518474100017

PM 31932217

DA 2022-08-24

ER

PT J

AU Tseng, HH

Luo, Y

Cui, S

Chien, JT

Ten Haken, RK

El Naqa, I

AF Tseng, Huan-Hsin

Luo, Yi

Cui, Sunan

Chien, Jen-Tzung

Ten Haken, Randall K.

El Naqa, Issam

TI Deep reinforcement learning for automated radiation adaptation in lung

cancer

SO MEDICAL PHYSICS

LA English

DT Article

DE adaptive radiotherapy; deep learning; lung cancer; reinforcement

learning

ID BREAST; TISSUE; RADIOTHERAPY; IRRADIATION; RESPONSES; MODEL

AB Purpose: To investigate deep reinforcement learning (DRL) based on historical treatment plans for developing automated radiation adaptation protocols for nonsmall cell lung cancer (NSCLC) patients that aim to maximize tumor local control at reduced rates of radiation pneumonitis grade 2 (RP2).

Methods: In a retrospective population of 114 NSCLC patients who received radiotherapy, a three-component neural networks framework was developed for deep reinforcement learning (DRL) of dose fractionation adaptation. Large-scale patient characteristics included clinical, genetic, and imaging radiomics features in addition to tumor and lung dosimetric variables. First, a generative adversarial network (GAN) was employed to learn patient population characteristics necessary for DRL training from a relatively limited sample size. Second, a radiotherapy artificial environment (RAE) was reconstructed by a deep neural network (DNN) utilizing both original and synthetic data (by GAN) to estimate the transition probabilities for adaptation of personalized radiotherapy patients' treatment courses. Third, a deep Q-network (DQN) was applied to the RAE for choosing the optimal dose in a response-adapted treatment setting. This multicomponent reinforcement learning approach was benchmarked against real clinical decisions that were applied in an adaptive dose escalation clinical protocol. In which, 34 patients were treated based on avid PET signal in the tumor and constrained by a 17.2% normal tissue complication probability (NTCP) limit for RP2. The uncomplicated cure probability (P+) was used as a baseline reward function in the DRL.

Results: Taking our adaptive dose escalation protocol as a blueprint for the proposed DRL (GAN + RAE + DQN) architecture, we obtained an automated dose adaptation estimate for use at similar to 2/3 of the way into the radiotherapy treatment course. By letting the DQN component freely control the estimated adaptive dose per fraction (ranging from 1-5 Gy), the DRL automatically favored dose escalation/de-escalation between 1.5 and 3.8 Gy, a range similar to that used in the clinical protocol. The same DQN yielded two patterns of dose escalation for the 34 test patients, but with different reward variants. First, using the baseline P+ reward function, individual adaptive fraction doses of the DQN had similar tendencies to the clinical data with an RMSE = 0.76 Gy; but adaptations suggested by the DQN were generally lower in magnitude (less aggressive). Second, by adjusting the P+ reward function with higher emphasis on mitigating local failure, better matching of doses between the DQN and the clinical protocol was achieved with an RMSE = 0.5 Gy. Moreover, the decisions selected by the DQN seemed to have better concordance with patients eventual outcomes. In comparison, the traditional temporal difference (TD) algorithm for reinforcement learning yielded an RMSE = 3.3 Gy due to numerical instabilities and lack of sufficient learning.

Conclusion: We demonstrated that automated dose adaptation by DRL is a feasible and a promising approach for achieving similar results to those chosen by clinicians. The process may require customization of the reward function if individual cases were to be considered. However, development of this framework into a fully credible autonomous system for clinical decision support would require further validation on larger multi-institutional datasets. (C) 2017 American Association of Physicists in Medicine.

C1 [Tseng, Huan-Hsin; Luo, Yi; Cui, Sunan; Chien, Jen-Tzung; Ten Haken, Randall K.; El Naqa, Issam] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

[Chien, Jen-Tzung] Natl Chiao Tung Univ, Dept Elect & Comp Engn, Hsinchu, Taiwan.

RP El Naqa, I (通讯作者)，Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

EM ielnaqa@med.umich.edu

RI cui, sunan/AAA-3286-2020; Naqa, Issam El/T-3066-2019

OI cui, sunan/0000-0002-8846-9449; Naqa, Issam El/0000-0001-6023-1132; Luo,

Yi/0000-0003-2519-5900; Chien, Jen-Tzung/0000-0003-3466-8941

FU National Institutes of Health [P01 CA059827]; NATIONAL CANCER INSTITUTE

[P01CA059827] Funding Source: NIH RePORTER

FX The authors thank Dr. Kong and Dr. Jolly for their help in providing the

lung testing datasets for the study and Julia Pakela for the careful

proofreading of our manuscript. This work was supported in part by the

National Institutes of Health P01 CA059827.

CR Abadi M., 2016, ARXIV 160304467

AGREN A, 1990, INT J RADIAT ONCOL, V19, P1077, DOI 10.1016/0360-3016(90)90037-K

Bellemare MG, 2013, J ARTIF INTELL RES, V47, P253, DOI 10.1613/jair.3912

Bentzen SM, 2000, ACTA ONCOL, V39, P337, DOI 10.1080/028418600750013113

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Brockman G., 2016, OPENAI GYM

Clevert D.-A., ARXIV151107289

Dalmis MU, 2017, MED PHYS, V44, P533, DOI 10.1002/mp.12079

Deshmane SL, 2009, J INTERF CYTOK RES, V29, P313, DOI 10.1089/jir.2008.0027

Eisbruch A, USING FDG PET ACQUIR

El Naqa I, 2017, PHYS MED BIOL, V62, pR179, DOI 10.1088/1361-6560/aa7c55

El Naqa I, 2014, CLIN TRANSL IMAGING, V2, P305, DOI 10.1007/s40336-014-0063-1

Falou O, 2013, TRANSL ONCOL, V6, P17, DOI 10.1593/tlo.12412

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Goh V, 2011, RADIOLOGY, V261, P165, DOI 10.1148/radiol.11110264

Goller C, 1996, IEEE IJCNN, P347, DOI 10.1109/ICNN.1996.548916

Goodfellow IJ, 2014, ADV NEUR IN, V27, P2672

HORNIK K, 1989, NEURAL NETWORKS, V2, P359, DOI 10.1016/0893-6080(89)90020-8

Ibragimov B, 2017, MED PHYS, V44, P547, DOI 10.1002/mp.12045

Jaffray DA, 2012, NAT REV CLIN ONCOL, V9, P688, DOI 10.1038/nrclinonc.2012.194

Kim M, 2009, PHYS MED BIOL, V54, P4455, DOI 10.1088/0031-9155/54/14/007

Kingma D, ARXIV1412698

Kong FM, 2017, JAMA ONCOL, V3, P1358, DOI 10.1001/jamaoncol.2017.0982

KUTCHER GJ, 1989, INT J RADIAT ONCOL, V16, P1623, DOI 10.1016/0360-3016(89)90972-3

Laffey JG, 2002, ANESTHESIOLOGY, V97, P215

LeCun Y, 2015, NATURE, V521, P436, DOI 10.1038/nature14539

Letterio JJ, 1998, ANNU REV IMMUNOL, V16, P137, DOI 10.1146/annurev.immunol.16.1.137

Lowry R., 2014, CONCEPTS APPL INFERE

Luo Y, 2017, RADIOTHER ONCOL, V123, P85, DOI 10.1016/j.radonc.2017.02.004

Mnih V., 2013, P ADV NEUR INF PROC, P1

Mnih V, 2015, NATURE, V518, P529, DOI 10.1038/nature14236

Mohri M., 2012, FDN MACHINE LEARNING

Naqa IEl, THEORY APPL

Ng A.Y., 2000, P 17 INT C MACH LEAR, P663, DOI DOI 10.2460/AJVR.67.2.323

Nguyen DHT, 2013, P NATL ACAD SCI USA, V110, P6712, DOI 10.1073/pnas.1221526110

Oh JH, 2011, PHYS MED BIOL, V56, P1635, DOI 10.1088/0031-9155/56/6/008

Ramirez MF, 2013, ANESTHESIOLOGY, V3, P133, DOI DOI 10.4236/0JANES.2013.33031

Sadeghi-Naini A, 2015, MED PHYS, V42, P6130, DOI 10.1118/1.4931603

Sadeghi-Naini A, 2013, MED PHYS, V40, DOI 10.1118/1.4812683

Sadeghi-Naini A, 2013, CLIN CANCER RES, V19, P2163, DOI 10.1158/1078-0432.CCR-12-2965

Schaue D, 2012, RADIAT RES, V178, P505, DOI 10.1667/RR3031.1

Sovik A, 2007, PHYS MEDICA, V23, P100, DOI 10.1016/j.ejmp.2007.09.001

Srivastava N, 2014, J MACH LEARN RES, V15, P1929

Sutton R.S., 1998, REINFORCEMENT LEARNI, V1

Tsitsiklis JN, 1997, ADV NEUR IN, V9, P1075

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

Vapnik V., 1999, NATURE STAT LEARNING

Vincent RD, 2016, ASA SIAM SER STAT AP, P263

Witney TH, 2010, BRIT J CANCER, V103, P1400, DOI 10.1038/sj.bjc.6605945

NR 49

TC 78

Z9 84

U1 6

U2 52

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD DEC

PY 2017

VL 44

IS 12

BP 6690

EP 6705

DI 10.1002/mp.12625

PG 16

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA FW5SQ

UT WOS:000425379200055

PM 29034482

OA Green Published, Green Accepted

DA 2022-08-24

ER

PT J

AU Zhou, ZG

Folkert, M

Cannon, N

Iyengar, P

Westover, K

Zhang, YY

Choy, H

Timmerman, R

Yan, JS

Xie, XJ

Jiang, S

Wang, J

AF Zhou, Zhiguo

Folkert, Michael

Cannon, Nathan

Iyengar, Puneeth

Westover, Kenneth

Zhang, Yuanyuan

Choy, Hak

Timmerman, Robert

Yan, Jingsheng

Xie, Xian-J.

Jiang, Steve

Wang, Jing

TI Predicting distant failure in early stage NSCLC treated with SBRT using

clinical parameters

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Distant failure; SBRT; Clinical parameter; Machine learning; Feature

selection

ID CELL LUNG-CANCER; STEREOTACTIC BODY RADIOTHERAPY; RADIATION-THERAPY;

CLONAL SELECTION; CLASSIFICATION; PET

AB Purpose/objective: The aim of this study is to predict early distant failure in early stage non-small cell lung cancer (NSCLC) treated with stereotactic body radiation therapy (SBRT) using clinical parameters by machine learning algorithms.

Materials/methods: The dataset used in this work includes 81 early stage NSCLC patients with at least 6 months of follow-up who underwent SBRT between 2006 and 2012 at a single institution. The clinical parameters (n = 18) for each patient include demographic parameters, tumor characteristics, treatment fraction schemes, and pretreatment medications. Three predictive models were constructed based on different machine learning algorithms: (1) artificial neural network (ANN), (2) logistic regression (LR) and (3) support vector machine (SVM). Furthermore, to select an optimal clinical parameter set for the model construction, three strategies were adopted: (1) clonal selection algorithm (CSA) based selection strategy; (2) sequential forward selection (SFS) method; and (3) statistical analysis (SA) based strategy. 5-cross validation is used to validate the performance of each predictive model. The accuracy was assessed by area under the receiver operating characteristic (ROC) curve (AUC), sensitivity and specificity of the system was also evaluated.

Results: The AUCs for ANN, LR and SVM were 0.75, 0.73, and 0.80, respectively. The sensitivity values for ANN, LR and SVM were 71.2%, 72.9% and 83.1%, while the specificity values for ANN, LR and SVM were 59.1%, 63.6% and 63.6%, respectively. Meanwhile, the CSA based strategy outperformed SFS and SA in terms of AUC, sensitivity and specificity.

Conclusions: Based on clinical parameters, the SVM with the CSA optimal parameter set selection strategy achieves better performance than other strategies for predicting distant failure in lung SBRT patients. (C) 2016 Elsevier Ireland Ltd. All rights reserved.

C1 [Zhou, Zhiguo; Folkert, Michael; Cannon, Nathan; Iyengar, Puneeth; Westover, Kenneth; Zhang, Yuanyuan; Choy, Hak; Timmerman, Robert; Jiang, Steve; Wang, Jing] UT Southwestern Med Ctr, Dept Radiat Oncol, Dallas, TX 75390 USA.

[Yan, Jingsheng; Xie, Xian-J.] UT Southwestern Med Ctr, Dept Clin Sci, Dallas, TX USA.

RP Wang, J (通讯作者)，UT Southwestern Med Ctr, Dept Radiat Oncol, Dallas, TX 75390 USA.

EM jing.wang@utsouthwestern.edu

RI Westover, Ken/AAZ-1795-2020; Wang, Jing/N-7332-2019

OI Westover, Ken/0000-0003-3653-5923; Zhang, Yuanyuan/0000-0001-9230-7314;

Wang, Jing/0000-0002-8491-4146

FU Cancer Prevention and Research Institute of Texas [RP130109]; American

Cancer Society [RSG-13-326-01-CCE, ACS-IRG-02-196]; US National Health

Institute [R01 EB020366]; NATIONAL INSTITUTE OF BIOMEDICAL IMAGING AND

BIOENGINEERING [R01EB020366] Funding Source: NIH RePORTER

FX The authors acknowledge funding support from the Cancer Prevention and

Research Institute of Texas (RP130109), the American Cancer Society

(RSG-13-326-01-CCE and ACS-IRG-02-196) and US National Health Institute

(R01 EB020366). The authors would like to thank Dr. Damiana Chiavolini

for editing the manuscript.

CR Aberle DR, 2011, NEW ENGL J MED, V365, P395, DOI 10.1056/NEJMoa1102873

Breslow N E, 1980, IARC Sci Publ, P5

Chang CC, 2011, ACM T INTEL SYST TEC, V2, DOI 10.1145/1961189.1961199

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Chi A, 2010, RADIOTHER ONCOL, V94, P1, DOI 10.1016/j.radonc.2009.12.008

Clarke K, 2012, RADIOTHER ONCOL, V104, P62, DOI 10.1016/j.radonc.2012.04.019

CORTES C, 1995, MACH LEARN, V20, P273, DOI 10.1023/A:1022627411411

de Castro LN, 2002, IEEE T EVOLUT COMPUT, V6, P239, DOI 10.1109/TEVC.2002.1011539

Ettinger DS, 2015, J NATL COMPR CANC NE, V13, P515, DOI 10.6004/jnccn.2015.0071

Freedman D., 2009, STAT MODELS THEORY P

Hoyer M, 2008, RADIOTHER ONCOL, V87, P1, DOI 10.1016/j.radonc.2008.03.004

Jain A, 1997, IEEE T PATTERN ANAL, V19, P153, DOI 10.1109/34.574797

Kazmierska J, 2008, RADIOTHER ONCOL, V86, P211, DOI 10.1016/j.radonc.2007.10.019

Khan J, 2001, NAT MED, V7, P673, DOI 10.1038/89044

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Liu HW, 2015, RADIOTHER ONCOL, V117, P71, DOI 10.1016/j.radonc.2015.08.027

Postmus PE, 2007, J THORAC ONCOL, V2, P686, DOI 10.1097/JTO.0b013e31811f4703

ROCHESTER N, 1956, IRE T INFORM THEOR, V2, P80, DOI 10.1109/TIT.1956.1056810

Roelofs E, 2014, RADIOTHER ONCOL, V110, P370, DOI 10.1016/j.radonc.2013.11.001

Senthi S, 2012, LANCET ONCOL, V13, P802, DOI 10.1016/S1470-2045(12)70242-5

Timmerman RD, 2014, INT J RADIAT ONCOL, V90, pS30, DOI 10.1016/j.ijrobp.2014.05.135

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

van Baardwijk A, 2012, RADIOTHER ONCOL, V105, P145, DOI 10.1016/j.radonc.2012.09.008

van Stiphout RGPM, 2011, RADIOTHER ONCOL, V98, P126, DOI 10.1016/j.radonc.2010.12.002

Zhang H, 2014, INT J RADIAT ONCOL, V88, P195, DOI 10.1016/j.ijrobp.2013.09.037

Zhang L, 2007, IEEE T GEOSCI REMOTE, V45, P4172, DOI 10.1109/TGRS.2007.905311

Zhang X, 2011, EURASIP J WIREL COMM, DOI 10.1155/2011/765143

Zhou ZG, 2013, BMC MED INFORM DECIS, V13, DOI 10.1186/1472-6947-13-123

NR 28

TC 30

Z9 30

U1 0

U2 6

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD JUN

PY 2016

VL 119

IS 3

BP 501

EP 504

DI 10.1016/j.radonc.2016.04.029

PG 4

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA DR7JH

UT WOS:000380075400020

PM 27156652

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Yu, W

Tang, C

Hobbs, BP

Li, X

Koay, EJ

Wistuba, II

Sepesi, B

Behrens, C

Canales, JR

Cuentas, ERP

Erasmus, JJ

Court, LE

Chang, JY

AF Yu, Wen

Tang, Chad

Hobbs, Brian P.

Li, Xiao

Koay, Eugene J.

Wistuba, Ignacio I.

Sepesi, Boris

Behrens, Carmen

Canales, Jaime Rodriguez

Cuentas, Edwin Roger Parra

Erasmus, Jeremy J.

Court, Laurence E.

Chang, Joe Y.

TI Development and Validation of a Predictive Radiomics Model for Clinical

Outcomes in Stage I Non-small Cell Lung Cancer

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

ID STEREOTACTIC ABLATIVE RADIOTHERAPY; BODY RADIATION-THERAPY; LOCAL

RADIATION; FEATURES; CT; RECURRENCE; MELANOMA; TUMOR

AB Purpose: To develop and validate a radiomics signature that can predict the clinical outcomes for patients with stage I non-small cell lung cancer (NSCLC).

Methods and Materials: We retrospectively analyzed contrast-enhanced computed tomography images of patients from a training cohort (n = 147) treated with surgery and an independent validation cohort (n = 295) treated with stereotactic ablative radiation therapy. Twelve radiomics features with established strategies for filtering and preprocessing were extracted. The random survival forests (RSF) method was used to build models from subsets of the 12 candidate features based on their survival relevance and generate a mortality risk index for each observation in the training set. An optimal model was selected, and its ability to predict clinical outcomes was evaluated in the validation set using predicted mortality risk indexes.

Results: The optimal RSF model, consisting of 2 predictive features, kurtosis and the gray level co-occurrence matrix feature homogeneity2, allowed for significant risk stratification (log-rank P <. 0001) and remained an independent predictor of overall survival after adjusting for age, tumor volume and histologic type, and Karnofsky performance status (hazard ratio [HR] 1.27; P < 2e-16) in the training set. The resultant mortality risk indexes were significantly associated with overall survival in the validation set (log-rank P = .0173; HR 1.02, P = .0438). They were also significant for distant metastasis (log-rank P <. 05; HR 1.04, P = .0407) and were borderline significant for regional recurrence on univariate analysis (log-rank P < .05; HR 1.04, P = .0617).

Conclusions: Our radiomics model accurately predicted several clinical outcomes and allowed pretreatment risk stratification in stage I NSCLC, allowing the choice of treatment to be tailored to each patient's individual risk profile. (C) 2017 Elsevier Inc. All rights reserved.

C1 [Yu, Wen; Tang, Chad; Koay, Eugene J.; Chang, Joe Y.] Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Unit 1422,1400 Pressler St, Houston, TX 77030 USA.

[Hobbs, Brian P.; Li, Xiao] Univ Texas MD Anderson Canc Ctr, Dept Biostat, Houston, TX 77030 USA.

[Wistuba, Ignacio I.; Canales, Jaime Rodriguez; Cuentas, Edwin Roger Parra] Univ Texas MD Anderson Canc Ctr, Dept Translat & Mol Pathol, Houston, TX 77030 USA.

[Sepesi, Boris] Univ Texas MD Anderson Canc Ctr, Dept Thorac & Cardiovasc Surg, Houston, TX 77030 USA.

[Behrens, Carmen] Univ Texas MD Anderson Canc Ctr, Dept Thorac Head & Neck Med Oncol, Houston, TX 77030 USA.

[Erasmus, Jeremy J.] Univ Texas MD Anderson Canc Ctr, Dept Diagnost Radiol, Houston, TX 77030 USA.

[Court, Laurence E.] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, 1515 Holcombe Blvd, Houston, TX 77030 USA.

[Yu, Wen] Shanghai Jiao Tong Univ, Shanghai Chest Hosp, Dept Radiat Oncol, Shanghai, Peoples R China.

RP Chang, JY (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Unit 1422,1400 Pressler St, Houston, TX 77030 USA.; Court, LE (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, 1515 Holcombe Blvd, Houston, TX 77030 USA.

EM LECourt@mdanderson.org; jychang@mdanderson.org

OI Court, Laurence/0000-0002-3241-6145

FU National Natural Science Foundation of China [81502645]; Western

Medicine Guiding Program - Science and Technology Commission of Shanghai

Municipality [14411968800]; Cancer Center Support (Core) grant from the

National Cancer Institute [CA016672]; NATIONAL CANCER INSTITUTE

[P30CA016672] Funding Source: NIH RePORTER

FX W.Y. was supported by the National Natural Science Foundation of China

(grant 81502645) and Western Medicine Guiding Program funded by the

Science and Technology Commission of Shanghai Municipality (grant

14411968800).; The present study was supported in part by Cancer Center

Support (Core) grant CA016672 from the National Cancer Institute to The

University of Texas MD Anderson Cancer Center.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ambler G, 2012, STAT MED, V31, P1150, DOI 10.1002/sim.4371

Bernstein MB, 2016, NAT REV CLIN ONCOL, V13, P516, DOI 10.1038/nrclinonc.2016.30

Chang JY, 2015, J THORAC ONCOL, V10, P577, DOI 10.1097/JTO.0000000000000453

Chang JY, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-152

Chen X, 2012, GENOMICS, V99, P323, DOI 10.1016/j.ygeno.2012.04.003

Fave X, 2016, TRANSL CANCER RES, V5, P349, DOI 10.21037/tcr.2016.07.11

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Hiniker SM, 2012, TRANSL ONCOL, V5, P404, DOI 10.1593/tlo.12280

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Ishwaran H, 2008, ANN APPL STAT, V2, P841, DOI 10.1214/08-AOAS169

Kamiya A, 2014, JPN J RADIOL, V32, P14, DOI 10.1007/s11604-013-0264-y

Lee YJ, 2009, BLOOD, V114, P589, DOI 10.1182/blood-2009-02-206870

Lugade AA, 2005, J IMMUNOL, V174, P7516, DOI 10.4049/jimmunol.174.12.7516

Mattonen SA, 2016, INT J RADIAT ONCOL, V94, P1121, DOI 10.1016/j.ijrobp.2015.12.369

Mattonen SA, 2015, J MED IMAGING, V2, DOI 10.1117/1.JMI.2.4.041010

Paul D, 2017, COMPUT MED IMAG GRAP, V60, P42, DOI 10.1016/j.compmedimag.2016.12.002

Postow MA, 2012, NEW ENGL J MED, V366, P925, DOI 10.1056/NEJMoa1112824

Schreibmann E, 2016, MED PHYS, V43, P3374, DOI 10.1118/1.4955779

Senthi S, 2012, LANCET ONCOL, V13, P802, DOI 10.1016/S1470-2045(12)70242-5

Singh VP, 2016, INT J COMPUTER SCI I, V14, P82

Taylor JMG, 2011, J THORAC ONCOL, V6, P1974, DOI 10.1097/JTO.0b013e318233d835

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Wang XH, 2017, CANCER RES, V77, P839, DOI 10.1158/0008-5472.CAN-15-3142

Yang ZG, 2001, AM J ROENTGENOL, V176, P1399, DOI 10.2214/ajr.176.6.1761399

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

Zhang YC, 2017, SCI REP-UK, V7, DOI 10.1038/srep46349

Zhou Z, 2016, MED PHYS, V43, P3383, DOI 10.1118/1.4955817

NR 30

TC 31

Z9 32

U1 2

U2 21

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD NOV 15

PY 2018

VL 102

IS 4

SI SI

BP 1090

EP 1097

DI 10.1016/j.ijrobp.2017.10.046

PG 8

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA GX5LR

UT WOS:000447789700055

PM 29246722

DA 2022-08-24

ER

PT J

AU Zhou, ZG

Folkert, M

Iyengar, P

Westover, K

Zhang, YY

Choy, H

Timmerman, R

Jiang, S

Wang, J

AF Zhou, Zhiguo

Folkert, Michael

Iyengar, Puneeth

Westover, Kenneth

Zhang, Yuanyuan

Choy, Hak

Timmerman, Robert

Jiang, Steve

Wang, Jing

TI Multi-objective radiomics model for predicting distant failure in lung

SBRT

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE lung SBRT; radiomics; multi-objective learning; pareto-optimal solution

ID BODY RADIATION-THERAPY; HYBRID GENETIC ALGORITHM; SUPPORT VECTOR

MACHINES; PARAMETER OPTIMIZATION; RADIOTHERAPY SBRT; CANCER NSCLC; CT;

SELECTION; FEATURES; IMAGES

AB Stereotactic body radiation therapy (SBRT) has demonstrated high local control rates in early stage non-small cell lung cancer patients who are not ideal surgical candidates. However, distant failure after SBRT is still common. For patients at high risk of early distant failure after SBRT treatment, additional systemic therapy may reduce the risk of distant relapse and improve overall survival. Therefore, a strategy that can correctly stratify patients at high risk of failure is needed. The field of radiomics holds great potential in predicting treatment outcomes by using high-throughput extraction of quantitative imaging features. The construction of predictive models in radiomics is typically based on a single objective such as overall accuracy or the area under the curve (AUC). However, because of imbalanced positive and negative events in the training datasets, a single objective may not be ideal to guide model construction. To overcome these limitations, we propose a multi-objective radiomics model that simultaneously considers sensitivity and specificity as objective functions. To design a more accurate and reliable model, an iterative multi-objective immune algorithm (IMIA) was proposed to optimize these objective functions. The multi-objective radiomics model is more sensitive than the single-objective model, while maintaining the same levels of specificity and AUC. The IMIA performs better than the traditional immune-inspired multi-objective algorithm.

C1 [Zhou, Zhiguo; Folkert, Michael; Iyengar, Puneeth; Westover, Kenneth; Zhang, Yuanyuan; Choy, Hak; Timmerman, Robert; Jiang, Steve; Wang, Jing] UT Southwestern Med Ctr, Dept Radiat Oncol, Dallas, TX 75390 USA.

RP Wang, J (通讯作者)，UT Southwestern Med Ctr, Dept Radiat Oncol, Dallas, TX 75390 USA.

EM Jing.Wang@UTSouthwestern.edu

RI Wang, Jing/N-7332-2019; Westover, Ken/AAZ-1795-2020

OI Westover, Ken/0000-0003-3653-5923; Wang, Jing/0000-0002-8491-4146;

Zhang, Yuanyuan/0000-0001-9230-7314

FU American Cancer Society [RSG-13-326-01-CCE, ACS-IRG-02-196]; US National

Institutes of Health [5P30CA142543]

FX This work was supported in part by the American Cancer Society

(RSG-13-326-01-CCE and ACS-IRG-02-196) and US National Institutes of

Health (5P30CA142543). The authors would like to thank Dr Damiana

Chiavolini for editing the manuscript.

CR Adams MC, 2010, AM J ROENTGENOL, V195, P310, DOI 10.2214/AJR.10.4923

Avci E, 2009, EXPERT SYST APPL, V36, P1391, DOI 10.1016/j.eswa.2007.11.014

Bagci U, 2013, MED IMAGE ANAL, V17, P929, DOI 10.1016/j.media.2013.05.004

CHENG YZ, 1995, IEEE T PATTERN ANAL, V17, P790, DOI 10.1109/34.400568

Cho MY, 2006, ICICIC 2006: FIRST INTERNATIONAL CONFERENCE ON INNOVATIVE COMPUTING, INFORMATION AND CONTROL, VOL 1, PROCEEDINGS, P26

Clarke K, 2012, RADIOTHER ONCOL, V104, P62, DOI 10.1016/j.radonc.2012.04.019

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Darbon J, 2008, I S BIOMED IMAGING, P1331, DOI 10.1109/ISBI.2008.4541250

Deb K, 2002, IEEE T EVOLUT COMPUT, V6, P182, DOI 10.1109/4235.996017

Deb K, 2001, MULTIOBJECTIVE OPTIM

Ding S, 2009, 2009 SECOND INTERNATIONAL SYMPOSIUM ON KNOWLEDGE ACQUISITION AND MODELING: KAM 2009, VOL 2, P17, DOI 10.1109/KAM.2009.86

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Gong MG, 2008, EVOL COMPUT, V16, P225, DOI 10.1162/evco.2008.16.2.225

Hawkins SH, 2014, IEEE ACCESS, V2, P1418, DOI 10.1109/ACCESS.2014.2373335

Hoyer M, 2008, RADIOTHER ONCOL, V87, P1, DOI 10.1016/j.radonc.2008.03.004

Huang CL, 2008, APPL SOFT COMPUT, V8, P1381, DOI 10.1016/j.asoc.2007.10.007

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

KAILATH T, 1967, IEEE T COMMUN TECHN, VCO15, P52, DOI 10.1109/TCOM.1967.1089532

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Levman J, 2008, IEEE T MED IMAGING, V27, P688, DOI 10.1109/TMI.2008.916959

Mu W, 2015, PHYS MED BIOL, V60, P5123, DOI 10.1088/0031-9155/60/13/5123

Nemhauser G L, 2004, 10 INT C INT PROGR C

OTSU N, 1979, IEEE T SYST MAN CYB, V9, P62, DOI 10.1109/TSMC.1979.4310076

Tan S, 2013, INT J RADIAT ONCOL, V85, P1375, DOI 10.1016/j.ijrobp.2012.10.017

Timmerman RD, 2014, INT J RADIAT ONCOL, V90, pS30, DOI 10.1016/j.ijrobp.2014.05.135

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

van Baardwijk A, 2012, RADIOTHER ONCOL, V105, P145, DOI 10.1016/j.radonc.2012.09.008

Wu CH, 2009, EXPERT SYST APPL, V36, P4725, DOI 10.1016/j.eswa.2008.06.046

Wu J, 2016, RADIOLOGY, V281, P270, DOI 10.1148/radiol.2016151829

Wu WM, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00071

Yang XF, 2012, MED PHYS, V39, P5732, DOI 10.1118/1.4747526

Zhou ZG, 2013, KNOWL-BASED SYST, V54, P128, DOI 10.1016/j.knosys.2013.09.001

Zhou ZG, 2013, COMPUT BIOL MED, V43, P1462, DOI 10.1016/j.compbiomed.2013.07.023

Zhou ZG, 2016, RADIOTHER ONCOL, V119, P501, DOI 10.1016/j.radonc.2016.04.029

NR 35

TC 35

Z9 37

U1 1

U2 18

PU IOP PUBLISHING LTD

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD JUN 7

PY 2017

VL 62

IS 11

BP 4460

EP 4478

DI 10.1088/1361-6560/aa6ae5

PG 19

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA EU4DO

UT WOS:000400980200001

PM 28480871

OA Green Accepted

DA 2022-08-24

ER

PT J

AU D'Amico, NC

Sicilia, R

Cordelli, E

Tronchin, L

Greco, C

Fiore, M

Carnevale, A

Iannello, G

Ramella, S

Soda, P

AF D'Amico, Natascha Claudia

Sicilia, Rosa

Cordelli, Ermanno

Tronchin, Lorenzo

Greco, Carlo

Fiore, Michele

Carnevale, Alessia

Iannello, Giulio

Ramella, Sara

Soda, Paolo

TI Radiomics-Based Prediction of Overall Survival in Lung Cancer Using

Different Volumes-Of-Interest

SO APPLIED SCIENCES-BASEL

LA English

DT Article

DE radiomics; NSCLC; Local Binary Patterns; multi-VOI analysis

ID FEATURES; RADIOTHERAPY; TRIAL; CHEMORADIOTHERAPY; CLASSIFICATION;

RECOGNITION; PATTERNS; OUTCOMES

AB Featured Application The manuscript aims to provide a signature to predict Overall Survival in patients with Locally Advanced Non-Small Cell Lung Cancer. The results could offer the physicians advanced software tools to early evaluate the disease evolution before the treatment start so to personalize each patient's therapy. Moreover, this work provides insight into the use of the different segmentation volumes usually applied in radiation oncology. Lung cancer accounts for the largest amount of deaths worldwide with respect to the other oncological pathologies. To guarantee the most effective cure to patients for such aggressive tumours, radiomics is increasing as a novel and promising research field that aims at extracting knowledge from data in terms of quantitative measures that are computed from diagnostic images, with prognostic and predictive ends. This knowledge could be used to optimize current treatments and to maximize their efficacy. To this end, we hereby study the use of such quantitative biomarkers computed from CT images of patients affected by Non-Small Cell Lung Cancer to predict Overall Survival. The main contributions of this work are two: first, we consider different volumes of interest for the same patient to find out whether the volume surrounding the visible lesions can provide useful information; second, we introduce 3D Local Binary Patterns, which are texture measures scarcely explored in radiomics. As further validation, we show that the proposed signature outperforms not only the features automatically computed by a deep learning-based approach, but also another signature at the state-of-the-art using other handcrafted features.

C1 [D'Amico, Natascha Claudia; Sicilia, Rosa; Cordelli, Ermanno; Tronchin, Lorenzo; Iannello, Giulio; Soda, Paolo] Univ Campus Biomed Roma, Dept Engn, Unit Comp Syst & Bioinformat, Via Alvaro del Portillo 21, I-00128 Rome, Italy.

[D'Amico, Natascha Claudia] Ctr Diagnost Italiano SpA, Dept Diagnost Imaging & Sterotact Radiosurgey, Via S St Bon 20, I-20147 Milan, Italy.

[Greco, Carlo; Fiore, Michele; Carnevale, Alessia; Ramella, Sara] Univ Campus Biomed Roma, Radiat Oncol, Via Alvaro del Portillo 21, I-00128 Rome, Italy.

RP Sicilia, R (通讯作者)，Univ Campus Biomed Roma, Dept Engn, Unit Comp Syst & Bioinformat, Via Alvaro del Portillo 21, I-00128 Rome, Italy.

EM n.damico@unicampus.it; r.sicilia@unicampus.it; e.cordelli@unicampus.it;

lorenzotronchin@gmail.com; c.greco@unicampus.it; m.fiore@unicampus.it;

a.carnevale@unicampus.it; g.iannello@unicampus.it;

s.ramella@unicampus.it; p.soda@unicampus.it

RI Michele, Fiore/AAC-6070-2022; Sicilia, Rosa/AAC-6012-2022; RAMELLA,

SARA/AAC-6523-2022; Soda, Paolo/K-8126-2016

OI Sicilia, Rosa/0000-0002-2513-0827; RAMELLA, SARA/0000-0002-5782-7717;

Fiore, Michele/0000-0003-1889-4578; Soda, Paolo/0000-0003-2621-072X;

Tronchin, Lorenzo/0000-0001-6512-9444; Iannello,

Giulio/0000-0003-3864-5800

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Burnet Neil G, 2004, Cancer Imaging, V4, P153, DOI 10.1102/1470-7330.2004.0054

Castaneda Christian, 2015, J Clin Bioinforma, V5, P4, DOI 10.1186/s13336-015-0019-3

Chen T., 2016, KDD16 P 22 ACM, P785, DOI [DOI 10.1145/2939672.2939785, 10.1145/2939672.2939785]

Curran WJ, 2011, J NATL CANCER I, V103, P1452, DOI 10.1093/jnci/djr325

D'Amico NC, 2019, INT J DATA MIN BIOIN, V22, P365

Di Noto Tommaso, 2019, Radiol Cardiothorac Imaging, V1, pe180026, DOI 10.1148/ryct.2019180026

ESMO, 2018, ESMO INT GUID LUNG C

Fang X, 2020, EUR RADIOL, V30, P6888, DOI 10.1007/s00330-020-07032-z

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Giraud P, 2002, RADIOTHER ONCOL, V62, P27, DOI 10.1016/S0167-8140(01)00444-3

Guyon I, 2002, MACH LEARN, V46, P389, DOI 10.1023/A:1012487302797

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

He KM, 2016, PROC CVPR IEEE, P770, DOI 10.1109/CVPR.2016.90

Homayounieh Fatemeh, 2020, Radiol Cardiothorac Imaging, V2, pe200322, DOI 10.1148/ryct.2020200322

Hu WX, 2016, CLIN J AM SOC NEPHRO, V11, P585, DOI 10.2215/CJN.06720615

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Ito H, 2020, INT J CLIN ONCOL, V25, P274, DOI 10.1007/s10147-019-01566-z

Jiang YM, 2018, EBIOMEDICINE, V36, P171, DOI 10.1016/j.ebiom.2018.09.007

Kickingereder P, 2016, RADIOLOGY, V280, P880, DOI 10.1148/radiol.2016160845

Kim TY, 2002, AM J CLIN ONCOL-CANC, V25, P238, DOI 10.1097/00000421-200206000-00007

Krizhevsky A., 2012, ADV NEURAL INFORM PR, V25, DOI DOI 10.1145/3065386

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Kwan JYY, 2018, INT J RADIAT ONCOL, V102, P1107, DOI 10.1016/j.ijrobp.2018.01.057

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lao JW, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-10649-8

Larue RTHM, 2018, ACTA ONCOL, V57, P1475, DOI 10.1080/0284186X.2018.1486039

Lemjabbar-Alaoui H, 2015, BBA-REV CANCER, V1856, P189, DOI 10.1016/j.bbcan.2015.08.002

Li HM, 2018, RADIOTHER ONCOL, V129, P218, DOI 10.1016/j.radonc.2018.06.025

Li H, 2016, NPJ BREAST CANCER, V2, DOI 10.1038/npjbcancer.2016.12

Li QH, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-14753-7

Lin D, 2016, NEUROCOMPUTING, V216, P700, DOI 10.1016/j.neucom.2016.08.039

Molina JR, 2008, MAYO CLIN PROC, V83, P584, DOI 10.4065/83.5.584

Nestle U, 2018, RADIOTHER ONCOL, V127, P1, DOI 10.1016/j.radonc.2018.02.023

Niu L, 2019, WORLD NEUROSURG, V126, pE646, DOI 10.1016/j.wneu.2019.02.109

Ojala T, 2002, IEEE T PATTERN ANAL, V24, P971, DOI 10.1109/TPAMI.2002.1017623

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

Percannella G, 2011, LECT NOTES COMPUT SC, V6979, P353, DOI 10.1007/978-3-642-24088-1\_37

Rahmim A, 2017, NEUROIMAGE-CLIN, V16, P539, DOI 10.1016/j.nicl.2017.08.021

Ramella S, 2018, PLOS ONE, V13, DOI 10.1371/journal.pone.0207455

Ramella S, 2017, J THORAC ONCOL, V12, P1122, DOI 10.1016/j.jtho.2017.03.025

Schimek-Jasch T, 2015, STRAHLENTHER ONKOL, V191, P525, DOI 10.1007/s00066-015-0812-8

Scrivener M, 2016, TRANSL CANCER RES, V5, P398, DOI 10.21037/tcr.2016.06.18

Sebastian V B., 2012, ARXIV12054831

Sicilia R, 2019, COMP MED SY, P355, DOI 10.1109/CBMS.2019.00078

Silvestri L, 2015, FRONT NEUROANAT, V9, DOI 10.3389/fnana.2015.00068

Spraker MB, 2019, ADV RADIAT ONCOL, V4, P413, DOI 10.1016/j.adro.2019.02.003

Thawani R, 2018, LUNG CANCER, V115, P34, DOI 10.1016/j.lungcan.2017.10.015

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Wang YL, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-50886-7

Zhao GY, 2007, IEEE T PATTERN ANAL, V29, P915, DOI 10.1109/TPAMI.2007.1110

NR 53

TC 3

Z9 3

U1 0

U2 7

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2076-3417

J9 APPL SCI-BASEL

JI Appl. Sci.-Basel

PD SEP

PY 2020

VL 10

IS 18

AR 6425

DI 10.3390/app10186425

PG 18

WC Chemistry, Multidisciplinary; Engineering, Multidisciplinary; Materials

Science, Multidisciplinary; Physics, Applied

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Chemistry; Engineering; Materials Science; Physics

GA OE2ZP

UT WOS:000580405300001

OA gold, Green Submitted

DA 2022-08-24

ER

PT J

AU Jayasurya, K

Fung, G

Yu, S

Dehing-Oberije, C

Ruysscher, D

Hope, A

De Neve, W

Lievens, Y

Lambin, P

Dekker, ALAJ

AF Jayasurya, K.

Fung, G.

Yu, S.

Dehing-Oberije, C.

De Ruysscher, D.

Hope, A.

De Neve, W.

Lievens, Y.

Lambin, P.

Dekker, A. L. A. J.

TI Comparison of Bayesian network and support vector machine models for

two-year survival prediction in lung cancer patients treated with

radiotherapy

SO MEDICAL PHYSICS

LA English

DT Article

DE belief networks; cancer; learning (artificial intelligence); lung;

parameter estimation; positron emission tomography; radiation therapy;

support vector machines; tumours

ID RADIATION-INDUCED PNEUMONITIS; PROGNOSTIC-FACTORS; MISSING VALUES;

CLASSIFICATION; STAGE

AB Purpose: Classic statistical and machine learning models such as support vector machines (SVMs) can be used to predict cancer outcome, but often only perform well if all the input variables are known, which is unlikely in the medical domain. Bayesian network (BN) models have a natural ability to reason under uncertainty and might handle missing data better. In this study, the authors hypothesize that a BN model can predict two-year survival in non-small cell lung cancer (NSCLC) patients as accurately as SVM, but will predict survival more accurately when data are missing.

Methods: A BN and SVM model were trained on 322 inoperable NSCLC patients treated with radiotherapy from Maastricht and validated in three independent data sets of 35, 47, and 33 patients from Ghent, Leuven, and Toronto. Missing variables occurred in the data set with only 37, 28, and 24 patients having a complete data set.

Results: The BN model structure and parameter learning identified gross tumor volume size, performance status, and number of positive lymph nodes on a PET as prognostic factors for two-year survival. When validated in the full validation set of Ghent, Leuven, and Toronto, the BN model had an AUC of 0.77, 0.72, and 0.70, respectively. A SVM model based on the same variables had an overall worse performance (AUC 0.71, 0.68, and 0.69) especially in the Ghent set, which had the highest percentage of missing the important GTV size data. When only patients with complete data sets were considered, the BN and SVM model performed more alike.

Conclusions: Within the limitations of this study, the hypothesis is supported that BN models are better at handling missing data than SVM models and are therefore more suitable for the medical domain. Future works have to focus on improving the BN performance by including more patients, more variables, and more diversity.

C1 [Jayasurya, K.; Fung, G.; Yu, S.] Siemens Med Solut, Malvern, PA 19355 USA.

[Dehing-Oberije, C.; De Ruysscher, D.; Lambin, P.; Dekker, A. L. A. J.] Maastricht Univ, Med Ctr, Dept Radiat Oncol, MAASTRO Clin, NL-6211 HK Maastricht, Netherlands.

[Hope, A.] Univ Hlth Network, Princess Margaret Hosp, Radiat Med Program, Toronto, ON M5G 2MG, Canada.

[De Neve, W.] Ghent Univ Hosp, Dept Radiotherapy, B-9000 Ghent, Belgium.

[Lievens, Y.] Univ Hosp Leuven, Dept Radiotherapy, B-3000 Louvain, Belgium.

RP Jayasurya, K (通讯作者)，Siemens Med Solut, Malvern, PA 19355 USA.

EM andre.dekker@maastro.nl

RI Oberije, Cary/I-4018-2013; Oberije, Cary/ABA-6178-2020; Dekker,

Andre/AAE-4830-2019

OI Oberije, Cary/0000-0003-0749-5117; Oberije, Cary/0000-0003-0749-5117;

Dekker, Andre/0000-0002-0422-7996; Lambin, Philippe/0000-0001-7961-0191

CR Ademuyiwa FO, 2007, CLIN LUNG CANCER, V8, P478, DOI 10.3816/CLC.2007.n.031

Brundage MD, 2002, CHEST, V122, P1037, DOI 10.1378/chest.122.3.1037

Burnside ES, 2005, ACAD RADIOL, V12, P422, DOI 10.1016/j.acra.2004.11.030

Chen S, 2007, MED PHYS, V34, P3808, DOI 10.1118/1.2776669

Chickering DM, 2004, J MACH LEARN RES, V5, P1287

Cristianini N, 2000, INTRO SUPPORT VECTOR, DOI DOI 10.1017/CBO9780511801389

Das SK, 2008, MED PHYS, V35, P5098, DOI 10.1118/1.2996012

Dehing-Oberije C, 2008, INT J RADIAT ONCOL, V70, P1039, DOI 10.1016/j.ijrobp.2007.07.2323

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

EATON D, 2007, P 23 C UNC ART UNPUB

El Naqa I, 2009, PHYS MED BIOL, V54, pS9, DOI 10.1088/0031-9155/54/18/S02

Farhangfar A, 2008, PATTERN RECOGN, V41, P3692, DOI 10.1016/j.patcog.2008.05.019

Fung G, 2003, NEUROCOMPUTING, V55, P39, DOI 10.1016/S0925-2312(03)00379-5

Meyer J, 2004, PHYS MED BIOL, V49, P1637, DOI 10.1088/0031-9155/49/9/004

Murphy K, 2001, COMP SCI STAT, V33, P1024

Needham CJ, 2007, PLOS COMPUT BIOL, V3, P1409, DOI 10.1371/journal.pcbi.0030129

Pelckmans K, 2005, NEURAL NETWORKS, V18, P684, DOI 10.1016/j.neunet.2005.06.025

Pfister DG, 2004, J CLIN ONCOL, V22, P330, DOI 10.1200/JCO.2004.09.053

Pillot G, 2006, J THORAC ONCOL, V1, P152, DOI 10.1097/01243894-200602000-00009

Smith WP, 2009, ARTIF INTELL MED, V46, P119, DOI 10.1016/j.artmed.2008.12.002

NR 20

TC 61

Z9 61

U1 0

U2 21

PU AMER ASSOC PHYSICISTS MEDICINE AMER INST PHYSICS

PI MELVILLE

PA STE 1 NO 1, 2 HUNTINGTON QUADRANGLE, MELVILLE, NY 11747-4502 USA

SN 0094-2405

J9 MED PHYS

JI Med. Phys.

PD APR

PY 2010

VL 37

IS 4

BP 1401

EP 1407

DI 10.1118/1.3352709

PG 7

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 577GT

UT WOS:000276211200004

PM 20443461

OA Green Published

DA 2022-08-24

ER

PT J

AU Arshad, MA

Thornton, A

Lu, HN

Tam, H

Wallitt, K

Rodgers, N

Scarsbrook, A

McDermott, G

Cook, GJ

Landau, D

Chua, S

O'Connor, R

Dickson, J

Power, DA

Barwick, TD

Rockall, A

Aboagye, EO

AF Arshad, Mubarik A.

Thornton, Andrew

Lu, Haonan

Tam, Henry

Wallitt, Kathryn

Rodgers, Nicola

Scarsbrook, Andrew

McDermott, Garry

Cook, Gary J.

Landau, David

Chua, Sue

O'Connor, Richard

Dickson, Jeanette

Power, Danielle A.

Barwick, Tara D.

Rockall, Andrea

Aboagye, Eric O.

TI Discovery of pre-therapy 2-deoxy-2-F-18-fluoro-D-glucose positron

emission tomography-based radiomics classifiers of survival outcome in

non-small-cell lung cancer patients

SO EUROPEAN JOURNAL OF NUCLEAR MEDICINE AND MOLECULAR IMAGING

LA English

DT Article

DE Radiomics; NSCLC; Survival; PET; Risk stratification

ID ED AMERICAN-COLLEGE; FDG-PET; TEXTURAL FEATURES; TUMOR VOLUME;

HETEROGENEITY; RADIOTHERAPY; PREDICTION; VARIABILITY; PARAMETERS;

MANAGEMENT

AB PurposeThe aim of this multi-center study was to discover and validate radiomics classifiers as image-derived biomarkers for risk stratification of non-small-cell lung cancer (NSCLC).Patients and methodsPre-therapy PET scans from a total of 358 Stage I-III NSCLC patients scheduled for radiotherapy/chemo-radiotherapy acquired between October 2008 and December 2013 were included in this seven-institution study. A semi-automatic threshold method was used to segment the primary tumors. Radiomics predictive classifiers were derived from a training set of 133 scans using TexLAB v2. Least absolute shrinkage and selection operator (LASSO) regression analysis was used for data dimension reduction and radiomics feature vector (FV) discovery. Multivariable analysis was performed to establish the relationship between FV, stage and overall survival (OS). Performance of the optimal FV was tested in an independent validation set of 204 patients, and a further independent set of 21 (TESTI) patients.ResultsOf 358 patients, 249 died within the follow-up period [median 22 (range 0-85) months]. From each primary tumor, 665 three-dimensional radiomics features from each of seven gray levels were extracted. The most predictive feature vector discovered (FVX) was independent of known prognostic factors, such as stage and tumor volume, and of interest to multi-center studies, invariant to the type of PET/CT manufacturer. Using the median cut-off, FVX predicted a 14-month survival difference in the validation cohort (N=204, p=0.00465; HR=1.61, 95% CI 1.16-2.24). In the TESTI cohort, a smaller cohort that presented with unusually poor survival of stage I cancers, FVX correctly indicated a lack of survival difference (N=21, p=0.501). In contrast to the radiomics classifier, clinically routine PET variables including SUVmax, SUVmean and SUVpeak lacked any prognostic information.ConclusionPET-based radiomics classifiers derived from routine pre-treatment imaging possess intrinsic prognostic information for risk stratification of NSCLC patients to radiotherapy/chemo-radiotherapy.

C1 [Arshad, Mubarik A.; Thornton, Andrew; Lu, Haonan; Rodgers, Nicola; Barwick, Tara D.; Rockall, Andrea; Aboagye, Eric O.] Imperial Coll London, Canc Imaging Ctr, Dept Surg & Canc, Hammersmith Hosp, Du Cane Rd, London W12 0NN, England.

[Arshad, Mubarik A.; Tam, Henry; Wallitt, Kathryn; Power, Danielle A.; Barwick, Tara D.; Rockall, Andrea] Imperial Coll Healthcare NHS Trust, Dept Clin Oncol, Hammersmith Hosp, Du Cane Rd, London W12 0HS, England.

[Arshad, Mubarik A.; Tam, Henry; Wallitt, Kathryn; Power, Danielle A.; Barwick, Tara D.; Rockall, Andrea] Imperial Coll Healthcare NHS Trust, Dept Radiol, Hammersmith Hosp, Du Cane Rd, London W12 0HS, England.

[Arshad, Mubarik A.; Tam, Henry; Wallitt, Kathryn; Power, Danielle A.; Barwick, Tara D.; Rockall, Andrea] Imperial Coll Healthcare NHS Trust, Dept Nucl Med, Hammersmith Hosp, Du Cane Rd, London W12 0HS, England.

[Arshad, Mubarik A.; Tam, Henry; Wallitt, Kathryn; Power, Danielle A.; Barwick, Tara D.; Rockall, Andrea] Charing Cross Hosp, Fulham Palace Rd, London W6 8RF, England.

[Scarsbrook, Andrew; McDermott, Garry] St James Univ Hosp, Dept Nucl Med, Level 1,Bexley Wing,Beckett St, Leeds LS9 7TF, W Yorkshire, England.

[Scarsbrook, Andrew] Univ Leeds, Leeds Inst Canc & Pathol, Sch Med, Leeds, W Yorkshire, England.

[Cook, Gary J.; Landau, David] Kings Coll London, Dept Canc Imaging, Sch Biomed Engn & Imaging Sci, St Thomas Hosp, Westminster Bridge Rd, London SE1 7EH, England.

[Chua, Sue] Royal Marsden Hosp, Dept Nucl Med, Downs Rd, Sutton SM2 5PT, Surrey, England.

[O'Connor, Richard] Nottingham Univ Hosp, Dept Nucl Med, Queens Med Ctr, Derby Rd, Nottingham NG7 2UH, England.

[Dickson, Jeanette] Mt Vernon Hosp, Dept Clin Oncol, Rickmansworth Rd, Northwood HA6 2RN, Middx, England.

RP Aboagye, EO (通讯作者)，Imperial Coll London, Canc Imaging Ctr, Dept Surg & Canc, Hammersmith Hosp, Du Cane Rd, London W12 0NN, England.

EM eric.aboagye@imperial.ac.uk

OI Lu, Haonan/0000-0002-2472-7488; Scarsbrook, Andrew/0000-0002-4243-032X;

Rockall, Andrea/0000-0001-8270-5597; Cook, Gary/0000-0002-8732-8134;

Thornton, Andrew/0000-0003-2455-7199; ABOAGYE, Eric/0000-0003-2276-6771

FU United Kingdom NIHR Biomedical Research Centre; United Kingdom Medical

Research Council [MR/N020782/1]; Cancer Research UK [C2536/A16584];

Imperial College Experimental Cancer Medicine's Centre; MRC

[MR/N020782/1] Funding Source: UKRI

FX This work was supported by United Kingdom NIHR Biomedical Research

Centre award to Imperial College London. EOA acknowledges programmatic

support from Imperial College Experimental Cancer Medicine's Centre,

United Kingdom Medical Research Council (MR/N020782/1), and Cancer

Research UK (C2536/A16584).

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Alberg AJ, 2013, CHEST, V143, pE1, DOI 10.1378/chest.12-2345

ARMITAGE P, 2001, STATISTICAL METHODS

Ball DL, 2013, RADIOTHER ONCOL, V106, P305, DOI 10.1016/j.radonc.2012.12.003

Berghmans T, 2008, J THORAC ONCOL, V3, P6, DOI 10.1097/JTO.0b013e31815e6d6b

Biehl KJ, 2006, J NUCL MED, V47, P1808

Boellaard R, 2015, EUR J NUCL MED MOL I, V42, P328, DOI 10.1007/s00259-014-2961-x

Brooks FJ, 2013, RADIAT ONCOL, V8, DOI 10.1186/1748-717X-8-294

Buyukdereli G, 2016, BALK MED J, V33, P308, DOI 10.5152/balkanmedj.2016.140530

Chalkidou A, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0124165

Chen Z, 2014, NAT REV CANCER, V14, P535, DOI 10.1038/nrc3775

de Bruin EC, 2014, SCIENCE, V346, P251, DOI 10.1126/science.1253462

Detterbeck FC, 2013, CHEST, V143, pE191, DOI 10.1378/chest.12-2354

Foster B, 2014, COMPUT BIOL MED, V50, P76, DOI 10.1016/j.compbiomed.2014.04.014

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Jemal A, 2010, CA-CANCER J CLIN, V60, P277, DOI [10.3322/caac.20073, 10.3322/caac.20115, 10.3322/caac.20107]

Kirienko M, 2018, EUR J NUCL MED MOL I, V45, P207, DOI 10.1007/s00259-017-3837-7

Lee ES, 2008, CLIN CANCER RES, V14, P7397, DOI 10.1158/1078-0432.CCR-07-4937

Leijenaar RTH, 2015, SCI REP-UK, V5, DOI 10.1038/srep11075

Majem M, 2013, TRANSL LUNG CANCER R, V2, P226, DOI 10.3978/j.issn.2218-6751.2013.03.09

Na FF, 2014, J THORAC ONCOL, V9, P834, DOI 10.1097/JTO.0000000000000185

Nana-Sinkam SP, 2013, CHEST, V143, pE30, DOI 10.1378/chest.12-2346

Okimoto RA, 2014, PERS MED, V11, P309, DOI 10.2217/pme.14.19

Overgaard J, 2007, J CLIN ONCOL, V25, P4066, DOI 10.1200/JCO.2007.12.7878

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Reuze S, 2017, ONCOTARGET, V8, P43169, DOI 10.18632/oncotarget.17856

Salavati A, 2017, EUR J NUCL MED MOL I, V44, P1969, DOI 10.1007/s00259-017-3753-x

Segal E, 2007, NAT BIOTECHNOL, V25, P675, DOI 10.1038/nbt1306

Soussan M, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0094017

SUN CJ, 1983, COMPUT VISION GRAPH, V23, P341, DOI 10.1016/0734-189X(83)90032-4

Thibault G, 2009, PATTERN RECOGNIT INF, V140, P145

Tibshirani R, 1997, STAT MED, V16, P385, DOI 10.1002/(SICI)1097-0258(19970228)16:4<385::AID-SIM380>3.0.CO;2-3

Willaime JMY, 2013, PHYS MED BIOL, V58, P187, DOI 10.1088/0031-9155/58/2/187

Wilson WR, 2011, NAT REV CANCER, V11, P393, DOI 10.1038/nrc3064

Wu WM, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00071

Zhang JJ, 2014, SCIENCE, V346, P256, DOI 10.1126/science.1256930

NR 36

TC 32

Z9 35

U1 2

U2 29

PU SPRINGER

PI NEW YORK

PA ONE NEW YORK PLAZA, SUITE 4600, NEW YORK, NY, UNITED STATES

SN 1619-7070

EI 1619-7089

J9 EUR J NUCL MED MOL I

JI Eur. J. Nucl. Med. Mol. Imaging

PD FEB

PY 2019

VL 46

IS 2

BP 455

EP 466

DI 10.1007/s00259-018-4139-4

PG 12

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA HH6CX

UT WOS:000455817600021

PM 30173391

OA Green Published, hybrid

DA 2022-08-24

ER

PT J

AU Hindocha, S

Charlton, TG

Linton-Reid, K

Hunter, B

Chan, C

Ahmed, M

Robinson, EJ

Orton, M

Ahmad, S

McDonald, F

Locke, I

Power, D

Blackledge, M

Lee, RW

Aboagye, EO

AF Hindocha, Sumeet

Charlton, Thomas G.

Linton-Reid, Kristofer

Hunter, Benjamin

Chan, Charleen

Ahmed, Merina

Robinson, Emily J.

Orton, Matthew

Ahmad, Shahreen

McDonald, Fiona

Locke, Imogen

Power, Danielle

Blackledge, Matthew

Lee, Richard W.

Aboagye, Eric O.

TI A comparison of machine learning methods for predicting recurrence and

death after curative-intent radiotherapy for non-small cell lung cancer:

Development and validation of multivariable clinical prediction models

SO EBIOMEDICINE

LA English

DT Article

DE Non-small cell lung cancer; Radiotherapy; Machine learning; Recurrence;

Overall survival; Prediction; Early detection

ID STANDARDIZED UPTAKE VALUE; TUMOR VOLUME; RADICAL RADIOTHERAPY; SURVIVAL

PREDICTION; PROGNOSTIC-FACTOR; NSCLC PATIENTS; CHEMORADIOTHERAPY; RISK;

SIZE; CARE

AB Background Surveillance is universally recommended for non-small cell lung cancer (NSCLC) patients treated with curative-intent radiotherapy. High-quality evidence to inform optimal surveillance strategies is lacking. Machine learning demonstrates promise in accurate outcome prediction for a variety of health conditions. The purpose of this study was to utilise readily available patient, tumour, and treatment data to develop, validate and externally test machine learning models for predicting recurrence, recurrence-free survival (RFS) and overall survival (OS) at 2 years from treatment.& nbsp;Methods A retrospective, multicentre study of patients receiving curative-intent radiotherapy for NSCLC was undertaken. A total of 657 patients from 5 hospitals were eligible for inclusion. Data pre-processing derived 34 features for predictive modelling. Combinations of 8 feature reduction methods and 10 machine learning classification algorithms were compared, producing risk-stratification models for predicting recurrence, RFS and OS. Models were compared with 10-fold cross validation and an external test set and benchmarked against TNM-stage and performance status. Youden Index was derived from validation set ROC curves to distinguish high and low risk groups and Kaplan-Meier analyses performed.& nbsp;Findings Median follow-up time was 852 days. Parameters were well matched across training-validation and external test sets: Mean age was 73 and 71 respectively, and recurrence, RFS and OS rates at 2 years were 43% vs 34%, 54% vs 47% and 54% vs 47% respectively. The respective validation and test set AUCs were as follows: 1) RFS: 0.682 (0.575-0.788) and 0.681 (0.597-0.766), 2) Recurrence: 0.687 (0.582-0.793) and 0.722 (0.635-0.81), and 3) OS: 0.759 (0.663-0.855) and 0.717 (0.634-0.8). Our models were superior to TNM stage and performance status in predicting recurrence and OS.& nbsp;Interpretation This robust and ready to use machine learning method, validated and externally tested, sets the stage for future clinical trials entailing quantitative personalised risk-stratification and surveillance following curative intent radiotherapy for NSCLC.& nbsp;FundingA full list of funding bodies that contributed to this study can be found in the Acknowledgements section. (C) 2022 The Authors. Published by Elsevier B.V.

C1 [Hindocha, Sumeet; Hunter, Benjamin; McDonald, Fiona; Lee, Richard W.] Royal Marsden NHS Fdn Trust, Lung Unit, Fulham Rd, London SW3 6JJ, England.

[Hindocha, Sumeet] Imperial Coll London, AI Healthcare Ctr Doctoral Training, Exhibit Rd, London SW7 2BX, England.

[Hindocha, Sumeet; Hunter, Benjamin; Chan, Charleen; McDonald, Fiona; Aboagye, Eric O.] Inst Canc Res NIHR Biomed Res Ctr, Dept Clin Oncol, London, England.

[Hindocha, Sumeet; Linton-Reid, Kristofer; Hunter, Benjamin] Imperial Coll London, Canc Imaging Ctr, Dept Surg & Canc, Du Cane Rd, London W12 0NN, England.

[Charlton, Thomas G.; Ahmad, Shahreen] Guys & St Thomas NHS Fdn Trust, Guys Canc Ctr, London SE1 9RT, England.

[Ahmed, Merina; Locke, Imogen] Royal Marsden NHS Fdn Trust, Lung Unit, Downs Rd, Sutton SM2 5PT, Surrey, England.

[Robinson, Emily J.] Royal Marsden NHS Fdn Trust, Clin Trials Unit, Downs Rd, Sutton SM2 5PT, Surrey, England.

[Orton, Matthew] Royal Marsden NHS Fdn Trust, Artificial Intelligence Imaging Hub, Downs Rd, Sutton SM2 5PT, Surrey, England.

[Power, Danielle] Charing Cross Hosp, Dept Clin Oncol, Fulham Palace Rd, London W6 8RF, England.

[Blackledge, Matthew] Inst Canc Res, Radiotherapy & Imaging, 123 Old Brompton Rd, London SW7 3RP, England.

[Hindocha, Sumeet; Hunter, Benjamin; Lee, Richard W.] Royal Marsden NHS Fdn Trust, Natl Inst Hlth Res NIHR Biomed Res Ctr, Early Diag & Detect Ctr, London, England.

[Hindocha, Sumeet; Hunter, Benjamin; Lee, Richard W.] Inst Canc Res, London, England.

[Lee, Richard W.] Imperial Coll, Natl Heart & Lung Inst, London, England.

RP Lee, RW (通讯作者)，Royal Marsden NHS Fdn Trust, Lung Unit, Fulham Rd, London SW3 6JJ, England.; Aboagye, EO (通讯作者)，Inst Canc Res NIHR Biomed Res Ctr, Dept Clin Oncol, London, England.

EM Richard.Lee@rmh.nhs.uk; eric.aboagye@imperial.ac.uk

OI ABOAGYE, Eric/0000-0003-2276-6771; Hindocha, Sumeet/0000-0003-1644-0142

FU National Institute for Health Research (NIHR) Biomedical Research Centre

at The Royal Marsden NHS Foundation Trust; Institute of Cancer Research,

London; Royal Marsden Cancer Charity; UKRI CDT in AI for Healthcare

[P/S023283/1]; Imperial College London; Royal Marsden & Institute of

Cancer Research NIHR Biomedical Research Centre; Cancer Research UK

[C309/A31316]; Royal Marsden Partners; Imperial College Biomedical

Research Centre; Experimental Cancer Medicines Centre

FX This study represents independent research funded by the National

Institute for Health Research (NIHR) Biomedical Research Centre at The

Royal Marsden NHS Foundation Trust and The Institute of Cancer Research,

London, and by the Royal Marsden Cancer Charity. The views expressed are

those of the author(s) and not necessarily those of the NIHR or the

Department of Health and Social Care. Sumeet Hindocha is funded by the

UKRI CDT in AI for Healthcare http://ai4health.io (Grant No.

P/S023283/1), by Imperial College London and by the Royal Marsden &

Institute of Cancer Research NIHR Biomedical Research Centre. Benjamin

Hunter is funded by Cancer Research UK (grant reference C309/A31316) and

Royal Marsden Partners. Richard Lee is funded by the Royal Marsden

Cancer Charity and by the Royal Marsden & Institute of Cancer Research

NIHR Biomedical Research Centre. Eric Aboagye receives funding from the

Imperial College Biomedical Research Centre and Experimental Cancer

Medicines Centre, paid to his institution. Richard Lee and Eric Aboagye

provided joint supervision for this work.

CR [Anonymous], 2019, DIAGN TREATM LUNG CA

Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Arshad MA, 2019, EUR J NUCL MED MOL I, V46, P455, DOI 10.1007/s00259-018-4139-4

Asamura H, 2015, J THORAC ONCOL, V10, P1675, DOI 10.1097/JTO.0000000000000678

Baek S, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-53461-2

Ball D, 2013, J THORAC ONCOL, V8, P315, DOI 10.1097/JTO.0b013e31827dc74d

Ball DL, 2013, RADIOTHER ONCOL, V106, P305, DOI 10.1016/j.radonc.2012.12.003

Chen FF, 2015, TRANSL LUNG CANCER R, V4, P18, DOI 10.3978/j.issn.2218-6751.2014.11.02

Deist TM, 2018, MED PHYS, V45, P3449, DOI 10.1002/mp.12967

Dekker A, 2014, RADIOTHER ONCOL, V111, pS24, DOI 10.1016/j.radonc.2014.08.013

Dong X, 2018, Zhonghua Zhong Liu Za Zhi, V40, P446, DOI 10.3760/cma.j.issn.0253-3766.2018.06.009

Evison M, 2021, CLIN ONCOL-UK, V33, P145, DOI 10.1016/j.clon.2020.09.001

He HB, 2013, IMBALANCED LEARNING: FOUNDATIONS, ALGORITHMS, AND APPLICATIONS, P1

Horne ZD, 2014, RADIAT ONCOL, V9, DOI 10.1186/1748-717X-9-41

Jochems A, 2017, INT J RADIAT ONCOL, V99, P344, DOI 10.1016/j.ijrobp.2017.04.021

Kasmann L, 2018, STRAHLENTHER ONKOL, V194, P79, DOI 10.1007/s00066-017-1221-y

Kawaguchi T, 2010, J THORAC ONCOL, V5, P620, DOI 10.1097/JTO.0b013e3181d2dcd9

Kohutek ZA, 2015, LUNG CANCER, V89, P115, DOI 10.1016/j.lungcan.2015.05.019

Kuhn M, 2019, 15 VARIABLE IMPORTAN

Lee B, 2020, SCI REP-UK, V10, P145

Moore S, 2019, J THORAC ONCOL, V14, P1430, DOI 10.1016/j.jtho.2019.04.005

Oberije C, 2015, INT J RADIAT ONCOL, V92, P935, DOI 10.1016/j.ijrobp.2015.02.048

Oberije C, 2014, RADIOTHER ONCOL, V112, P37, DOI 10.1016/j.radonc.2014.04.012

Paesmans M, 2015, EUR RESPIR J, V46, P1751, DOI 10.1183/13993003.00099-2015

Palomar-Abril V, 2020, CLIN TRANSL ONCOL, V22, P2333, DOI 10.1007/s12094-020-02396-6

Rami-Porta R, 2015, J THORAC ONCOL, V10, P990, DOI 10.1097/JTO.0000000000000559

Sher A, 2020, CANCER MANAG RES, V12, P7165, DOI 10.2147/CMAR.S250868

Siah KW, 2019, JCO CLIN CANCER INFO, V3, P1, DOI 10.1200/CCI.19.00046

Spooner A, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-77220-w

Wang DY, 2020, FUTURE ONCOL, V16, P439, DOI 10.2217/fon-2019-0837

Yu Y, 2015, CLIN THER, V37, P2256, DOI 10.1016/j.clinthera.2015.07.014

Zhang YC, 2017, SCI REP-UK, V7, DOI 10.1038/srep46349

NR 32

TC 0

Z9 0

U1 4

U2 4

PU ELSEVIER

PI AMSTERDAM

PA RADARWEG 29, 1043 NX AMSTERDAM, NETHERLANDS

SN 2352-3964

J9 EBIOMEDICINE

JI EBioMedicine

PD MAR

PY 2022

VL 77

AR 103911

DI 10.1016/j.ebiom.2022.103911

PG 13

WC Medicine, General & Internal; Medicine, Research & Experimental

WE Science Citation Index Expanded (SCI-EXPANDED)

SC General & Internal Medicine; Research & Experimental Medicine

GA 1D8FZ

UT WOS:000794033100007

PM 35248997

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Kothari, G

Woon, B

Patrick, CJ

Korte, J

Wee, L

Hanna, GG

Kron, T

Hardcastle, N

Siva, S

AF Kothari, Gargi

Woon, Beverley

Patrick, Cameron J.

Korte, James

Wee, Leonard

Hanna, Gerard G.

Kron, Tomas

Hardcastle, Nicholas

Siva, Shankar

TI The impact of inter-observer variation in delineation on robustness of

radiomics features in non-small cell lung cancer

SO SCIENTIFIC REPORTS

LA English

DT Article

ID VOLUME DELINEATION; RADIOTHERAPY; VARIABILITY; STABILITY

AB Artificial intelligence and radiomics have the potential to revolutionise cancer prognostication and personalised treatment. Manual outlining of the tumour volume for extraction of radiomics features (RF) is a subjective process. This study investigates robustness of RF to inter-observer variation (IOV) in contouring in lung cancer. We utilised two public imaging datasets: 'NSCLC-Radiomics' and 'NSCLC-Radiomics-Interobserver1' ('Interobserver'). For 'NSCLC-Radiomics', we created an additional set of manual contours for 92 patients, and for 'Interobserver', there were five manual and five semi-automated contours available for 20 patients. Dice coefficients (DC) were calculated for contours. 1113 RF were extracted including shape, first order and texture features. Intraclass correlation coefficient (ICC) was computed to assess robustness of RF to IOV. Cox regression analysis for overall survival (OS) was performed with a previously published radiomics signature. The median DC ranged from 0.81 ('NSCLC-Radiomics') to 0.85 ('Interobserver'-semi-automated). The median ICC for the 'NSCLC-Radiomics', 'Interobserver' (manual) and 'Interobserver' (semi-automated) were 0.90, 0.88 and 0.93 respectively. The ICC varied by feature type and was lower for first order and gray level co-occurrence matrix (GLCM) features. Shape features had a lower median ICC in the 'NSCLC-Radiomics' dataset compared to the 'Interobserver' dataset. Survival analysis showed similar separation of curves for three of four RF apart from 'original\_shape\_Compactness2', a feature with low ICC (0.61). The majority of RF are robust to IOV, with first order, GLCM and shape features being the least robust. Semi-automated contouring improves feature stability. Decreased robustness of a feature is significant as it may impact upon the features' prognostic capability.

C1 [Kothari, Gargi; Hanna, Gerard G.; Siva, Shankar] Peter MacCallum Canc Ctr, Dept Radiat Oncol, Victorian Comprehens Canc Ctr Bldg,305 Grattan St, Melbourne, Vic 3000, Australia.

[Kothari, Gargi; Woon, Beverley; Hanna, Gerard G.; Kron, Tomas; Hardcastle, Nicholas; Siva, Shankar] Univ Melbourne, Peter MacCallum Canc Ctr, Sir Peter MacCallum Dept Oncol, Melbourne, Vic, Australia.

[Woon, Beverley] Peter MacCallum Canc Ctr, Dept Radiol, Canc Imaging, Melbourne, Vic, Australia.

[Patrick, Cameron J.] Univ Melbourne, Stat Consulting Ctr, Parkville, Vic, Australia.

[Korte, James; Kron, Tomas; Hardcastle, Nicholas] Peter MacCallum Canc Ctr, Dept Phys Sci, Melbourne, Vic, Australia.

[Korte, James] Univ Melbourne, Sch Chem & Biomed Engn, Dept Biomed Engn, Melbourne, Vic, Australia.

[Wee, Leonard] Maastricht Univ, Med Ctr, Dept Radiotherapy MAASTRO, GROW Sch Oncol, Maastricht, Netherlands.

[Wee, Leonard] Maastricht Univ, Clin Data Sci, Maastricht, Netherlands.

[Kron, Tomas; Hardcastle, Nicholas] Univ Wollongong, Ctr Med Radiat Phys, Wollongong, NSW, Australia.

RP Kothari, G (通讯作者)，Peter MacCallum Canc Ctr, Dept Radiat Oncol, Victorian Comprehens Canc Ctr Bldg,305 Grattan St, Melbourne, Vic 3000, Australia.; Kothari, G (通讯作者)，Univ Melbourne, Peter MacCallum Canc Ctr, Sir Peter MacCallum Dept Oncol, Melbourne, Vic, Australia.

EM Gargi.Kothari@petermac.org

FU Dutch Research Council NWO [14930, BIONIC 629.002.205, TRAIN

629.002.212]; Queen Wilhemina foundation KWF (ProTRaIT); Hanarth

Foundation

FX LW acknowledges financial support from the Dutch Research Council NWO

(STW-Perspectief STRaTegy 14930, Indo-Dutch projects BIONIC 629.002.205

and TRAIN 629.002.212), the Queen Wilhemina foundation KWF (ProTRaIT)

and a personal research grant from the Hanarth Foundation. Funders had

no role in the writing of this manuscript.

CR Aerts HJ, 2019, DATA NSCLC RADIOMICS, V9, DOI 10.7937K

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ardila D, 2019, NAT MED, V25, P954, DOI 10.1038/s41591-019-0447-x

Bousabarah K, 2021, RADIAT ONCOL, V16, DOI 10.1186/s13014-021-01805-6

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

D'Antonoli TA, 2020, ACAD RADIOL, V27, P497, DOI 10.1016/j.acra.2019.05.019

Das S, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-020-80900-2

Davey A, 2021, PHYS MED BIOL, V66, DOI 10.1088/1361-6560/abfa34

DICE LR, 1945, ECOLOGY, V26, P297, DOI 10.2307/1932409

Dou TH, 2018, PLOS ONE, V13, DOI 10.1371/journal.pone.0206108

Fernandes MG, 2021, RADIOTHER ONCOL, V165, P52, DOI 10.1016/j.radonc.2021.10.008

Granzier RWY, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-70940-z

Haarburger C, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-69534-6

Hanna GG, 2010, CLIN ONCOL-UK, V22, P515, DOI 10.1016/j.clon.2010.05.006

Hosny A, 2018, PLOS MED, V15, DOI 10.1371/journal.pmed.1002711

Jethanandani A, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00131

Kassambara A.K, MARIN BIECEK PRZEMYS

Kim H, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0164924

Korte JC, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-021-96600-4

Kothari G, 2022, J MED IMAG RADIAT ON, V66, P575, DOI 10.1111/1754-9485.13426

Kothari G, 2021, RADIOTHER ONCOL, V155, P188, DOI 10.1016/j.radonc.2020.10.023

Larue RTHM, 2017, ACTA ONCOL, V56, P1544, DOI 10.1080/0284186X.2017.1351624

Liu Y, 2018, MED PHYS, V45, P2518, DOI 10.1002/mp.12901

Lustberg T, 2018, RADIOTHER ONCOL, V126, P312, DOI 10.1016/j.radonc.2017.11.012

Mackin D, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-20713-6

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Owens CA, 2018, PLOS ONE, V13, DOI 10.1371/journal.pone.0205003

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Pavic M, 2018, ACTA ONCOL, V57, P1070, DOI 10.1080/0284186X.2018.1445283

Peeken JC, 2021, RADIOTHER ONCOL, V164, P73, DOI 10.1016/j.radonc.2021.08.023

R Core Team, 2019, R LANG ENV STAT COMP

Revelle W.R, PSYCH PROCEDURES PER

Shafiq-ul-Hassan M, 2018, J MED IMAGING, V5, DOI 10.1117/1.JMI.5.1.011013

Shi ZW, 2019, SCI DATA, V6, DOI 10.1038/s41597-019-0241-0

Shi ZW, 2019, MED PHYS, V46, P5677, DOI 10.1002/mp.13844

Sun R, 2018, LANCET ONCOL, V19, P1180, DOI 10.1016/S1470-2045(18)30413-3

Therneau TM., 2020, \*\*DATA OBJECT\*\*

Traverso A, 2018, INT J RADIAT ONCOL, V102, P1143, DOI 10.1016/j.ijrobp.2018.05.053

Valdora F, 2018, BREAST CANCER RES TR, V169, P217, DOI 10.1007/s10549-018-4675-4

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

van Velden FHP, 2016, MOL IMAGING BIOL, V18, P788, DOI 10.1007/s11307-016-0940-2

Vinod SK, 2016, RADIOTHER ONCOL, V121, P169, DOI 10.1016/j.radonc.2016.09.009

Vuong D, 2020, MED PHYS, V47, P4045, DOI 10.1002/mp.14224

Wang S, 2019, EUR RESPIR J, V53, DOI 10.1183/13993003.00986-2018

Wee L., CANC IMAGING ARCHIVE, DOI [10.7937/tcia.2019.cwvlpd26.2019, DOI 10.7937/TCIA.2019.CWVLPD26.2019]

Weiss E, 2003, STRAHLENTHER ONKOL, V179, P21, DOI 10.1007/s00066-003-0976-5

Welch ML, 2019, RADIOTHER ONCOL, V130, P2, DOI 10.1016/j.radonc.2018.10.027

Yang F, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-019-57171-7

Zhao BS, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.633176

Zwanenburg A, 2020, RADIOLOGY, V295, P328, DOI 10.1148/radiol.2020191145

NR 50

TC 0

Z9 0

U1 0

U2 0

PU NATURE PORTFOLIO

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD JUL 27

PY 2022

VL 12

IS 1

AR 12822

DI 10.1038/s41598-022-16520-9

PG 11

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA 3H2RJ

UT WOS:000831887000043

PM 35896707

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Johnson, C

Price, G

Khalifa, J

Faivre-Finn, C

Dekker, A

Moore, C

van Herk, M

AF Johnson, Corinne

Price, Gareth

Khalifa, Jonathan

Faivre-Finn, Corinne

Dekker, Andre

Moore, Christopher

van Herk, Marcel

TI A method to combine target volume data from 3D and 4D planned thoracic

radiotherapy patient cohorts for machine learning applications

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Radiotherapy; Machine-learning; GTV; Lung cancer

ID GROSS TUMOR VOLUME; LUNG-CANCER; RADIATION PNEUMONITIS; EXTERNAL

VALIDATION; DELINEATION; DEFINITION; SURVIVAL; MODEL; GTV

AB Background and purpose: The gross tumour volume (GTV) is predictive of clinical outcome and consequently features in many machine-learned models. 4D-planning, however, has prompted substitution of the GTV with the internal gross target volume (iGTV). We present and validate a method to synthesise GTV data from the iGTV, allowing the combination of 3D and 4D planned patient cohorts for modelling.

Material and methods: Expert delineations in 40 non-small cell lung cancer patients were used to develop linear fit and erosion methods to synthesise the GTV volume and shape. Quality was assessed using Dice Similarity Coefficients (DSC) and closest point measurements; by calculating dosimetric features; and by assessing the quality of random forest models built on patient populations with and without synthetic GTVs.

Results: Volume estimates were within the magnitudes of inter-observer delineation variability. Shape comparisons produced mean DSCs of 0.8817 and 0.8584 for upper and lower lobe cases, respectively. A model trained on combined true and synthetic data performed significantly better than models trained on GTV alone, or combined GTV and iGTV data.

Conclusions: Accurate synthesis of GTV size from the iGTV permits the combination of lung cancer patient cohorts, facilitating machine learning applications in thoracic radiotherapy. (C) 2017 Elsevier B.V. All rights reserved. Radiotherapy and Oncology 126 (2018) 355-361

C1 [Johnson, Corinne; Price, Gareth; Faivre-Finn, Corinne; Moore, Christopher; van Herk, Marcel] Univ Manchester, Manchester Acad Hlth Sci Ctr, Fac Biol Med & Hlth,Sch Med Sci, Manchester Canc Res Ctr,Div Mol & Clin Canc Sci, Manchester, Lancs, England.

[Johnson, Corinne; Price, Gareth; Khalifa, Jonathan; Faivre-Finn, Corinne; Moore, Christopher; van Herk, Marcel] Manchester Acad Hlth Sci Ctr, Christie NHS Fdn Trust, Manchester, Lancs, England.

[Khalifa, Jonathan] Inst Univ Canc Toulouse Oncopole, Dept Radiat Oncol, Toulouse, France.

[Dekker, Andre] Maastricht Univ, Med Ctr, MAASTRO Clin, Maastricht, Netherlands.

RP Johnson, C (通讯作者)，Christie NHS Fdn Trust, Wilmslow Rd, Manchester M20 4BX, Lancs, England.

EM corinne.johnson@physics.cr.man.ac.uk

RI Dekker, Andre/AAE-4830-2019; van Herk, Marcel/P-6307-2015

OI Dekker, Andre/0000-0002-0422-7996; Hart, Corinne/0000-0002-9753-4740;

van Herk, Marcel/0000-0001-6448-898X; Faivre-Finn,

Corinne/0000-0001-5617-9781; Price, Gareth/0000-0003-4353-3360

FU Manchester Cancer Research UK Major Centre Award

FX This study was funded by the Manchester Cancer Research UK Major Centre

Award.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Balter JM, 1996, INT J RADIAT ONCOL, V36, P167, DOI 10.1016/S0360-3016(96)00275-1

Bowden P, 2002, INT J RADIAT ONCOL, V53, P566, DOI 10.1016/S0360-3016(02)02783-9

Dehing-Oberije C, 2010, RADIOTHER ONCOL, V97, P455, DOI 10.1016/j.radonc.2010.09.028

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

El Naqa I, 2015, MACHINE LEARNING RAD

Giraud P, 2002, RADIOTHER ONCOL, V62, P27, DOI 10.1016/S0167-8140(01)00444-3

ICRU, 1999, 62 ICRU

\*INT COMM RAD UN M, 1987, 42 ICRU

International Commission on Radiation Units and Measurements, 1993, 50 ICRU

Ishwaran H., 2016, RANDOM FORESTS SURVI

Ishwaran H, 2007, R NEWS, V7, P25

Ishwaran H, 2008, ANN APPL STAT, V2, P841, DOI 10.1214/08-AOAS169

Kuhn M., 2016, CARET CLASSIFICATION

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lee S, 2015, MED PHYS, V42, P2421, DOI 10.1118/1.4915284

Oberije C, 2015, INT J RADIAT ONCOL, P1

Peulen H, 2014, RADIOTHER ONCOL, V110, P511, DOI 10.1016/j.radonc.2014.01.010

Price G, 2017, CLIN ONCOL, P10

Reymen B, 2013, INT J RADIAT ONCOL, V85, P1319, DOI 10.1016/j.ijrobp.2012.10.003

Seppenwoolde Y, 2002, INT J RADIAT ONCOL, V53, P822, DOI 10.1016/S0360-3016(02)02803-1

Sonke JJ, 2008, INT J RADIAT ONCOL, V70, P590, DOI 10.1016/j.ijrobp.2007.08.067

Steenbakkers RJHM, 2005, RADIOTHER ONCOL, V77, P182, DOI 10.1016/j.radonc.2005.09.017

Sterne JAC, 2009, BMJ-BRIT MED J, V29, P338

Tsujino K, 2003, INT J RADIAT ONCOL, V55, P110, DOI 10.1016/S0360-3016(02)03807-5

Van de Steene J, 2002, RADIOTHER ONCOL, V62, P37, DOI 10.1016/S0167-8140(01)00453-4

van Loon J, 2012, INT J RADIAT ONCOL, V82, P448, DOI 10.1016/j.ijrobp.2010.09.001

Vorwerk H, 2009, RADIOTHER ONCOL, V91, P455, DOI 10.1016/j.radonc.2009.03.014

Weiss E, 2003, STRAHLENTHER ONKOL, V179, P21, DOI 10.1007/s00066-003-0976-5

Zamora DA, 2010, MED PHYS, V37, P5811, DOI 10.1118/1.3504605

NR 31

TC 10

Z9 10

U1 0

U2 5

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD FEB

PY 2018

VL 126

IS 2

BP 355

EP 361

DI 10.1016/j.radonc.2017.11.015

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA GB6MX

UT WOS:000429184400025

PM 29223683

OA Green Accepted, Green Published

DA 2022-08-24

ER

PT J

AU Zhai, XJ

Cheng, HR

Long, HL

Mao, WK

Cao, L

Xiao, BR

Li, RQ

AF Zhai, X. J.

Cheng, H. R.

Long, H. L.

Mao, W. K.

Cao, L.

Xiao, B. R.

Li, R. Q.

TI Effects of docetaxel plus three-dimensional conformal radiation therapy

on microvessel density and apoptosis expression in local advanced

squamous non-small-cell lung cancer

SO GENETICS AND MOLECULAR RESEARCH

LA English

DT Article

DE Docetaxel; Squamous cell carcinoma; Radiotherapy; Microvessel density;

Apoptosis

ID CHEMOTHERAPY

AB We examined the effects of weekly single-agent docetaxel plus three-dimensional conformal radiation therapy (3D-CRT) on apoptotic index (AI) and microvessel density (MVD) in local advanced non-small-cell lung squamous cancer patients and analyzed the correlation of MVD, AI, and 50% tumor shrinkage time (T0.5) The molecular mechanism of docetaxel radiosensitization was investigated. Sixty untreated patients with stage IIIA or IIIB lung squamous cancer were enrolled and randomly divided into two groups: observation (N = 30; 3D-CRT + docetaxel + adjuvant chemotherapy) and control (N = 30; 3D-CRT + adjuvant chemotherapy). From day 1 radiotherapy, the observation group received intravenous docetaxel (36 mg/m(2)) once weekly for 6 weeks. Post-radiotherapy, chemotherapy of docetaxel combined with cisplatin lasted 4-6 cycles in both groups. Before radiotherapy and within 24 h after radiotherapy (20 Gy), bronchoscopic biopsy was performed twice at the same site. To analyze the MVD of tumor specimens with immunohistochemical staining. The AI of lung cancer cells was assessed with TUNEL assay, T0.5 values were calculated. The observation group had significantly lower MVD than the control group (P < 0.05). AI significantly increased before and after treatment in the observation group compared with the control group (P < 0.05). The decreased MVD values negatively correlated with T0.5 values (r = -0.624, P < 0.05), whereas the increased AI values did not correlate with the T0.5 values. Docetaxel radiosensitization may occur by decrease in MVD and increase in AI values. Weekly single-agent docetaxel plus 3D-CRT can improve prognosis and quality of life in local advanced non-small-cell lung squamous cancer patients.

C1 [Zhai, X. J.; Cheng, H. R.; Long, H. L.; Mao, W. K.; Cao, L.; Xiao, B. R.; Li, R. Q.] Canc Hosp, Radiotherapy Div 1, Tai An, Shandong, Peoples R China.

RP Xiao, BR (通讯作者)，Canc Hosp, Radiotherapy Div 1, Tai An, Shandong, Peoples R China.

EM zhaixiju\_zxj@yeah.net

FU Tai'an City Technology Bureau of Project Planning [20103060]

FX Research funded by the Tai'an City Technology Bureau of Project Planning

(Project #20103060).

CR Dancey J, 2004, LUNG CANCER-J IASLC, V43, P183, DOI 10.1016/j.lungcan.2003.09.001

Fischer S, 2001, EUR J PHARMACOL, V411, P231, DOI 10.1016/S0014-2999(00)00915-8

FOLKMAN J, 1990, JNCI-J NATL CANCER I, V82, P4, DOI 10.1093/jnci/82.1.4

Hainsworth JD, 2001, SEMIN ONCOL, V28, P21, DOI 10.1053/sonc.2001.24604

Hennequin C, 2004, Cancer Radiother, V8 Suppl 1, pS95

Liu XF, 2005, CHINA REHABIL CLIN O, V12, P100

Mo YZ, 2008, PRACTICAL J MED, V25, P925

Sun Y, 1998, ZHONGGUO XIN YAO ZAZ, V7, P165

Vokes EE, 2007, J CLIN ONCOL, V25, P1698, DOI 10.1200/JCO.2006.07.3569

Wu KL, 2003, ZHONGHUA FANG SHE ZH, V12, P10

Zhai XJ, 2012, MED J, V10, P8

Zheng W, 2006, ZHONG HUA ZHONG LIU, V13, P1424

Zhou Q, 2003, LUNG CANCER, V41, pS45

NR 13

TC 3

Z9 3

U1 0

U2 2

PU FUNPEC-EDITORA

PI RIBEIRAO PRETO

PA RUA FLORIANO PEIXOTO 2444, ALTO DA BOA VISTA, RIBEIRAO PRETO, SP 00000,

BRAZIL

SN 1676-5680

J9 GENET MOL RES

JI Genet. Mol. Res.

PY 2015

VL 14

IS 2

BP 5399

EP 5406

DI 10.4238/2015.May.22.9

PG 8

WC Biochemistry & Molecular Biology; Genetics & Heredity

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Biochemistry & Molecular Biology; Genetics & Heredity

GA CL7WT

UT WOS:000357183700263

PM 26125735

OA Bronze

DA 2022-08-24

ER

PT J

AU He, L

Li, ZH

Chen, X

Huang, YQ

Yan, LX

Liang, CH

Liu, ZY

AF He, Lan

Li, Zhenhui

Chen, Xin

Huang, Yanqi

Yan, Lixu

Liang, Changhong

Liu, Zaiyi

TI A radiomics prognostic scoring system for predicting progression-free

survival in patients with stage IV non-small cell lung cancer treated

with platinum-based chemotherapy

SO CHINESE JOURNAL OF CANCER RESEARCH

LA English

DT Article

DE Non-small cell lung cancer; radiomics; prognostic scoring system;

progression-free survival; platinum-based chemotherapy

ID LINEAR-MODELS; BIOMARKER; HETEROGENEITY; RADIOTHERAPY; STATISTICS;

REGRESSION; DIAGNOSIS; DISEASE

AB Objective: To develop and validate a radiomics prognostic scoring system (RPSS) for prediction of progression-free survival (PFS) in patients with stage IV non-small cell lung cancer (NSCLC) treated with platinum-based chemotherapy.

Methods: In this retrospective study, four independent cohorts of stage IV NSCLC patients treated with platinum-based chemotherapy were included for model construction and validation (Discovery: n=159; Internal validation: n=156; External validation: n=81, Mutation validation: n=64). First, a total of 1,182 three-dimensional radiomics features were extracted from pre-treatment computed tomography (CT) images of each patient. Then, a radiomics signature was constructed using the least absolute shrinkage and selection operator method (LASSO) penalized Cox regression analysis. Finally, an individualized prognostic scoring system incorporating radiomics signature and clinicopathologic risk factors was proposed for PFS prediction.

Results: The established radiomics signature consisting of 16 features showed good discrimination for classifying patients with high-risk and low-risk progression to chemotherapy in all cohorts (All P<0.05). On the multivariable analysis, independent factors for PFS were radiomics signature, performance status (PS), and N stage, which were all selected into construction of RPSS. The RPSS showed significant prognostic performance for predicting PFS in discovery [C-index: 0.772, 95% confidence interval (95% CI): 0.765-0.779], internal validation (C-index: 0.738, 95% CI: 0.730-0.746), external validation (C-index: 0.750, 95% CI: 0.734-0.765), and mutation validation (C-index: 0.739, 95% CI: 0.720-0.758). Decision curve analysis revealed that RPSS significantly outperformed the clinicopathologic-based model in terms of clinical usefulness (All P<0.05).

Conclusions: This study established a radiomics prognostic scoring system as RPSS that can be conveniently used to achieve individualized prediction of PFS probability for stage IV NSCLC patients treated with platinum-based chemotherapy, which holds promise for guiding personalized pre-therapy of stage IV NSCLC.

C1 [He, Lan; Li, Zhenhui; Huang, Yanqi; Liang, Changhong; Liu, Zaiyi] Guangdong Acad Med Sci, Guangdong Prov Peoples Hosp, Dept Radiol, 106 Zhongshan Er Rd, Guangzhou 510080, Peoples R China.

[Li, Zhenhui] Kunming Med Univ, Yunnan Canc Hosp, Yunnan Canc Ctr, Affiliated Hosp 3,Dept Radiol, Kunming 650118, Yunnan, Peoples R China.

[Chen, Xin] South China Univ Technol, Sch Med, Guangzhou Peoples Hosp 1, Dept Radiol, Guangzhou 510120, Peoples R China.

[Huang, Yanqi] Southern Med Univ, Sch Clin Med 2, Guangzhou 510515, Peoples R China.

[Yan, Lixu] Guangdong Acad Med Sci, Guangdong Prov Peoples Hosp, Dept Pathol, Guangzhou 510080, Peoples R China.

RP Liang, CH; Liu, ZY (通讯作者)，Guangdong Acad Med Sci, Guangdong Prov Peoples Hosp, Dept Radiol, 106 Zhongshan Er Rd, Guangzhou 510080, Peoples R China.

EM liangchanghong@gdph.org.cn; zyliu@163.com

FU National Key Research and Development Plan of China [2017YFC1309100];

National Science Fund for Distinguished Young Scholars [81925023];

National Natural Scientific Foundation of China [81771912, 81901910,

82072090, 82001986]

FX This study was supported by the National Key Research and Development

Plan of China (No. 2017YFC1309100); the National Science Fund for

Distinguished Young Scholars (No. 81925023); and the National Natural

Scientific Foundation of China (No. 81771912, 81901910, 82072090, and

82001986).

CR Acharya UR, 2011, IEEE T INF TECHNOL B, V15, P449, DOI 10.1109/TITB.2011.2119322

[Anonymous], 2017, J CLIN ONCOL, V35, P3484

Bortolotto C, 2021, EXPERT REV ANTICANC, V21, P257, DOI 10.1080/14737140.2021.1852935

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Buyske S, 2000, J AM STAT ASSOC, V95, P249, DOI 10.2307/2669542

Caudell JJ, 2017, LANCET ONCOL, V18, pE266, DOI 10.1016/S1470-2045(17)30252-8

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

de Jong EEC, 2017, EUR J NUCL MED MOL I, V44, P8, DOI 10.1007/s00259-016-3498-y

Edge B. D., 2010, AJCC CANC STAGING MA

Fisher R, 2013, BRIT J CANCER, V108, P479, DOI 10.1038/bjc.2012.581

Fitzgerald M, 2015, JAMA-J AM MED ASSOC, V313, P409, DOI 10.1001/jama.2015.37

Friedman J, 2010, J STAT SOFTW, V33, P1, DOI 10.18637/jss.v033.i01

Gerlinger M, 2012, NEW ENGL J MED, V366, P883, DOI 10.1056/NEJMoa1113205

Giovannetti E, 2012, PHARMACOGENOMICS, V13, P1073, DOI [10.2217/PGS.12.91, 10.2217/pgs.12.91]

Harrell FE, 2015, SPRINGER SER STAT, DOI 10.1007/978-3-319-19425-7

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Heagerty PJ, 2005, BIOMETRICS, V61, P92, DOI 10.1111/j.0006-341X.2005.030814.x

Huang YQ, 2016, J CLIN ONCOL, V34, P2157, DOI 10.1200/JCO.2015.65.9128

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Huitzil-Melendez FD, 2010, J CLIN ONCOL, V28, P2889, DOI 10.1200/JCO.2009.25.9895

Kerr KF, 2016, J CLIN ONCOL, V34, P2534, DOI 10.1200/JCO.2015.65.5654

Khorrami M, 2019, RADIOL-ARTIF INTELL, V1, DOI 10.1148/ryai.2019180012

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lancia A, 2019, ANN TRANSL MED, V7, DOI 10.21037/atm.2019.07.02

Lee SM, 2017, J CLIN ONCOL, V35, P402, DOI 10.1200/JCO.2016.68.1841

Marusyk A, 2012, NAT REV CANCER, V12, P323, DOI 10.1038/nrc3261

Mauguen A, 2013, LANCET ONCOL, V14, P619, DOI 10.1016/S1470-2045(13)70158-X

Papadaki C, 2014, BRIT J CANCER, V111, P1757, DOI 10.1038/bjc.2014.492

Pepe MS, 2014, JNCI-J NATL CANCER I, V106, DOI 10.1093/jnci/dju041

Pilkington G, 2015, THORAX, V70, P359, DOI 10.1136/thoraxjnl-2014-205914

Segal E, 2007, NAT BIOTECHNOL, V25, P675, DOI 10.1038/nbt1306

Siegel RL, 2021, CA-CANCER J CLIN, V71, P7, DOI 10.3322/caac.21654

Song JD, 2018, CLIN CANCER RES, V24, P3583, DOI 10.1158/1078-0432.CCR-17-2507

Steyerberg EW, 2010, EPIDEMIOLOGY, V21, P128, DOI 10.1097/EDE.0b013e3181c30fb2

Tangri N, 2011, JAMA-J AM MED ASSOC, V305, P1553, DOI 10.1001/jama.2011.451

Temin S, AM SOC CLIN ONCOLOGY, V603

ten Haaf K, 2017, PLOS MED, V14, DOI 10.1371/journal.pmed.1002277

Thawani R, 2018, LUNG CANCER, V115, P34, DOI 10.1016/j.lungcan.2017.10.015

Tibshirani R, 1996, J ROY STAT SOC B MET, V58, P267, DOI 10.1111/j.2517-6161.1996.tb02080.x

Verma V, 2017, J NATL CANC I, P109

Yin JY, 2016, CANCER LETT, V377, P65, DOI 10.1016/j.canlet.2016.04.029

Zhang Q, 2014, CANCER CHEMOTH PHARM, V74, P839, DOI 10.1007/s00280-014-2513-x

Zwanenburg A, 2020, RADIOLOGY, V295, P328, DOI 10.1148/radiol.2020191145

NR 43

TC 1

Z9 1

U1 2

U2 6

PU CHINESE JOURNAL CANCER RESEARCH CO

PI BEIJING

PA LTD PEKING U CANCER HOSP & INST, NO 52, FUCHENG RD, HAIDIAN, BEIJING,

100142, PEOPLES R CHINA

SN 1000-9604

EI 1993-0631

J9 CHINESE J CANCER RES

JI Chin. J. Cancer Res.

PD OCT

PY 2021

VL 33

IS 5

BP 592

EP +

DI 10.21147/j.issn.1000-9604.2021.05.06

PG 23

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA WR8RM

UT WOS:000714762200006

PM 34815633

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU El Naqa, I

AF El Naqa, Issam

TI Machine learning methods for predicting tumor response in lung cancer

SO WILEY INTERDISCIPLINARY REVIEWS-DATA MINING AND KNOWLEDGE DISCOVERY

LA English

DT Article

ID GROWTH-FACTOR RECEPTOR; GENE-EXPRESSION; RADIOTHERAPY; MECHANISMS;

CARCINOMA; INHIBITORS; SURVIVAL; THERAPY; FAILURE; MARKERS

AB Among cancer victims, lung cancer accounts for most fatalities inmen and women. Patients at advanced stages of lung cancer suffer from poor survival rate. Majority of these patients are not candidates for surgery and receive radiation therapy (radiotherapy) as their main course of treatment. Despite effectiveness of radiotherapy against many cancers, more than half of these patients are unfortunately expected to fail. Recent advances in biotechnology have allowed for an unprecedented ability to investigate the role of gene regulation in lung cancer development and progression. However, limited studies have provided insight into lung tumor response to radiotherapy. The inherent complexity and heterogeneity of biological response to radiation therapy may explain the inability of existing prediction models to achieve the necessary sensitivity and specificity for clinical practice's or trial's design. In this study, we briefly review the current knowledge of genetic and signaling pathways in modulating tumor response to radiotherapy in non-small cell lung cancer as a case study of data mining application in the challenging cancer treatment problem. We highlight the role that data mining approaches, particularly machine learning methods, can play to improve our understanding of complex systems such as tumor response to radiotherapy. This can potentially result in identification of new prognostic biomarkers or molecular targets to improve response to treatment leading to better personalization of patients' treatment planning by reducing the risk of complications or supporting therapy that is more intensive for those patients likely to benefit. (C) 2012 Wiley Periodicals, Inc.

C1 McGill Univ, Dept Oncol, Med Phys Unit, Montreal, PQ, Canada.

RP El Naqa, I (通讯作者)，McGill Univ, Dept Oncol, Med Phys Unit, Montreal, PQ, Canada.

EM Issam.elnaqa@mcgill.ca

RI Naqa, Issam El/T-3066-2019

OI Naqa, Issam El/0000-0001-6023-1132

FU Fast Foundation; [CIHR-MOP-114910]

FX This work was supported in part by CIHR-MOP-114910 and Fast Foundation

grants.

CR Akimoto T, 1999, CLIN CANCER RES, V5, P2884

American Cancer Society, CANC FACTS FIG

Bradley JD, 2010, INT J RADIAT ONCOL, V77, P1146, DOI 10.1016/j.ijrobp.2009.06.017

Brock MV, 2008, NEW ENGL J MED, V358, P1118, DOI 10.1056/NEJMoa0706550

Choi N, 2001, LUNG CANCER, V31, P43, DOI 10.1016/S0169-5002(00)00156-2

Citrin D, 2006, INT J RADIAT ONCOL, V64, P15, DOI 10.1016/j.ijrobp.2005.03.065

Das AK, 2007, CANCER RES, V67, P5267, DOI 10.1158/0008-5472.CAN-07-0242

Dent P, 2003, RADIAT RES, V159, P283, DOI 10.1667/0033-7587(2003)159[0283:SARIAO]2.0.CO;2

El Naqa I, 2010, ACTA ONCOL, V49, P1363, DOI 10.3109/02841861003649224

Hall EJ, 2006, RADIOBIOLOGY RADIOLO

Herbst RS, 2008, NEW ENGL J MED, V359, P1367, DOI 10.1056/NEJMra0802714

Hirami Y, 2004, CANCER LETT, V214, P157, DOI 10.1016/j.canlet.2004.04.028

Jemal A, 2008, CA-CANCER J CLIN, V58, P71, DOI 10.3322/CA.2007.0010

Kirkpatrick JP, 2004, INT J RADIAT ONCOL, V58, P641, DOI 10.1016/j.ijrobp.2003.09.035

Langendijk H, 2000, RADIOTHER ONCOL, V56, P197, DOI 10.1016/S0167-8140(00)00218-8

Le QT, 2006, CLIN CANCER RES, V12, P1507, DOI 10.1158/1078-0432.CCR-05-2049

Lehnert S, 2008, SER MED PHYS BIOMED, P1

Marples B, 1998, BRIT J CANCER, V77, P1108, DOI 10.1038/bjc.1998.184

Mayo LD, 2001, P NATL ACAD SCI USA, V98, P11598, DOI 10.1073/pnas.181181198

Oh JH, 2011, PHYS MED BIOL, V56, P1635, DOI 10.1088/0031-9155/56/6/008

PEREZ CA, 2004, PRINCIPLES PRACTICE

Risch A, 2008, INT J CANCER, V123, P1, DOI 10.1002/ijc.23605

Rube CE, 2008, PLOS ONE, V3, DOI 10.1371/journal.pone.0002898

Sartor CI, 2004, NAT CLIN PRACT ONCOL, V1, P80, DOI 10.1038/ncponc0048

Schuurbiers OCJ, 2009, J THORAC ONCOL, V4, P761, DOI 10.1097/JTO.0b013e3181a1084f

Spira A, 2004, NEW ENGL J MED, V350, P379, DOI 10.1056/NEJMra035536

Steel GG., 2002, BASIC CLIN RADIOBIOL, V3rd, P120

Su D, 2007, LUNG CANCER, V56, P281, DOI 10.1016/j.lungcan.2006.12.002

Wang XW, 2008, BIOINFORMATICS, V24, P325, DOI 10.1093/bioinformatics/btm595

Weake VM, 2010, NAT REV GENET, V11, P426, DOI 10.1038/nrg2781

West CML, 2005, INT J RADIAT ONCOL, V62, P1264, DOI 10.1016/j.ijrobp.2005.05.001

Wu X, 2009, J THORAC ONCOL, V4, P1028, DOI 10.1097/JTO.0b013e3181a99c77

Yoon SM, 2005, INT J RADIAT ONCOL, V63, P885, DOI 10.1016/j.ijrobp.2005.07.951

Yu SL, 2008, CANCER CELL, V13, P48, DOI 10.1016/j.ccr.2007.12.008

NR 34

TC 11

Z9 11

U1 1

U2 22

PU WILEY PERIODICALS, INC

PI SAN FRANCISCO

PA ONE MONTGOMERY ST, SUITE 1200, SAN FRANCISCO, CA 94104 USA

SN 1942-4787

J9 WIRES DATA MIN KNOWL

JI Wiley Interdiscip. Rev.-Data Mining Knowl. Discov.

PD MAR-APR

PY 2012

VL 2

IS 2

BP 173

EP 181

DI 10.1002/widm.1047

PG 9

WC Computer Science, Artificial Intelligence; Computer Science, Theory &

Methods

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Computer Science

GA 945GF

UT WOS:000304260400006

DA 2022-08-24

ER

PT J

AU Luo, Y

McShan, DL

Matuszak, MM

Ray, D

Lawrence, TS

Jolly, S

Kong, FM

Ten Haken, RK

El Naqa, I

AF Luo, Yi

McShan, Daniel L.

Matuszak, Martha M.

Ray, Dipankar

Lawrence, Theodore S.

Jolly, Shruti

Kong, Feng-Ming

Ten Haken, Randall K.

El Naqa, Issam

TI A multiobjective Bayesian networks approach for joint prediction of

tumor local control and radiation pneumonitis in nonsmall-cell lung

cancer (NSCLC) for response-adapted radiotherapy

SO MEDICAL PHYSICS

LA English

DT Article

DE joint prediction of LC and RP2; multiobjective Bayesian networks;

nonsmall-cell lung cancer; response-adapted radiotherapy

ID COMPLICATION PROBABILITY; TEXTURAL FEATURES; THERAPY; DIAGNOSIS;

TOXICITY; SURVIVAL; MODEL; INDEX; RISK

AB PurposeIndividualization of therapeutic outcomes in NSCLC radiotherapy is likely to be compromised by the lack of proper balance of biophysical factors affecting both tumor local control (LC) and side effects such as radiation pneumonitis (RP), which are likely to be intertwined. Here, we compare the performance of separate and joint outcomes predictions for response-adapted personalized treatment planning.

MethodsA total of 118 NSCLC patients treated on prospective protocols with 32 cases of local progression and 20 cases of RP grade 2 or higher (RP2) were studied. Sixty-eight patients with 297 features before and during radiotherapy were used for discovery and 50 patients were reserved for independent testing. A multiobjective Bayesian network (MO-BN) approach was developed to identify important features for joint LC/RP2 prediction using extended Markov blankets as inputs to develop a BN predictive structure. Cross-validation (CV) was used to guide the MO-BN structure learning. Area under the free-response receiver operating characteristic (AU-FROC) curve was used to evaluate joint prediction performance.

ResultsImportant features including single nucleotide polymorphisms (SNPs), micro RNAs, pretreatment cytokines, pretreatment PET radiomics together with lung and tumor gEUDs were selected and their biophysical inter-relationships with radiation outcomes (LC and RP2) were identified in a pretreatment MO-BN. The joint LC/RP2 prediction yielded an AU-FROC of 0.80 (95% CI: 0.70-0.86) upon internal CV. This improved to 0.85 (0.75-0.91) with additional two SNPs, changes in one cytokine and two radiomics PET image features through the course of radiotherapy in a during-treatment MO-BN. This MO-BN model outperformed combined single-objective Bayesian networks (SO-BNs) during-treatment [0.78 (0.67-0.84)]. AU-FROC values in the evaluation of the MO-BN and individual SO-BNs on the testing dataset were 0.77 and 0.68 for pretreatment, and 0.79 and 0.71 for during-treatment, respectively.

ConclusionsMO-BNs can reveal possible biophysical cross-talks between competing radiotherapy clinical endpoints. The prediction is improved by providing additional during-treatment information. The developed MO-BNs can be an important component of decision support systems for personalized response-adapted radiotherapy. (C) 2018 The Authors. Medical Physics published by Wiley Periodicals, Inc. on behalf of American Association of Physicists in Medicine.

C1 [Luo, Yi; McShan, Daniel L.; Matuszak, Martha M.; Ray, Dipankar; Lawrence, Theodore S.; Jolly, Shruti; Ten Haken, Randall K.; El Naqa, Issam] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48103 USA.

[Kong, Feng-Ming] Indiana Univ, Dept Radiat Oncol, Indianapolis, IN 46202 USA.

RP Luo, Y (通讯作者)，Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48103 USA.

EM yiyiLuo@med.umich.edu

RI Kong, Feng-Ming/Y-2825-2019; Naqa, Issam El/T-3066-2019

OI Kong, Feng-Ming/0000-0003-2652-098X; Naqa, Issam El/0000-0001-6023-1132;

Luo, Yi/0000-0003-2519-5900

FU National Institutes of Health [P01 CA059827, R01-CA142840]; NATIONAL

CANCER INSTITUTE [P01CA059827, R01CA142840] Funding Source: NIH RePORTER

FX This work was supported in part by the National Institutes of Health P01

CA059827 and R01-CA142840.

CR Adhami F, 2012, J CLIN ONCOL, V30

Asadullah K, 2003, PHARMACOL REV, V55, P241, DOI 10.1124/pr.55.2.4

Bandos AI, 2009, BIOMETRICS, V65, P247, DOI 10.1111/j.1541-0420.2008.01049.x

Barber D., 2012, BAYESIAN REASONING M

Berges O, 2010, B CANCER, V97, P225, DOI 10.1684/bdc.2009.1020

Cheng NM, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0150509

Collins GS, 2015, EUR UROL, V67, P1142, DOI 10.1016/j.eururo.2014.11.025

Cruz-Ramirez N, 2007, COMPUT BIOL MED, V37, P1553, DOI 10.1016/j.compbiomed.2007.02.003

El Naqa I, 2018, GUIDE OUTCOME MODELI

El Naqa I, 2014, CLIN TRANSL IMAGING, V2, P305, DOI 10.1007/s40336-014-0063-1

Everson RM, 2006, PATTERN RECOGN LETT, V27, P918, DOI 10.1016/j.patrec.2005.10.016

Fowler JF, 2010, BRIT J RADIOL, V83, P554, DOI 10.1259/bjr/31372149

Fu S, 2010, WORLD C ENG JUN 30 J

Gerger A, 2011, CLIN CANCER RES, V17, P5783, DOI 10.1158/1078-0432.CCR-11-1115

GLOVER F, 1986, COMPUT OPER RES, V13, P533, DOI 10.1016/0305-0548(86)90048-1

Hall EJ, 2006, RADIOBIOLOGY RADIOLO

Kong FM, 2014, J THORAC DIS, V6, P336, DOI 10.3978/j.issn.2072-1439.2014.01.23

Kong FM, 2005, INT J RADIAT ONCOL, V63, P324, DOI 10.1016/j.ijrobp.2005.02.010

Kong FM, 2005, SEMIN ONCOL, V32, pS42, DOI 10.1053/j.seminoncol.2005.03.009

KUTCHER GJ, 1987, MED PHYS, V14, P489

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lee S, 2015, MED PHYS, V42, P2421, DOI 10.1118/1.4915284

Lee SM, 2003, J BIOMED INFORM, V36, P389, DOI 10.1016/j.jbi.2003.09.022

Lin EC, 2010, MAYO CLIN PROC, V85, P1142, DOI 10.4065/mcp.2010.0260

Luo Y, 2019, IEEE T RADIAT PLASMA, V3, P232, DOI 10.1109/TRPMS.2018.2832609

Luo Y, 2017, RADIOTHER ONCOL, V123, P85, DOI 10.1016/j.radonc.2017.02.004

LYMAN JT, 1985, RADIAT RES, V104, pS13, DOI 10.2307/3576626

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

McBride WH, 2004, RADIAT RES, V162, P1, DOI 10.1667/RR3196

Negus PRM, 1996, WORLD J UROL, V14, P157

Oberije C, 2015, INT J RADIAT ONCOL, V92, P935, DOI 10.1016/j.ijrobp.2015.02.048

Oh JH, 2011, PHYS MED BIOL, V56, P1635, DOI 10.1088/0031-9155/56/6/008

Oh S, 2008, P NATL ACAD SCI USA, V105, P5201, DOI 10.1073/pnas.0801003105

Ohri N, 2016, J NUCL MED, V57, P842, DOI 10.2967/jnumed.115.166934

Paladini L, 2016, J EXP CLIN CANC RES, V35, DOI 10.1186/s13046-016-0375-2

Provatopoulou X, 2008, ANTICANCER RES, V28, P2421

Ricciuti Biagio, 2014, Oncoscience, V1, P674

Ruopp MD, 2008, BIOMETRICAL J, V50, P419, DOI 10.1002/bimj.200710415

Scarel-Caminaga RM, 2011, J NEGAT RESULTS BIOM, V10, DOI 10.1186/1477-5751-10-14

Siegel JA, 2014, J NUCL MED, V55, p16N

Siva S, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0109560

Stenmark MH, 2012, INT J RADIAT ONCOL, V84, pE217, DOI 10.1016/j.ijrobp.2012.03.067

Theuws JCM, 2000, INT J RADIAT ONCOL, V47, P681, DOI 10.1016/S0360-3016(00)00454-5

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

Wang WA, 2016, ONCOTARGET, V7, P26739, DOI 10.18632/oncotarget.8496

Yang F, 2013, EUR J NUCL MED MOL I, V40, P716, DOI 10.1007/s00259-012-2332-4

NR 46

TC 22

Z9 23

U1 0

U2 11

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD AUG

PY 2018

VL 45

IS 8

BP 3980

EP 3995

DI 10.1002/mp.13029

PG 16

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA GQ0FH

UT WOS:000441292000049

PM 29862533

OA Green Published, Green Accepted

DA 2022-08-24

ER

PT J

AU Gu, HL

Gan, WT

Zhang, CC

Feng, AH

Wang, H

Huang, Y

Chen, H

Shao, Y

Duan, YH

Xu, ZY

AF Gu, Hengle

Gan, Wutian

Zhang, Chenchen

Feng, Aihui

Wang, Hao

Huang, Ying

Chen, Hua

Shao, Yan

Duan, Yanhua

Xu, Zhiyong

TI A 2D-3D hybrid convolutional neural network for lung lobe

auto-segmentation on standard slice thickness computed tomography of

patients receiving radiotherapy

SO BIOMEDICAL ENGINEERING ONLINE

LA English

DT Article

DE Artificial intelligence; Computed tomography; Automatic segmentation;

Lung lobe; Convolutional neural network

ID AUTOMATIC SEGMENTATION; RADIATION PNEUMONITIS; CANCER

AB Background Accurate segmentation of lung lobe on routine computed tomography (CT) images of locally advanced stage lung cancer patients undergoing radiotherapy can help radiation oncologists to implement lobar-level treatment planning, dose assessment and efficacy prediction. We aim to establish a novel 2D-3D hybrid convolutional neural network (CNN) to provide reliable lung lobe auto-segmentation results in the clinical setting. Methods We retrospectively collected and evaluated thorax CT scans of 105 locally advanced non-small-cell lung cancer (NSCLC) patients treated at our institution from June 2019 to August 2020. The CT images were acquired with 5 mm slice thickness. Two CNNs were used for lung lobe segmentation, a 3D CNN for extracting 3D contextual information and a 2D CNN for extracting texture information. Contouring quality was evaluated using six quantitative metrics and visual evaluation was performed to assess the clinical acceptability. Results For the 35 cases in the test group, Dice Similarity Coefficient (DSC) of all lung lobes contours exceeded 0.75, which met the pass criteria of the segmentation result. Our model achieved high performances with DSC as high as 0.9579, 0.9479, 0.9507, 0.9484, and 0.9003 for left upper lobe (LUL), left lower lobe (LLL), right upper lobe (RUL), right lower lobe (RLL), and right middle lobe (RML), respectively. The proposed model resulted in accuracy, sensitivity, and specificity of 99.57, 98.23, 99.65 for LUL; 99.6, 96.14, 99.76 for LLL; 99.67, 96.13, 99.81 for RUL; 99.72, 92.38, 99.83 for RML; 99.58, 96.03, 99.78 for RLL, respectively. Clinician's visual assessment showed that 164/175 lobe contours met the requirements for clinical use, only 11 contours need manual correction. Conclusions Our 2D-3D hybrid CNN model achieved accurate automatic segmentation of lung lobes on conventional slice-thickness CT of locally advanced lung cancer patients, and has good clinical practicability.

C1 [Gu, Hengle; Gan, Wutian; Zhang, Chenchen; Feng, Aihui; Wang, Hao; Huang, Ying; Chen, Hua; Shao, Yan; Duan, Yanhua; Xu, Zhiyong] Shanghai Jiao Tong Univ, Shanghai Chest Hosp, Shanghai, Peoples R China.

RP Xu, ZY (通讯作者)，Shanghai Jiao Tong Univ, Shanghai Chest Hosp, Shanghai, Peoples R China.

EM zhiyongxuxk@163.com

FU Nurture projects for basic research of Shanghai Chest Hospital

[2019YNJCM05]

FX Sponsored by the Nurture projects for basic research of Shanghai Chest

Hospital (No.2019YNJCM05).

CR Akter O, 2021, APPL INTELL, V51, P3391, DOI 10.1007/s10489-020-02046-y

Bailey DL, 2019, SEMIN NUCL MED, V49, P58, DOI 10.1053/j.semnuclmed.2018.10.008

Barriger RB, 2012, INT J RADIAT ONCOL, V82, P457, DOI 10.1016/j.ijrobp.2010.08.056

Barriger RB, 2010, INT J RADIAT ONCOL, V78, P1381, DOI 10.1016/j.ijrobp.2009.09.030

Bragman FJS, 2017, IEEE T MED IMAGING, V36, P1650, DOI 10.1109/TMI.2017.2688377

Choi MS, 2020, RADIOTHER ONCOL, V153, P139, DOI 10.1016/j.radonc.2020.09.045

George K, 2017, LECT NOTES COMPUT SC, V10553, P195, DOI 10.1007/978-3-319-67558-9\_23

Harrison Adam P., 2017, Medical Image Computing and Computer Assisted Intervention - MICCAI 2017. 20th International Conference. Proceedings: LNCS 10435, P621, DOI 10.1007/978-3-319-66179-7\_71

Hayashi K, 2001, RADIOGRAPHICS, V21, P861, DOI 10.1148/radiographics.21.4.g01jl24861

Hernando ML, 2001, INT J RADIAT ONCOL, V51, P650, DOI 10.1016/S0360-3016(01)01685-6

Imran AAZ, 2020, COMP M BIO BIO E-IV, V8, P509, DOI 10.1080/21681163.2019.1672210

Imran AA, 2018, LECT NOTES COMPUT SC, V11045, P282, DOI 10.1007/978-3-030-00889-5\_32

Lenchik L, 2019, ACAD RADIOL, V26, P1695, DOI 10.1016/j.acra.2019.07.006

Milletari F, 2016, INT CONF 3D VISION, P565, DOI 10.1109/3DV.2016.79

Monnin P, 2017, J APPL CLIN MED PHYS, V18, P251, DOI 10.1002/acm2.12005

Park J, 2020, J DIGIT IMAGING, V33, P221, DOI 10.1007/s10278-019-00223-1

Ramella S, 2010, INT J RADIAT ONCOL, V76, P110, DOI 10.1016/j.ijrobp.2009.01.036

Rodrigues G, 2004, RADIOTHER ONCOL, V71, P127, DOI 10.1016/j.radonc.2004.02.015

Siegel RL, 2020, CA-CANCER J CLIN, V70, P7, DOI 10.3322/caac.21590

Taha AA, 2015, BMC MED IMAGING, V15, DOI 10.1186/s12880-015-0068-x

Tang X, 2019, RADIOTHER ONCOL, V132, P197, DOI 10.1016/j.radonc.2018.10.016

Vrtovec T, 2020, MED PHYS, V47, pE929, DOI 10.1002/mp.14320

Xu YY, 2019, TRANSL LUNG CANCER R, V8, P1061, DOI 10.21037/tlcr.2019.12.21

Zhu J, 2016, ONCOTARGETS THER, V9, P7537, DOI 10.2147/OTT.S116508

NR 24

TC 1

Z9 1

U1 3

U2 10

PU BMC

PI LONDON

PA CAMPUS, 4 CRINAN ST, LONDON N1 9XW, ENGLAND

EI 1475-925X

J9 BIOMED ENG ONLINE

JI Biomed. Eng. Online

PD SEP 23

PY 2021

VL 20

IS 1

AR 94

DI 10.1186/s12938-021-00932-1

PG 13

WC Engineering, Biomedical

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering

GA UU2XE

UT WOS:000698663500001

PM 34556141

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Qin, QJ

Shi, AH

Zhang, R

Wen, Q

Niu, TY

Chen, JH

Qiu, QT

Wan, YD

Sun, XR

Xing, LG

AF Qin, Qingjin

Shi, Anhui

Zhang, Ran

Wen, Qiang

Niu, Tianye

Chen, Jinhu

Qiu, Qingtao

Wan, Yidong

Sun, Xiaorong

Xing, Ligang

TI Cone-beam CT radiomics features might improve the prediction of lung

toxicity after SBRT in stage I NSCLC patients

SO THORACIC CANCER

LA English

DT Article

DE Cone-beam CT; lung toxicity; non-small cell lung cancer; radiomics;

stereotactic body radiotherapy

ID STEREOTACTIC ABLATIVE RADIOTHERAPY; DECISION-SUPPORT-SYSTEMS;

COMPUTED-TOMOGRAPHY; PROGNOSTIC VALUE; BODY RADIOTHERAPY; TUMOR VOLUME;

CANCER; REPRODUCIBILITY; IMAGES; REDUCTION

AB Background Stereotactic body radiotherapy (SBRT) is the standard care for inoperable early stage non-small cell lung cancer (NSCLC). The purpose of our study was to investigate whether a prediction model based on cone-beam CT (CBCT) plus pretreatment CT radiomics features could improve the prediction of tumor control and lung toxicity after SBRT in comparison to a model based on pretreatment CT radiomics features alone.

Methods A total of 34 cases of stage I NSCLC patients who received SBRT were included in the study. The pretreatment planning CT and serial CBCT radiomics features were analyzed using the imaging biomarker explorer (IBEX) software platform. Multivariate logistic regression was conducted for the association between progression-free survival (PFS), lung toxicity and features. The predictive capabilities of the models based on CBCT and CT features were compared using receiver operating characteristic (ROC) curves.

Results Five CBCT features and two planning CT features were correlated with disease progression. Six CBCT features and two planning CT features were related to lung injury. The ROC curves indicated that the model based on the CBCT plus planning CT features might be better than the model based on the planning CT features in predicting lung injury. The other ROC curves indicated that the model based on the planning CT features was similar to the model based on the CBCT plus planning CT features in predicting disease progression.

Conclusions Both pretreatment CT and CBCT radiomics features could predict disease progression and lung injury. A model with CBCT plus pretreatment CT radiomics features might improve the prediction of lung toxicity in comparison with a model with pretreatment CT features alone.

Key points

Significant findings of the study: A model with cone-beam CT radiomics features plus pre-treatment CT radiomics features might improve the prediction of lung toxicity after SBRT in stage I NSCLC patients.

What this study adds: In the prediction of PFS and lung toxicity in early-stage NSCLC patients treated with SBRT, CBCT radiomics could be another effective method.

C1 [Qin, Qingjin; Sun, Xiaorong; Xing, Ligang] Univ Jinan, Shandong Acad Med Sci, Sch Med & Life Sci, Jinan, Peoples R China.

[Qin, Qingjin; Zhang, Ran; Chen, Jinhu; Qiu, Qingtao; Xing, Ligang] Shandong First Med Univ, Shandong Canc Hosp & Inst, Dept Radiat Oncol, Jinan, Peoples R China.

[Qin, Qingjin; Zhang, Ran; Chen, Jinhu; Qiu, Qingtao; Sun, Xiaorong; Xing, Ligang] Shandong Acad Med Sci, Jinan, Peoples R China.

[Shi, Anhui] Minist Educ, Key Lab Carcinogenesis & Translat Res, Beijing, Peoples R China.

[Shi, Anhui] Peking Univ Canc Hosp & Inst, Dept Radiat Oncol, Beijing, Peoples R China.

[Zhang, Ran; Sun, Xiaorong] Shandong Univ, Cheeloo Coll Med, Jinan, Peoples R China.

[Wen, Qiang] Shandong Univ, Shandong Prov Hosp, Dept Oncol, Jinan, Peoples R China.

[Niu, Tianye] Georgia Inst Technol, Woodruff Sch Mech Engn, Nucl & Radiol Engn & Med Phys Programs, Atlanta, GA 30332 USA.

[Wan, Yidong] Zhejiang Univ, Inst Translat Med, Hangzhou, Zhejiang, Peoples R China.

[Sun, Xiaorong] Shandong First Med Univ, Dept Nucl Med, Shandong Canc Hosp & Inst, Jinan, Peoples R China.

RP Sun, XR (通讯作者)，Shandong First Med Univ, Dept Nucl Med, Shandong Canc Hosp & Inst, Jinan, Peoples R China.; Sun, XR (通讯作者)，440 Jiyan Rd, Jinan 250117, Shandong, Peoples R China.

EM 714763520@qq.com; 251400067@qq.com

RI Qiu, Qingtao/AAS-9287-2020

FU National Natural Science Foundation of China [81572970] Funding Source:

Medline; Shandong Key Research and Development Project [2016CYJS01A03]

Funding Source: Medline; Jinan Scientific and Technology Development

Project [201805005] Funding Source: Medline; National Key Research and

Development Project [2018YFC1313200] Funding Source: Medline

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Balagurunathan Y, 2014, J DIGIT IMAGING, V27, P805, DOI 10.1007/s10278-014-9716-x

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Ball D, 2019, LANCET ONCOL, V20, P494, DOI 10.1016/S1470-2045(18)30896-9

Bernchou U, 2015, RADIOTHER ONCOL, V117, P17, DOI 10.1016/j.radonc.2015.07.021

Bertelsen A, 2011, RADIOTHER ONCOL, V100, P351, DOI 10.1016/j.radonc.2011.08.012

Brink C, 2014, INT J RADIAT ONCOL, V89, P916, DOI 10.1016/j.ijrobp.2014.03.038

Carvalho S, 2013, ACTA ONCOL, V52, P1398, DOI 10.3109/0284186X.2013.812795

Chang JY, 2015, LANCET ONCOL, V16, P630, DOI 10.1016/S1470-2045(15)70168-3

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Guckenberger M, 2013, RADIOTHER ONCOL, V109, P13, DOI 10.1016/j.radonc.2013.09.005

Jabbour SK, 2015, INT J RADIAT ONCOL, V92, P627, DOI 10.1016/j.ijrobp.2015.02.017

Jaffray DA, 2002, INT J RADIAT ONCOL, V53, P1337, DOI 10.1016/S0360-3016(02)02884-5

Jin XC, 2013, RADIAT ONCOL, V8, DOI 10.1186/1748-717X-8-279

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2017, ADV DRUG DELIVER REV, V109, P131, DOI 10.1016/j.addr.2016.01.006

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lo SS, 2010, NAT REV CLIN ONCOL, V7, P44, DOI 10.1038/nrclinonc.2009.188

Louie AV, 2011, INT J RADIAT ONCOL, V81, P964, DOI 10.1016/j.ijrobp.2010.06.040

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

National Comprehensive Cancer Network, 2017, NCCN GUID NONSM CELL

Navarria P, 2013, RADIOTHER ONCOL, V107, P414, DOI 10.1016/j.radonc.2013.04.016

Onishi H, 2011, INT J RADIAT ONCOL, V81, P1352, DOI 10.1016/j.ijrobp.2009.07.1751

Palma DA, 2013, CLIN LUNG CANCER, V14, P1, DOI 10.1016/j.cllc.2012.06.005

Rosario M, 2016, BRIT J RADIOL, V89, P0146

Rosen BS, 2018, INT J RADIAT ONCOL, V102, P1319, DOI 10.1016/j.ijrobp.2018.06.048

Shi LT, 2020, PHYS MED BIOL, V65, DOI 10.1088/1361-6560/ab3247

Timmerman RD, 2018, JAMA ONCOL, V4, P1263, DOI 10.1001/jamaoncol.2018.1251

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

Wald P, 2017, J THORAC ONCOL, V12, P1779, DOI 10.1016/j.jtho.2017.08.010

Wen Q, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-14548-w

Westberg J, 2010, ACTA ONCOL, V49, P225, DOI 10.3109/02841860903386408

NR 38

TC 8

Z9 8

U1 1

U2 17

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1759-7706

EI 1759-7714

J9 THORAC CANCER

JI Thorac. Cancer

PD APR

PY 2020

VL 11

IS 4

BP 964

EP 972

DI 10.1111/1759-7714.13349

EA FEB 2020

PG 9

WC Oncology; Respiratory System

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Respiratory System

GA KY5PD

UT WOS:000513358400001

PM 32061061

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU de Jong, EEC

van Elmpt, W

Rizzo, S

Colarieti, A

Spitaleri, G

Leijenaar, RTH

Jochems, A

Hendriks, LEL

Troost, EGC

Reymen, B

Dingemans, AMC

Lambin, P

AF de Jong, Evelyn E. C.

van Elmpt, Wouter

Rizzo, Stefania

Colarieti, Anna

Spitaleri, Gianluca

Leijenaar, Ralph T. H.

Jochems, Arthur

Hendriks, Lizza E. L.

Troost, Esther G. C.

Reymen, Bart

Dingemans, Anne-Marie C.

Lambin, Philippe

TI Applicability of a prognostic CT-based radiomic signature model trained

on stage I-III non-small cell lung cancer in stage IV non-small cell

lung cancer

SO LUNG CANCER

LA English

DT Article

DE Stage IV NSCLC; Prognostic model; Radiomics; CT

ID TEXTURE ANALYSIS; FEATURES; REPRODUCIBILITY; CARCINOMA; SURVIVAL;

IMAGES; RADIOTHERAPY

AB Objectives: Recently it has been shown that radiomic features of computed tomography (CT) have prognostic information in stage I-III non-small cell lung cancer (NSCLC) patients. We aim to validate this prognostic radiomic signature in stage IV adenocarcinoma patients undergoing chemotherapy.

Materials and methods: Two datasets of chemo-naive stage IV adenocarcinoma patients were investigated, dataset 1: 285 patients with CTs performed in a single center; dataset 2: 223 patients included in a multicenter clinical trial. The main exclusion criteria were EGFR mutation or unknown mutation status and non-delineated primary tumor. Radiomic features were calculated for the primary tumor. The c-index of cox regression was calculated and compared to the signature performance for overall survival (OS).

Results: In total CT scans from 195 patients were eligible for analysis. Patients having a prognostic index (PI) lower than the signature median (n = 92) had a significantly better OS than patients with a PI higher than the median (n = 103, HR 1.445, 95% CI 1.07-1.95, p = 0.02, c-index 0.576, 95% CI 0.527-0.624).

Conclusion: The radiomic signature, derived from daily practice CT scans, has prognostic value for stage IV NSCLC, however the signature performs less than previously described for stage I-III NSCLC stages. In the future, machine learning techniques can potentially lead to a better prognostic imaging based model for stage IV NSCLC.

C1 [de Jong, Evelyn E. C.; Leijenaar, Ralph T. H.; Jochems, Arthur; Lambin, Philippe] Maastricht Univ Med Ctr, GROW Sch Oncol & Dev Biol, D Lab Decis Support Precis Med, Univ Singel 40, NL-6229 ER Maastricht, Netherlands.

[van Elmpt, Wouter; Reymen, Bart] Maastricht Univ Med Ctr, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Doctor Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

[Rizzo, Stefania] European Inst Oncol, Dept Radiol, Via Ripamonti 435, I-20141 Milan, Italy.

[Colarieti, Anna] Sapienza Univ Rome, Dept Radiol Sci Oncol & Pathol, Piazzale Aldo Moro 5, I-00185 Rome, Italy.

[Spitaleri, Gianluca] European Inst Oncol, Dept Thorac Oncol, Via Ripamonti 435, I-20141 Milan, Italy.

[Hendriks, Lizza E. L.; Dingemans, Anne-Marie C.] Maastricht Univ Med Ctr, GROW Sch Oncol & Dev Biol, Dept Pulm Dis, P Debyelaan 25, NL-6229 HX Maastricht, Netherlands.

[Troost, Esther G. C.] Inst Radiooncol OncoRay, Helmholtz Zentrum Dresden Rossendorf, Handelallee 26 Bldg 130, D-01309 Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Fac Med, Dept Radiotherapy & Radiat Oncol, Handelallee 26 Bldg 130, D-01309 Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Univ Hosp Carl Gustav Carus, Handelallee 26 Bldg 130, D-01309 Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Helmholtz Zentrum Dresden Rossendorf, Fac Med, OncoRay Natl Ctr Radiat Res Oncol, Handelallee 26 Bldg 130, D-01309 Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Helmholtz Zentrum Dresden Rossendorf, Univ Hosp Carl Gustav Carus, Handelallee 26 Bldg 130, D-01309 Dresden, Germany.

[Troost, Esther G. C.] German Canc Consortium DKTK, Partner Site Dresden, Im Neuenheimer Feld 280, D-69120 Heidelberg, Germany.

[Troost, Esther G. C.] German Canc Res Ctr, Im Neuenheimer Feld 280, D-69120 Heidelberg, Germany.

RP de Jong, EEC; Lambin, P (通讯作者)，Maastricht Univ Med Ctr, GROW Sch Oncol & Dev Biol, D Lab Decis Support Precis Med, Univ Singel 40, NL-6229 ER Maastricht, Netherlands.

EM e.dejong@maastrichtuniversity.nl; wouter.vanelmpt@maastro.nl;

stefania.rizzo@ieo.it; anna.colarieti@gmail.com;

gianluca.spitaleri@ieo.it; ralph.leijenaar@maastrichtuniversity.nl;

a.jochems@maastrichtuniversity.nl; lizza.hendriks@mumc.nl;

esther.troost@uniklinikum-dresden.de; bart.reymen@maastro.nl;

a.dingemans@mumc.nl; philippe.lambin@maastrichtuniversity.nl

RI Colarieti, Anna/AAV-6478-2021; rizzo, stefania/ABE-8536-2020; Spitaleri,

Gianluca/AAQ-7125-2020

OI Colarieti, Anna/0000-0003-4133-2012; rizzo,

stefania/0000-0002-5151-0866; Hendriks, Lizza/0000-0002-3521-2535;

Lambin, Philippe/0000-0001-7961-0191

FU Dutch Cancer Society [UM 2010-4883]

FX The NVALT12 is a multicenter randomized open-label parallel group phase

II trial conducted by the Dutch Lung Physician Society (NVALT) and was

supported by the Dutch Cancer Society under Grant UM 2010-4883.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Antropova N, 2017, MED PHYS, V44, P5162, DOI 10.1002/mp.12453

Balagurunathan Y, 2014, J DIGIT IMAGING, V27, P805, DOI 10.1007/s10278-014-9716-x

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Deasy JO, 2003, MED PHYS, V30, P979, DOI 10.1118/1.1568978

Dingemans AMC, 2015, ANN ONCOL, V26, P2286, DOI 10.1093/annonc/mdv370

Eberhardt WEE, 2015, J THORAC ONCOL, V10, P1515, DOI 10.1097/JTO.0000000000000673

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Hendriks LE, 2015, EUR J CANCER, V51, P2534, DOI 10.1016/j.ejca.2015.08.008

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lame R. T. H. M., 2017, ACTA ONCOL, P11

Leijenaar RTH, 2015, ACTA ONCOL, V54, P1423, DOI 10.3109/0284186X.2015.1061214

Mackin D, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0178524

Panth KM, 2015, RADIOTHER ONCOL, V116, P462, DOI 10.1016/j.radonc.2015.06.013

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Rao SX, 2014, UNITED EUR GASTROENT, V2, P530, DOI 10.1177/2050640614552463

Rizzo S, 2016, EUR RADIOL, V26, P32, DOI 10.1007/s00330-015-3814-0

Shafiq-ul-Hassan M, 2017, MED PHYS, V44, P1050, DOI 10.1002/mp.12123

Song J., 2017, SPIE MED IM

Velazquez ER, 2012, RADIOTHER ONCOL, V105, P167, DOI 10.1016/j.radonc.2012.09.023

Zhang HW, 2013, RADIOLOGY, V269, P801, DOI 10.1148/radiol.13130110

NR 27

TC 23

Z9 23

U1 1

U2 12

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0169-5002

EI 1872-8332

J9 LUNG CANCER

JI Lung Cancer

PD OCT

PY 2018

VL 124

BP 6

EP 11

DI 10.1016/j.lungcan.2018.07.023

PG 6

WC Oncology; Respiratory System

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Respiratory System

GA GX9EF

UT WOS:000448100600002

PM 30268481

OA Green Submitted, hybrid

DA 2022-08-24

ER

PT J

AU Zhang, H

Wang, WL

Pi, WH

Bi, N

DesRosiers, C

Kong, FC

Cheng, M

Yang, L

Lautenschlaeger, T

Jolly, S

Jin, JY

Kong, FM

AF Zhang, Hong

Wang, Weili

Pi, Wenhu

Bi, Nan

DesRosiers, Colleen

Kong, Fengchong

Cheng, Monica

Yang, Li

Lautenschlaeger, Tim

Jolly, Shruti

Jin, Jianyue

Kong, Feng-Ming (Spring)

TI Genetic Variations in the Transforming Growth Factor-beta 1 Pathway May

Improve Predictive Power for Overall Survival in Non-small Cell Lung

Cancer

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE machine learning; single nuclear polymorphism; overall survival;

non-small cell lung cancer; TGF-beta 1

ID DEFINITIVE RADIOTHERAPY; RADIATION PNEUMONITIS; INCREASED RISK; SMAD4

GENE; GROWTH; POLYMORPHISMS; TGF-BETA-1; VARIANTS; TOXICITY; INDEX

AB Purpose: Transforming growth factor-beta 1 (TGF-beta 1), a known immune suppressor, plays an important role in tumor progression and overall survival (OS) in many types of cancers. We hypothesized that genetic variations of single nucleotide polymorphisms (SNPs) in the TGF-beta 1 pathway can predict survival in patients with non-small cell lung cancer (NSCLC) after radiation therapy. Materials and Methods: Fourteen functional SNPs in the TGF-beta 1 pathway were measured in 166 patients with NSCLC enrolled in a multi-center clinical trial. Clinical factors, including age, gender, ethnicity, smoking status, stage group, histology, Karnofsky Performance Status, equivalent dose at 2 Gy fractions (EQD2), and the use of chemotherapy, were first tested under the univariate Cox's proportional hazards model. All significant clinical predictors were combined as a group of predictors named "Clinical." The significant SNPs under the Cox proportional hazards model were combined as a group of predictors named "SNP." The predictive powers of models using Clinical and Clinical + SNP were compared with the cross-validation concordance index (C-index) of random forest models. Results: Age, gender, stage group, smoking, histology, and EQD2 were identified as significant clinical predictors: Clinical. Among 14 SNPs, BMP2:rs235756 (HR = 0.63; 95% CI:0.42-0.93; p = 0.022), SMAD9:rs7333607 (HR = 2.79; 95% CI 1.22-6.41; p = 0.015), SMAD3:rs12102171 (HR = 0.68; 95% CI: 0.46-1.00; p = 0.050), and SMAD4: rs12456284 (HR = 0.63; 95% CI: 0.43-0.92; p = 0.016) were identified as powerful predictors of SNP. After adding SNP, the C-index of the model increased from 84.1 to 87.6% at 24 months and from 79.4 to 84.4% at 36 months. Conclusion: Genetic variations in the TGF-beta 1 pathway have the potential to improve the prediction accuracy for OS in patients with NSCLC.

C1 [Zhang, Hong] Univ Maryland, Sch Med, Dept Radiat Oncol, Baltimore, MD 21201 USA.

[Wang, Weili; Jin, Jianyue; Kong, Feng-Ming (Spring)] Case Western Reserve Univ, Comprehens Canc Ctr, Dept Radiat Oncol, Cleveland, OH 44106 USA.

[Pi, Wenhu] Wenzhou Med Univ, Radiat Oncol Inst, Dept Radiat Oncol,Affiliated Talzhou Hosp, Lab Cellular & Mol Radiat Oncol,Enze Med Hlth Aca, Taizhou, Peoples R China.

[Bi, Nan] Chinese Acad Med Sci & Peking Union Med Coll, Dept Radiat Oncol, Natl Canc Ctr, Natl Clin Res Ctr Canc,Canc Hosp, Beijing, Peoples R China.

[DesRosiers, Colleen; Cheng, Monica; Lautenschlaeger, Tim] Indiana Univ Sch Med, IU Simon Canc Ctr, Dept Radiat Oncol, Indianapolis, IN 46202 USA.

[Kong, Fengchong; Jolly, Shruti] Univ Hosp, Michigan Med Radiat Oncol, Ann Arbor, MI USA.

[Yang, Li; Kong, Feng-Ming (Spring)] Univ Hong Kong, Li Ka SHing Med Sch, Dept Clin Oncol, Shenzhen Hosp, Shenzhen, Peoples R China.

RP Kong, FM (通讯作者)，Case Western Reserve Univ, Comprehens Canc Ctr, Dept Radiat Oncol, Cleveland, OH 44106 USA.; Kong, FM (通讯作者)，Univ Hong Kong, Li Ka SHing Med Sch, Dept Clin Oncol, Shenzhen Hosp, Shenzhen, Peoples R China.

EM kong0001@hku.hk

RI Wang, Weili/A-5336-2013

OI Wang, Weili/0000-0002-1627-3025

FU National Institutes of Health [R01CA142840]; Shenzhen Science and

Technology [KQTD20180411185028798]

FX This study was supported in parts by the National Institutes of Health

(grant number R01CA142840, PI: F-MK) and Shenzhen Science and Technology

grant KQTD20180411185028798 (PI: F-MK).

CR An P, 2012, HUM MOL GENET, V21, P2124, DOI 10.1093/hmg/dds028

Batlle E, 2019, IMMUNITY, V50, P924, DOI 10.1016/j.immuni.2019.03.024

Bellam N, 2010, CANCER TREAT RES, V155, P85, DOI 10.1007/978-1-4419-6033-7\_5

Boyle EA, 2017, CELL, V169, P1177, DOI 10.1016/j.cell.2017.05.038

Chapet O, 2005, INT J RADIAT ONCOL, V63, P170, DOI 10.1016/j.ijrobp.2004.12.060

Chen YB, 2014, TUMOR BIOL, V35, P6707, DOI 10.1007/s13277-014-1908-y

Cheng M, 2019, J CANCER, V10, P168, DOI 10.7150/jca.26600

Chu HY, 2014, DIAGN PATHOL, V9, DOI 10.1186/1746-1596-9-123

de Caestecker MP, 2000, JNCI-J NATL CANCER I, V92, P1388, DOI 10.1093/jnci/92.17.1388

Flanders KC, 2004, INT J EXP PATHOL, V85, P47, DOI 10.1111/j.0959-9673.2004.00377.x

Gerds TA, 2013, STAT MED, V32, P2173, DOI 10.1002/sim.5681

Gordian Edna, 2019, Oncotarget, V10, P810, DOI 10.18632/oncotarget.26574

HILL W G, 1968, Theoretical and Applied Genetics, V38, P226, DOI 10.1007/BF01245622

Ishwaran H, 2008, ANN APPL STAT, V2, P841, DOI 10.1214/08-AOAS169

Javle M, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0085942

Ji Y, 2018, BLOOD TRANSFUS-ITALY, V16, P123, DOI 10.2450/2016.0138-16

Jurisic V, 2020, J ONCOL, V2020, DOI 10.1155/2020/1973241

Kang BL, 2015, INT J CLIN EXP PATHO, V8, P7364

Kattan MW, 1998, COMPUT BIOMED RES, V31, P363, DOI 10.1006/cbmr.1998.1488

Kawaguchi T, 2010, J THORAC ONCOL, V5, P620, DOI 10.1097/JTO.0b013e3181d2dcd9

Kohavi R., 1995, IJCAI-95. Proceedings of the Fourteenth International Joint Conference on Artificial Intelligence, P1137

Kong FM, 2006, INT J RADIAT ONCOL, V65, P1075, DOI 10.1016/j.ijrobp.2006.01.051

Kong FM, 1996, LUNG CANCER-J IASLC, V16, P47, DOI 10.1016/S0169-5002(96)00611-3

Langenfeld EM, 2006, ONCOGENE, V25, P685, DOI 10.1038/sj.onc.1209110

Langenfeld EM, 2004, MOL CANCER RES, V2, P141

Li QX, 2013, CLIN CANCER RES, V19, P6252, DOI 10.1158/1078-0432.CCR-13-1093

LIN DY, 1989, J AM STAT ASSOC, V84, P1074, DOI 10.2307/2290085

Lin MB, 2011, CARCINOGENESIS, V32, P1050, DOI 10.1093/carcin/bgr067

Ma YL, 2014, CHINESE J CANCER RES, V26, P525, DOI 10.3978/j.issn.1000-9604.2014.09.02

MacFarlane EG, 2017, CSH PERSPECT BIOL, V9, DOI 10.1101/cshperspect.a022269

MANN MD, 1991, LAB ANIM SCI, V41, P6

Massague J, 2012, NAT REV MOL CELL BIO, V13, P616, DOI 10.1038/nrm3434

Milet J, 2007, AM J HUM GENET, V81, P799, DOI 10.1086/520001

Miller KD, 2016, CA-CANCER J CLIN, V66, P271, DOI 10.3322/caac.21349

Miyazawa K, 2002, GENES CELLS, V7, P1191, DOI 10.1046/j.1365-2443.2002.00599.x

Mueller TD, 2012, FEBS LETT, V586, P1846, DOI 10.1016/j.febslet.2012.02.043

Nickel J, 2019, CELLS-BASEL, V8, DOI 10.3390/cells8121579

Ooshima A, 2019, CANCER SCI, V110, P481, DOI 10.1111/cas.13922

R Development Core Team, 2009, R LANG ENV STAT COMP

Saito A, 2018, INT J MOL SCI, V19, DOI 10.3390/ijms19082460

Siegel RL, 2021, CA-CANCER J CLIN, V71, P7, DOI 10.3322/caac.21654

Siegel RL, 2022, CA-CANCER J CLIN, V72, P7, DOI [10.3322/caac.21332, 10.3322/caac.21708, 10.3322/caac.21551]

Staff A., 2018, CANCER

Wang SL, 2017, INT J RADIAT ONCOL, V98, P615, DOI 10.1016/j.ijrobp.2017.03.011

Wang WL, 2018, CANCER RES, V78, P809, DOI 10.1158/0008-5472.CAN-17-2995

Weiss A, 2013, WIRES DEV BIOL, V2, P47, DOI 10.1002/wdev.86

Wu DM, 2010, WORLD J GASTROENTERO, V16, P5635, DOI 10.3748/wjg.v16.i44.5635

Xing SG, 2016, TRANSL ONCOL, V9, P1, DOI 10.1016/j.tranon.2015.11.007

Xue SL, 2013, MED ONCOL, V30, DOI 10.1007/s12032-013-0512-0

Yang J, 2018, CANCER MED-US, V7, P2247, DOI 10.1002/cam4.1349

Yang J, 2017, ONCOTARGET, V8, P43080, DOI 10.18632/oncotarget.17904

Yuan SH, 2013, J THORAC ONCOL, V8, P208, DOI 10.1097/JTO.0b013e318274592e

Zhao L, 2008, LUNG CANCER, V59, P232, DOI 10.1016/j.lungcan.2007.08.010

Zinski J, 2018, CSH PERSPECT BIOL, V10, DOI 10.1101/cshperspect.a033274

NR 54

TC 1

Z9 1

U1 2

U2 6

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD JUL 7

PY 2021

VL 11

AR 599719

DI 10.3389/fonc.2021.599719

PG 9

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA TL6VD

UT WOS:000674996800001

PM 34307117

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU van Timmeren, JE

van Elmpt, W

Leijenaar, RTH

Reymen, B

Monshouwer, R

Bussink, J

Paelinck, L

Bogaert, E

De Wagter, C

Elhaseen, E

Lievens, Y

Hansen, O

Brink, C

Lambin, P

AF van Timmeren, Janna E.

van Elmpt, Wouter

Leijenaar, Ralph T. H.

Reymen, Bart

Monshouwer, Rene

Bussink, Johan

Paelinck, Leen

Bogaert, Evelien

De Wagter, Carlos

Elhaseen, Elamin

Lievens, Yolande

Hansen, Olfred

Brink, Carsten

Lambin, Philippe

TI Longitudinal radiomics of cone-beam CT images from non-small cell lung

cancer patients: Evaluation of the added prognostic value for overall

survival and locoregional recurrence

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Non-small cell lung cancer; Radiomics; Cone-beam CT; Longitudinal;

Overall survival

ID MULTIVARIABLE PREDICTION MODEL; INDIVIDUAL PROGNOSIS; DIAGNOSIS TRIPOD;

FEATURES; REGRESSION

AB Background and purpose: The prognostic value of radiomics for non-small cell lung cancer (NSCLC) patients has been investigated for images acquired prior to treatment, but no prognostic model has been developed that includes the change of radiomic features during treatment. Therefore, the aim of this study was to investigate the potential added prognostic value of a longitudinal radiomics approach using cone-beam computed tomography (CBCT) for NSCLC patients. Materials and methods: This retrospective study includes a training dataset of 141 stage I-IV NSCLC patients and three external validation datasets of 94, 61 and 41 patients, all treated with curative intended (chemo) radiotherapy. The change of radiomic features extracted from CBCT images was summarized as the slope of a linear regression. The CBCT slope-features and CT-extracted features were used as input for a Cox proportional hazards model. Moreover, prognostic performance of clinical parameters was investigated for overall survival and locoregional recurrence. Model performances were assessed using the Kaplan-Meier curves and c-index. Results: The radiomics model contained only CT-derived features and reached a c-index of 0.63 for overall survival and could be validated on the first validation dataset. No model for locoregional recurrence could be developed that validated on the validation datasets. The clinical parameters model could not be validated for either overall survival or locoregional recurrence. Conclusion: In this study we could not confirm our hypothesis that longitudinal CBCT-extracted radiomic features contribute to improved prognostic information. Moreover, performance of baseline radiomic features or clinical parameters was poor, probably affected by heterogeneity within and between datasets. (C) 2019 The Authors. Published by Elsevier B. V. Radiotherapy and Oncology 136 (2019) 78-85 This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

C1 [van Timmeren, Janna E.; Leijenaar, Ralph T. H.; Lambin, Philippe] Maastricht Univ, Med Ctr, GROW Sch Oncol & Dev Biol, D Lab Decis Support Precis Med, Maastricht, Netherlands.

[van Elmpt, Wouter; Reymen, Bart] MUMC, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Maastricht, Netherlands.

[Monshouwer, Rene; Bussink, Johan] Radboud Univ Nijmegen, Med Ctr, Dept Radiat Oncol, Nijmegen, Netherlands.

[Paelinck, Leen; Bogaert, Evelien; De Wagter, Carlos; Elhaseen, Elamin; Lievens, Yolande] Ghent Univ Hosp, Ghent, Belgium.

[Paelinck, Leen; Bogaert, Evelien; De Wagter, Carlos; Elhaseen, Elamin; Lievens, Yolande] Univ Ghent, Ghent, Belgium.

[Hansen, Olfred; Brink, Carsten] Univ Southern Denmark, Inst Clin Res, Sonderborg, Denmark.

[Brink, Carsten] Odense Univ Hosp, Lab Radiat Phys, Odense, Denmark.

[Hansen, Olfred] Odense Univ Hosp, Dept Oncol, Odense, Denmark.

RP van Timmeren, JE (通讯作者)，Maastricht Univ, D Lab Decis Support Precis Med, Univ Singel 40, NL-6229ER Maastricht, Netherlands.

EM j.vantimmeren@maastrichtuniversity.nl

RI van Timmeren, Janita/AAL-4456-2020; Monshouwer, R./L-4527-2015; Hansen,

Olfred/D-1432-2012

OI van Timmeren, Janita/0000-0002-8166-6853; Hansen,

Olfred/0000-0003-0396-1424; Bogaert, Evelien/0000-0002-7527-5012; De

Wagter, Carlos/0000-0002-7426-4282; Brink, Carsten/0000-0003-3906-1962;

Bussink, Johan/0000-0002-5751-4796; Lambin, Philippe/0000-0001-7961-0191

FU ERC [694812, 81320]; Dutch Technology Foundation STW the applied science

division of NWO [10696, P14-19]; Ministry of Economic Affairs; SME

[673780]; EUROSTARS (DART); EUROSTARS (DECIDE); EUROSTARS (COMPACT);

European Program H2020-2015-17 (BD2Decide) [PHC30-689715]; European

Program H2020-2015-17 (ImmunoSABR) [733008]; European Program

H2020-2015-17 (PREDICT - ITN) [766276]; TRANSCAN Joint Transnational

Call 2016 (JTC2016 "CLEARLY") [UM 2017-8295]; Interreg V-A Euregio

MeuseRhine ("Euradiomics"); Health Foundation Limburg; Dutch Cancer

Society; AgeCare (Academy of Geriatric Research at Odense University

Hospital)

FX Philippe Lambin acknowledges financial support from ERC advanced grant

(ERC-ADG-2015, no 694812 - Hypoximmuno), ERC-2018-PoC (no 81320 -

CL-IO). This research is also supported by the Dutch Technology

Foundation STW (grant no 10696 DuCAT & no P14-19 Radiomics STRaTegy),

which is the applied science division of NWO, and the Technology

Programme of the Ministry of Economic Affairs. Authors also acknowledge

financial support from SME Phase 2 (RAIL - no 673780), EUROSTARS (DART,

DECIDE, COMPACT), the European Program H2020-2015-17 (BD2Decide

PHC30-689715, ImmunoSABR - no 733008, PREDICT - ITN - no 766276),

TRANSCAN Joint Transnational Call 2016 (JTC2016 "CLEARLY" - no UM

2017-8295), Interreg V-A Euregio MeuseRhine ("Euradiomics"),

Kankeronderzoekfonds Limburg from the Health Foundation Limburg and the

Dutch Cancer Society.; Olfred Hansen and Carsten Brink acknowledge

support from AgeCare (Academy of Geriatric Research at Odense University

Hospital).

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ahn SY, 2015, INVEST RADIOL, V50, P719, DOI 10.1097/RLI.0000000000000174

[Anonymous], 2016, CARDIAC CT IMAGING D

Avanzo M, 2017, PHYS MEDICA, V38, P122, DOI 10.1016/j.ejmp.2017.05.071

Bernchou U, 2015, RADIOTHER ONCOL, V117, P17, DOI 10.1016/j.radonc.2015.07.021

Bertelsen A, 2011, RADIOTHER ONCOL, V100, P351, DOI 10.1016/j.radonc.2011.08.012

Brink C, 2014, INT J RADIAT ONCOL, V89, P916, DOI 10.1016/j.ijrobp.2014.03.038

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

de Jong EEC, 2018, LUNG CANCER, V124, P6, DOI 10.1016/j.lungcan.2018.07.023

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

HARRELL FE, 1982, JAMA-J AM MED ASSOC, V247, P2543, DOI 10.1001/jama.247.18.2543

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Leger S, 2019, RADIOTHER ONCOL, V130, P10, DOI 10.1016/j.radonc.2018.07.020

Lustberg T, 2018, RADIOTHER ONCOL, V126, P312, DOI 10.1016/j.radonc.2017.11.012

Martin R, 2017, MED PHYS, V44, P6515, DOI 10.1002/mp.12575

Moons KGM, 2015, ANN INTERN MED, V162, pW1, DOI 10.7326/M14-0698

O'Connor JPB, 2017, NAT REV CLIN ONCOL, V14, P169, DOI 10.1038/nrclinonc.2016.162

Pan Y, 2015, MEDICINE, V94, DOI 10.1097/MD.0000000000001863

Rosen BS, 2018, INT J RAD ONCOL BIOL

Royston P, 2013, BMC MED RES METHODOL, V13, DOI 10.1186/1471-2288-13-33

Schipaanboord B, 2018, IEEE T MED IMAGING

Star-Lack J, 2018, MED PHYS

Tibshirani R, 1996, J ROY STAT SOC B MET, V58, P267, DOI 10.1111/j.2517-6161.1996.tb02080.x

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

van Timmeren JE, 2017, ACTA ONCOL, P1, DOI DOI 10.1080/0284186X.2017.1350285

Zhu L, 2009, MED PHYS, V36, P2258, DOI 10.1118/1.3130047

NR 29

TC 29

Z9 30

U1 1

U2 5

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD JUL

PY 2019

VL 136

BP 78

EP 85

DI 10.1016/j.radonc.2019.03.032

PG 8

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA IE6MO

UT WOS:000472490500012

PM 31015133

OA Green Published, hybrid

DA 2022-08-24

ER

PT J

AU Zheng, S

Jabbour, SK

O'Reilly, SE

Lu, JJ

Dong, LH

Ding, LJ

Xiao, Y

Yue, N

Wang, FS

Zou, W

AF Zheng, Shuai

Jabbour, Salma K.

O'Reilly, Shannon E.

Lu, James J.

Dong, Lihua

Ding, Lijuan

Xiao, Ying

Yue, Ning

Wang, Fusheng

Zou, Wei

TI Automated Information Extraction on Treatment and Prognosis for

Non-Small Cell Lung Cancer Radiotherapy Patients: Clinical Study

SO JMIR MEDICAL INFORMATICS

LA English

DT Article

DE information extraction; oncology; chemoradiation treatment; prognosis;

non-small cell lung; information storage and retrieval; natural language

processing

ID COMPUTED-TOMOGRAPHY; PATHOLOGY REPORTS; SYSTEM

AB Background: In outcome studies of oncology patients undergoing radiation, researchers extract valuable information from medical records generated before, during, and after radiotherapy visits, such as survival data, toxicities, and complications. Clinical studies rely heavily on these data to correlate the treatment regimen with the prognosis to develop evidence-based radiation therapy paradigms. These data are available mainly in forms of narrative texts or table formats with heterogeneous vocabularies. Manual extraction of the related information from these data can be time consuming and labor intensive, which is not ideal for large studies.

Objective: The objective of this study was to adapt the interactive information extraction platform Information and Data Extraction using Adaptive Learning (IDEAL-X) to extract treatment and prognosis data for patients with locally advanced or inoperable non-small cell lung cancer (NSCLC).

Methods: We transformed patient treatment and prognosis documents into normalized structured forms using the IDEAL-X system for easy data navigation. The adaptive learning and user-customized controlled toxicity vocabularies were applied to extract categorized treatment and prognosis data, so as to generate structured output.

Results: In total, we extracted data from 261 treatment and prognosis documents relating to 50 patients, with overall precision and recall more than 93% and 83%, respectively. For toxicity information extractions, which are important to study patient posttreatment side effects and quality of life, the precision and recall achieved 95.7% and 94.5% respectively.

Conclusions: The IDEAL-X system is capable of extracting study data regarding NSCLC chemoradiation patients with significant accuracy and effectiveness, and therefore can be used in large-scale radiotherapy clinical data studies.

C1 [Zheng, Shuai] Emory Univ, Dept Biomed Informat, Atlanta, GA 30322 USA.

[Jabbour, Salma K.; Yue, Ning] Rutgers Canc Inst New Jersey, Dept Radiat Oncol, New Brunswick, NJ USA.

[O'Reilly, Shannon E.; Xiao, Ying; Zou, Wei] Univ Penn, Dept Radiat Oncol, Penn Med, 3400 Civ Ctr Blvd, Philadelphia, PA 19104 USA.

[Lu, James J.] Emory Univ, Dept Math & Comp Sci, Atlanta, GA 30322 USA.

[Dong, Lihua; Ding, Lijuan] First Hosp, Dept Radiat Oncol, Changchun, Jilin, Peoples R China.

[Wang, Fusheng] SUNY Stony Brook, Dept Biomed Informat, Stony Brook, NY USA.

[Wang, Fusheng] SUNY Stony Brook, Dept Comp Sci, Stony Brook, NY USA.

RP Zou, W (通讯作者)，Univ Penn, Dept Radiat Oncol, Penn Med, 3400 Civ Ctr Blvd, Philadelphia, PA 19104 USA.

EM wei.zou@uphs.upenn.edu

RI O'Reilly, Shannon/P-8534-2019

OI O'Reilly, Shannon/0000-0002-7766-8979; Xiao, Ying/0000-0001-8558-6394;

Zheng, Shuai/0000-0002-8090-9278; Wang, Fusheng/0000-0002-9369-9361

CR Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

Belani CP, 2005, J CLIN ONCOL, V23, P5883, DOI 10.1200/JCO.2005.55.405

Bral S, 2011, INT J RADIAT ONCOL, V80, P1338, DOI 10.1016/j.ijrobp.2010.04.002

CLAMP: Clinical Language Annotation Modeling and Processing Toolkit, 2018, CLAMP CLIN LANG ANN

Common Terminology Criteria for Adverse Events (CTCAE), 2010, COMM TERM CRIT ADV E

Crowley RS, 2010, J AM MED INFORM ASSN, V17, P253, DOI 10.1136/jamia.2009.002295

Elliott R. J., 1994, HIDDEN MARKOV MODELS

FierceBiotech, 2012, COL GRANTS HLTH FID

Furuse K, 1999, J CLIN ONCOL, V17, P2692, DOI 10.1200/JCO.1999.17.9.2692

Jabbour SK, 2015, INT J RADIAT ONCOL, V92, P627, DOI 10.1016/j.ijrobp.2015.02.017

Lee H, 2016, 10 INT WORKSH SEM EV, DOI [10.1136/jamia.2010.003707, DOI 10.1136/JAMIA.2010.003707]

Liao ZXX, 2010, INT J RADIAT ONCOL, V76, P775, DOI 10.1016/j.ijrobp.2009.02.032

Nguyen AN, 2010, J AM MED INFORM ASSN, V17, P440, DOI 10.1136/jamia.2010.003707

Ramalingam S, 2008, ONCOLOGIST, V13, P5, DOI 10.1634/theoncologist.13-S1-5

Savova GK, 2010, J AM MED INFORM ASSN, V17, P507, DOI 10.1136/jamia.2009.001560

Soysal Ergin, 2017, AMIA Jt Summits Transl Sci Proc, V2017, P268

Warner JL, 2016, J ONCOL PRACT, V12, P157, DOI 10.1200/JOP.2015.004622

Xu H, 2010, J AM MED INFORM ASSN, V17, P19, DOI 10.1197/jamia.M3378

Zheng S, 2017, JMIR MED INF, V5, P68, DOI 10.2196/medinform.7235

Zheng Shuai, 2015, J Pathol Inform, V6, P51, DOI 10.4103/2153-3539.166012

Zheng Shuai, 2013, AMIA Annu Symp Proc, V2013, P1590

NR 21

TC 7

Z9 8

U1 0

U2 4

PU JMIR PUBLICATIONS, INC

PI TORONTO

PA 59 WINNERS CIRCLE, TORONTO, ON M4L 3Y7, CANADA

SN 2291-9694

J9 JMIR MED INF

JI JMIR Med. Inf.

PD JAN-MAR

PY 2018

VL 6

IS 1

AR e8

DI 10.2196/medinform.8662

PG 7

WC Medical Informatics

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Medical Informatics

GA GH8VS

UT WOS:000433947600004

PM 29391345

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Sun, FH

Chen, YC

Chen, X

Sun, XR

Xing, LG

AF Sun, Fenghao

Chen, Yicong

Chen, Xia

Sun, Xiaorong

Xing, Ligang

TI CT-based radiomics for predicting brain metastases as the first failure

in patients with curatively resected locally advanced non-small cell

lung cancer

SO EUROPEAN JOURNAL OF RADIOLOGY

LA English

DT Article

DE Radiomics; Brain metastases; Locally advanced non-small cell lung

cancer; Prognostic model

ID PROPHYLACTIC CRANIAL IRRADIATION; RISK-FACTORS; EGFR; SURGERY;

CHEMORADIATION; RADIOTHERAPY; MUTATIONS; CARCINOMA; DIAGNOSIS; NOMOGRAM

AB Purpose: Brain metastasis (BM) is the primary first failure pattern in patients with curatively resected locally advanced non-small cell lung cancer (LA-NSCLC). It is not yet possible to accurately predict the occurrence of BM. The purpose of the research is to develop and validate a prediction model of BM-free survival based on radiomics characterising the primary lesions combined with clinical characteristics in patients with curatively resected LA-NSCLC.

Methods: This study consisted of 124 patients with curatively resected stage IIB-IIIB NSCLC in our institution between January 2014 and June 2018. Patients were randomly divided into training and validation cohorts using a 4:1 ratio. Radiomics features were selected from the chest CT images before surgery. A radiomics signature was constructed using the LASSO algorithm based on the training cohort. Clinical model was developed using the Cox proportional hazards model. The clinical, radiomics, and integrated nomograms were constructed. The prediction performance of the models was assessed based on its discrimination, calibration, and clinical utility.

Results: The radiomics signature is significantly associated with BM-free survival in the overall cohort. The discrimination performance of the integrated nomogram, with the C-indexes 0.889 (0.872-0.906, 95 % CI) and 0.853 (0.788-0.918, 95 % CI) in the training and validation cohorts, respectively, is significantly better than the clinical nomogram (p < 0.0001 for the training cohort, p = 0.0008 for the validation cohort). Compared with the radiomics nomogram, the integrated nomogram is also improved to varying degrees, but not apparent in the validation cohort (p = 0.0007 for the training cohort, p = 0.0554 for the validation cohort). The calibration curve and decision curve analysis demonstrated that the integrated nomogram exceeded the clinical or radiomics nomograms in predicting BM-free survival.

Conclusions: Compared with the clinical or radiomics nomograms, the predictive performance of the integrated nomogram is significantly improved. The integrated nomogram is most suitable for predicting BM-free survival in patients with curatively resected LA-NSCLC.

C1 [Sun, Fenghao; Xing, Ligang] Weifang Med Univ, Sch Clin Med, Weifang, Shandong, Peoples R China.

[Sun, Fenghao; Chen, Yicong; Xing, Ligang] Shandong First Med Univ & Shandong Acad Med Sci, Shandong Canc Hosp & Inst, Dept Radiat Oncol, Jinan, Shandong, Peoples R China.

[Chen, Xia; Sun, Xiaorong] Shandong First Med Univ & Shandong Acad Med Sci, Shandong Canc Hosp & Inst, Dept Nucl Med, Jinan, Shandong, Peoples R China.

[Chen, Yicong; Xing, Ligang] Shandong Univ, Cheeloo Coll Med, Jinan, Shandong, Peoples R China.

[Chen, Xia; Sun, Xiaorong; Xing, Ligang] Shandong First Med Univ & Shandong Acad Med Sci, Dept Grad, Jinan, Shandong, Peoples R China.

RP Sun, XR; Xing, LG (通讯作者)，Shandong First Med Univ & Shandong Acad Med Sci, Shandong Canc Hosp & Inst, Jinan, Shandong, Peoples R China.

EM 18366120520@163.com; 251400067@qq.com; xinglg@medmail.com.cn

FU National Key Research and Development Project [2018YFC1313200]; National

Natural Science Foundation of China [81572970]; Shandong Natural Science

Foundation [ZR2019LZL019]; Jinan Scientific and Technology Development

Project [201805005]

FX This work was financially supported by grants from the National Key

Research and Development Project (2018YFC1313200), the National Natural

Science Foundation of China (81572970), the Shandong Natural Science

Foundation (ZR2019LZL019), and the Jinan Scientific and Technology

Development Project (201805005).

CR ALBAIN KS, 1995, J CLIN ONCOL, V13, P1880, DOI 10.1200/JCO.1995.13.8.1880

An N, 2018, CANCER MED-US, V7, P6357, DOI 10.1002/cam4.1865

Arrieta O, 2009, BMC CANCER, V9, DOI 10.1186/1471-2407-9-119

Arshad MA, 2019, EUR J NUCL MED MOL I, V46, P455, DOI 10.1007/s00259-018-4139-4

Bajard A, 2004, LUNG CANCER, V45, P317, DOI 10.1016/j.lungcan.2004.01.025

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Burel-Vandenbos F, 2013, J NEURO-ONCOL, V111, P1, DOI 10.1007/s11060-012-0990-5

Cardona AF, 2018, LUNG CANCER, V125, P265, DOI 10.1016/j.lungcan.2018.10.007

Carolan H, 2005, LUNG CANCER, V49, P109, DOI 10.1016/j.lungcan.2004.12.004

Ceresoli GL, 2002, CANCER, V95, P605, DOI 10.1002/cncr.10687

Chen AP, 2019, AM J ROENTGENOL, V213, P134, DOI 10.2214/AJR.18.20591

Chen AM, 2007, CANCER-AM CANCER SOC, V109, P1668, DOI 10.1002/cncr.22565

De Ruysscher D, 2018, J CLIN ONCOL, V36, P2366, DOI 10.1200/JCO.2017.77.5817

Ding X, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-119

Gaspar LE, 2005, J CLIN ONCOL, V23, P2955, DOI 10.1200/JCO.2005.08.026

Gondi V, 2014, J CLIN ONCOL, V32, P3810, DOI 10.1200/JCO.2014.57.2909

Gonen M, 2005, BIOMETRIKA, V92, P965, DOI 10.1093/biomet/92.4.965

Gore EM, 2011, J CLIN ONCOL, V29, P272, DOI 10.1200/JCO.2010.29.1609

Gui J, 2005, BIOINFORMATICS, V21, P3001, DOI 10.1093/bioinformatics/bti422

HARRELL FE, 1982, JAMA-J AM MED ASSOC, V247, P2543, DOI 10.1001/jama.247.18.2543

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Hubbs JL, 2010, CANCER-AM CANCER SOC, V116, P5038, DOI 10.1002/cncr.25254

Huynh E, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169172

Ji Z, 2014, INT J RADIAT ONCOL, V89, P330, DOI 10.1016/j.ijrobp.2014.02.025

Kattan MW, 2003, J NATL CANCER I, V95, P634, DOI 10.1093/jnci/95.9.634

Keith B, 2002, AM J CLIN ONCOL-CANC, V25, P583, DOI 10.1097/00000421-200212000-00011

Kerr KF, 2016, J CLIN ONCOL, V34, P2534, DOI 10.1200/JCO.2015.65.5654

Liang WJ, 2019, CLIN CANCER RES, V25, P584, DOI 10.1158/1078-0432.CCR-18-1305

Mamon HJ, 2005, J CLIN ONCOL, V23, P1530, DOI 10.1200/JCO.2005.04.123

Moons KGM, 2015, ANN INTERN MED, V162, pW1, DOI 10.7326/M14-0698

Munfus-McCray D, 2011, HUM PATHOL, V42, P1447, DOI 10.1016/j.humpath.2010.12.011

Ortiz-Ramon R, 2018, EUR RADIOL, V28, P4514, DOI 10.1007/s00330-018-5463-6

Pugh TJ, 2007, CLIN LUNG CANCER, V8, P365, DOI 10.3816/CLC.2007.n.016

Robnett TJ, 2001, J CLIN ONCOL, V19, P1344, DOI 10.1200/JCO.2001.19.5.1344

Schouten LJ, 2002, CANCER, V94, P2698, DOI 10.1002/cncr.10541

Shin DY, 2016, J CANCER RES THER, V12, P318, DOI 10.4103/0973-1482.154024

Steyerberg E.W.J.B., 2016, REGRESSION MODELING, V72, P1006

Sun R, 2018, LANCET ONCOL, V19, P1180, DOI 10.1016/S1470-2045(18)30413-3

Tibshirani R, 1997, STAT MED, V16, P385, DOI 10.1002/(SICI)1097-0258(19970228)16:4<385::AID-SIM380>3.0.CO;2-3

Vickers AJ, 2006, MED DECIS MAKING, V26, P565, DOI 10.1177/0272989X06295361

Villalva C, 2013, CANCER MED-US, V2, P296, DOI 10.1002/cam4.82

Won YW, 2015, LUNG CANCER, V88, P201, DOI 10.1016/j.lungcan.2015.02.006

Xie CY, 2019, EBIOMEDICINE, V44, P289, DOI 10.1016/j.ebiom.2019.05.023

Xie SS, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0103431

Yip SSF, 2017, EUR J RADIOL, V97, P8, DOI 10.1016/j.ejrad.2017.10.009

Zhang FR, 2016, ANN SURG ONCOL, V23, P3033, DOI 10.1245/s10434-016-5206-3

Zhao SL, 2019, J BONE ONCOL, V19, DOI 10.1016/j.jbo.2019.100263

NR 47

TC 4

Z9 4

U1 0

U2 9

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0720-048X

EI 1872-7727

J9 EUR J RADIOL

JI Eur. J. Radiol.

PD JAN

PY 2021

VL 134

AR 109411

DI 10.1016/j.ejrad.2020.109411

PG 10

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA PQ9JN

UT WOS:000606857800005

PM 33246270

OA Bronze

DA 2022-08-24

ER

PT J

AU Field, M

Vinod, S

Aherne, N

Carolan, M

Dekker, A

Delaney, G

Greenham, S

Hau, E

Lehmann, J

Ludbrook, J

Miller, A

Rezo, A

Selvaraj, J

Sykes, J

Holloway, L

Thwaites, D

AF Field, Matthew

Vinod, Shalini

Aherne, Noel

Carolan, Martin

Dekker, Andre

Delaney, Geoff

Greenham, Stuart

Hau, Eric

Lehmann, Joerg

Ludbrook, Joanna

Miller, Andrew

Rezo, Angela

Selvaraj, Jothybasu

Sykes, Jonathan

Holloway, Lois

Thwaites, David

TI Implementation of the Australian Computer-Assisted Theragnostics

(AusCAT) network for radiation oncology data extraction, reporting and

distributed learning

SO JOURNAL OF MEDICAL IMAGING AND RADIATION ONCOLOGY

LA English

DT Article

DE artificial intelligence; decision support systems; distributed learning;

federated learning; radiation oncology

ID LUNG-CANCER; SURVIVAL PREDICTION; 2-YEAR SURVIVAL; CLINICAL-TRIALS;

MODEL; RADIOTHERAPY; CONCURRENT; CARE

AB Introduction There is significant potential to analyse and model routinely collected data for radiotherapy patients to provide evidence to support clinical decisions, particularly where clinical trials evidence is limited or non-existent. However, in practice there are administrative, ethical, technical, logistical and legislative barriers to having coordinated data analysis platforms across radiation oncology centres. Methods A distributed learning network of computer systems is presented, with software tools to extract and report on oncology data and to enable statistical model development. A distributed or federated learning approach keeps data in the local centre, but models are developed from the entire cohort. Results The feasibility of this approach is demonstrated across six Australian oncology centres, using routinely collected lung cancer data from oncology information systems. The infrastructure was used to validate and develop machine learning for model-based clinical decision support and for one centre to assess patient eligibility criteria for two major lung cancer radiotherapy clinical trials (RTOG-9410, RTOG-0617). External validation of a 2-year overall survival model for non-small cell lung cancer (NSCLC) gave an AUC of 0.65 and C-index of 0.62 across the network. For one centre, 65% of Stage III NSCLC patients did not meet eligibility criteria for either of the two practice-changing clinical trials, and these patients had poorer survival than eligible patients (10.6 m vs. 15.8 m, P = 0.024). Conclusion Population-based studies on routine data are possible using a distributed learning approach. This has the potential for decision support models for patients for whom supporting clinical trial evidence is not applicable.

C1 [Field, Matthew; Vinod, Shalini; Delaney, Geoff; Selvaraj, Jothybasu; Holloway, Lois] UNSW, South Western Sydney Clin Sch, Fac Med, Sydney, NSW, Australia.

[Field, Matthew; Vinod, Shalini; Delaney, Geoff; Holloway, Lois] Ingham Inst Appl Med Res, 1 Campbell St, Liverpool, NSW 2170, Australia.

[Vinod, Shalini; Delaney, Geoff; Holloway, Lois] Liverpool & Macarthur Canc Therapy Centres, Liverpool, Merseyside, England.

[Aherne, Noel; Greenham, Stuart] Mid North Coast Canc Inst, Coffs Harbour, NSW, Australia.

[Aherne, Noel] Univ New South Wales, Rural Clin Sch, Fac Med, Sydney, NSW, Australia.

[Carolan, Martin; Miller, Andrew] Illawarra Canc Care Ctr, Wollongong, NSW, Australia.

[Dekker, Andre] Maastricht Univ, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Maastricht, Netherlands.

[Hau, Eric; Sykes, Jonathan] Sydney West Radiat Oncol Network, Sydney, NSW, Australia.

[Hau, Eric] Univ Sydney, Westmead Clin Sch, Sydney, NSW, Australia.

[Lehmann, Joerg] Univ Newcastle, Sch Math & Phys Sci, Newcastle, NSW, Australia.

[Lehmann, Joerg; Ludbrook, Joanna] Calvary Mater, Dept Radiat Oncol, Newcastle, NSW, Australia.

[Lehmann, Joerg; Sykes, Jonathan; Holloway, Lois; Thwaites, David] Univ Sydney, Inst Med Phys, Sch Phys, Sydney, NSW, Australia.

[Rezo, Angela; Selvaraj, Jothybasu] Canberra Hlth Serv, Canberra, ACT, Australia.

RP Field, M (通讯作者)，Ingham Inst Appl Med Res, 1 Campbell St, Liverpool, NSW 2170, Australia.

EM matthew.field@unsw.edu.au

RI ; Field, Matthew/J-2810-2015

OI Carolan, Martin/0000-0001-6671-029X; Ludbrook, Joanna

Jane/0000-0001-9909-3945; Delaney, Geoff/0000-0002-1829-396X; Dekker,

Andre/0000-0002-0422-7996; Holloway, Lois/0000-0003-4337-2165; Greenham,

Stuart/0000-0001-7471-3052; Field, Matthew/0000-0002-6169-6721; Lehmann,

Joerg/0000-0001-7667-3090; Vinod, Shalini/0000-0001-8075-6219

FU NSW Office of Health and Medical Research (OHMR) Bioinformatics grant

[RG14/11]; Macarthur Cancer Therapy Centre; Sydney West Radiation

Oncology Network; Westmead Hospital; Blacktown Hospital; Illawarra

Cancer Care Centre (Wollongong Hospital); Hunter Cancer Alliance grant;

Cancer Institute NSW Early Career Fellowship [2019/ECF004]; Liverpool

Cancer Therapy Centre

FX This work was in part supported by a NSW Office of Health and Medical

Research (OHMR) Bioinformatics grant, RG14/11, by radiation oncology

trust funds from Liverpool and Macarthur Cancer Therapy Centres, Sydney

West Radiation Oncology Network, Westmead and Blacktown Hospitals and

Illawarra Cancer Care Centre (Wollongong Hospital), by a Hunter Cancer

Alliance grant and by Cancer Institute NSW Early Career Fellowship

2019/ECF004.

CR Alexander M, 2017, BRIT J CANCER, V117, P744, DOI 10.1038/bjc.2017.232

Bailey, 2015, DISTRIBUTED DATA MIN, P323

Barakat MS, 2017, HEALTH INF SCI SYST, V5, DOI 10.1007/s13755-017-0039-4

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Curran WJ, 2011, J NATL CANCER I, V103, P1452, DOI 10.1093/jnci/djr325

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Deist TM, 2020, RADIOTHER ONCOL, V144, P189, DOI 10.1016/j.radonc.2019.11.019

Dekker A, 2014, RADIOTHER ONCOL, V111, pS24, DOI 10.1016/j.radonc.2014.08.013

Duggan KJ, 2016, CLIN ONCOL-UK, V28, P639, DOI 10.1016/j.clon.2016.04.045

eviQ Cancer Treatments Online, 2006, RESP NONSM CELL LUNG

Gaye A, 2014, INT J EPIDEMIOL, V43, P1929, DOI 10.1093/ije/dyu188

Girgis A, 2016, JMIR RES PROTOC, V5, DOI 10.2196/resprot.6459

Grand MM, 2012, J MED IMAG RADIAT ON, V56, P31, DOI 10.1111/j.1754-9485.2011.02337.x

Jayasurya K, 2010, MED PHYS, V37, P1401, DOI 10.1118/1.3352709

Jochems A, 2018, ACTA ONCOL, V57, P226, DOI 10.1080/0284186X.2017.1385842

Jochems A, 2016, RADIOTHER ONCOL, V121, P459, DOI 10.1016/j.radonc.2016.10.002

Kalendralis P, 2021, PHYS MEDICA, V82, P158, DOI 10.1016/j.ejmp.2021.01.083

Lambin P, 2015, ACTA ONCOL, V54, P1289, DOI 10.3109/0284186X.2015.1062136

Lu CL, 2015, J AM MED INFORM ASSN, V22, P1212, DOI 10.1093/jamia/ocv083

Lustberg T, 2016, ONCOTARGET, V7, P37288, DOI 10.18632/oncotarget.8755

Price G, 2017, CLIN ONCOL-UK, V29, P814, DOI 10.1016/j.clon.2017.07.011

Shi ZW, 2019, SCI DATA, V6, DOI 10.1038/s41597-019-0241-0

Sioutos N, 2007, J BIOMED INFORM, V40, P30, DOI 10.1016/j.jbi.2006.02.013

Stevens J., 2016, USING EHR CONDUCT OU, DOI [10.1007/978-3-319-43742-2\_7, DOI 10.1007/978-3-319-43742-2\_7]

Traverso A, 2018, MED PHYS, V45, pE854, DOI 10.1002/mp.12879

Walpole ET, 2019, J ONCOL PRACT, V15, P416, DOI 10.1200/JOP.18.00372

Wilkinson MD, 2016, SCI DATA, V3, DOI 10.1038/sdata.2016.18

Wong J, 2018, CURR EPIDEMIOL REP, V5, P331, DOI 10.1007/s40471-018-0165-9

NR 28

TC 3

Z9 3

U1 0

U2 4

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1754-9477

EI 1754-9485

J9 J MED IMAG RADIAT ON

JI J. Med. Imag. Radiat. Oncol.

PD AUG

PY 2021

VL 65

IS 5

SI SI

BP 627

EP 636

DI 10.1111/1754-9485.13287

EA JUL 2021

PG 10

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA TT2DX

UT WOS:000679682500001

PM 34331748

OA Green Published

DA 2022-08-24

ER

PT J

AU Li, Q

Kim, J

Balagurunathan, Y

Liu, Y

Latifi, K

Stringfield, O

Garcia, A

Moros, EG

Dilling, TJ

Schabath, MB

Ye, ZX

Gillies, RJ

AF Li, Qian

Kim, Jongphil

Balagurunathan, Yoganand

Liu, Ying

Latifi, Kujtim

Stringfield, Olya

Garcia, Alberto

Moros, Eduardo G.

Dilling, Thomas J.

Schabath, Matthew B.

Ye, Zhaoxiang

Gillies, Robert J.

TI Imaging features from pretreatment CT scans are associated with clinical

outcomes in nonsmall-cell lung cancer patients treated with stereotactic

body radiotherapy

SO MEDICAL PHYSICS

LA English

DT Article

DE computed tomography; image features; radiomics; semantics; stereotactic

body radiotherapy (SBRT); survival

ID POSITRON-EMISSION-TOMOGRAPHY; RADIATION-THERAPY; ABLATIVE RADIOTHERAPY;

PROGNOSTIC-FACTOR; VESSEL INVASION; RADIOMICS; RECURRENCE; IMPACT;

REPRODUCIBILITY; IMAGES

AB Purpose: To investigate whether imaging features from pretreatment planning CT scans are associated with overall survival (OS), recurrence-free survival (RFS), and loco-regional recurrence-free survival (LR-RFS) after stereotactic body radiotherapy (SBRT) among nonsmall-cell lung cancer (NSCLC) patients.

Patients and methods: A total of 92 patients (median age: 73 yr) with stage I or IIA NSCLC were qualified for this study. A total dose of 50 Gy in five fractions was the standard treatment. Besides clinical characteristics, 24 "semantic" image features were manually scored based on a point scale (up to 5) and 219 computer-derived "radiomic" features were extracted based on whole tumor segmentation. Statistical analysis was performed using Cox proportional hazards model and Harrell's C-index, and the robustness of final prognostic model was assessed using tenfold cross validation by dichotomizing patients according to the survival or recurrence status at 24 months.

Results: Two-year OS, RFS and LR-RFS were 69.95%, 41.3%, and 51.85%, respectively. There was an improvement of Harrell's C-index when adding imaging features to a clinical model. The model for OS contained the Eastern Cooperative Oncology Group (ECOG) performance status [Hazard Ratio (HR) = 2.78, 95% Confidence Interval (CI): 1.37-5.65], pleural retraction (HR = 0.27, 95% CI: 0.08-0.92), F2 (short axis x longest diameter, HR = 1.72, 95% CI: 1.21-2.44) and F186 (HistEnergy- L1, HR = 1.27, 95% CI: 1.00-1.61); The prognostic model for RFS contained vessel attachment (HR = 2.13, 95% CI: 1.24-3.64) and F2 (HR = 1.69, 95% CI: 1.33-2.15); and the model for LR-RFS contained the ECOG performance status (HR = 2.01, 95% CI: 1.12-3.60) and F2 (HR = 1.67, 95% CI: 1.29-2.18).

Conclusions: Imaging features derived from planning CT demonstrate prognostic value for recurrence following SBRT treatment, and might be helpful in patient stratification. (C ) 2017 American Association of Physicists in Medicine

C1 [Li, Qian; Liu, Ying; Ye, Zhaoxiang] Tianjin Med Univ Canc Inst & Hosp, Dept Radiol, Natl Clin Res Ctr Canc, Key Lab Canc Prevent & Therapy, Tianjin, Peoples R China.

[Li, Qian; Balagurunathan, Yoganand; Stringfield, Olya; Garcia, Alberto; Moros, Eduardo G.; Gillies, Robert J.] H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Imaging & Metab, Tampa, FL 33612 USA.

[Kim, Jongphil] H Lee Moffitt Canc Ctr & Res Inst, Dept Biostat & Bioinformat, Tampa, FL USA.

[Latifi, Kujtim; Moros, Eduardo G.; Dilling, Thomas J.] H Lee Moffitt Canc Ctr & Res Inst, Dept Radiat Oncol, Tampa, FL USA.

[Schabath, Matthew B.] H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Epidemiol, Tampa, FL USA.

RP Ye, ZX (通讯作者)，Tianjin Med Univ Canc Inst & Hosp, Dept Radiol, Natl Clin Res Ctr Canc, Key Lab Canc Prevent & Therapy, Tianjin, Peoples R China.; Gillies, RJ (通讯作者)，H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Imaging & Metab, Tampa, FL 33612 USA.

EM yezhaoxiang@163.com; robert.gillies@moffitt.org

RI Balagurunathan, Yoganand/AAH-9139-2021; Schabath, Matthew

B./J-3763-2016; YE, ZHAOXIANG/B-8969-2016; Kim, Jongphil/ABU-5779-2022;

Balagurunathan, Yoganand/AAF-9163-2020; Moros, Eduardo G./AAY-2771-2020

OI Schabath, Matthew B./0000-0003-3241-3216; YE,

ZHAOXIANG/0000-0003-3157-8393; Balagurunathan,

Yoganand/0000-0002-5598-4727; Moros, Eduardo G./0000-0003-1964-2460;

Gillies, Robert/0000-0002-8888-7747

FU National Cancer Institute [U01 CA143062, P50 CA119997]; State of Florida

Department of Health, James & Esther King Biomedical Research Program

[2kT01]; Biostatistics Core shared resources at the H. Lee Moffitt

Cancer Center & Research Institute, an NCI designated Comprehensive

Cancer Center [P30-CA076292]; NATIONAL CANCER INSTITUTE [U01CA152662,

U01CA196405, U01CA143062, U01CA186145, P50CA119997, P30CA076292] Funding

Source: NIH RePORTER

FX This research was supported by the National Cancer Institute (grants U01

CA143062 and P50 CA119997), State of Florida Department of Health, James

& Esther King Biomedical Research Program (grant 2kT01), and in part by

Biostatistics Core shared resources at the H. Lee Moffitt Cancer Center

& Research Institute, an NCI designated Comprehensive Cancer Center

(P30-CA076292).

CR Aerts HJWL, 2016, JAMA ONCOL, V2, P1636, DOI 10.1001/jamaoncol.2016.2631

Atallah S, 2014, INT J RADIAT ONCOL, V89, P532, DOI 10.1016/j.ijrobp.2014.03.003

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Bhatt AD, 2015, AM J CLIN ONCOL-CANC, V38, P41, DOI 10.1097/COC.0b013e318287bd7f

Burdick MJ, 2010, INT J RADIAT ONCOL, V78, P1033, DOI 10.1016/j.ijrobp.2009.09.081

Chen FS, 2010, J THORAC ONCOL, V5, P1999, DOI 10.1097/JTO.0b013e3181f260f9

Clarke K, 2012, RADIOTHER ONCOL, V104, P62, DOI 10.1016/j.radonc.2012.04.019

Cohen JG, 2015, EUR J RADIOL, V84, P738, DOI 10.1016/j.ejrad.2014.12.031

EFRON B, 1983, J AM STAT ASSOC, V78, P316, DOI 10.2307/2288636

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Giger M, 2016, MED PHYS, V43, P3715, DOI 10.1118/1.4957330

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Gu YH, 2013, PATTERN RECOGN, V46, P692, DOI 10.1016/j.patcog.2012.10.005

Harrell F., 2001, REGRESSION MODELING

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Huang K, 2013, RADIOTHER ONCOL, V109, P51, DOI 10.1016/j.radonc.2013.06.047

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

KAPLAN EL, 1958, J AM STAT ASSOC, V53, P457, DOI 10.2307/2281868

Kessler R, 1996, ANN THORAC SURG, V62, P1489, DOI 10.1016/0003-4975(96)00540-1

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Mattonen SA, 2014, MED PHYS, V41, DOI 10.1118/1.4866219

Na FF, 2014, J THORAC ONCOL, V9, P834, DOI 10.1097/JTO.0000000000000185

Nyflot MJ, 2015, J MED IMAGING, V2, DOI 10.1117/1.JMI.2.4.041002

Onishi H, 2011, INT J RADIAT ONCOL, V81, P1352, DOI 10.1016/j.ijrobp.2009.07.1751

Rich JT, 2010, OTOLARYNG HEAD NECK, V143, P331, DOI 10.1016/j.otohns.2010.05.007

Ruffini E, 2011, J THORAC ONCOL, V6, P319, DOI 10.1097/JTO.0b013e3182011f70

Sala E, 2017, CLIN RADIOL, V72, P3, DOI 10.1016/j.crad.2016.09.013

Satoh Y, 2012, EUR J RADIOL, V81, P3530, DOI 10.1016/j.ejrad.2011.11.047

Shirvani SM, 2012, INT J RADIAT ONCOL, V84, P1060, DOI 10.1016/j.ijrobp.2012.07.2354

Shultz DB, 2014, CLIN LUNG CANCER, V15, P294, DOI 10.1016/j.cllc.2013.12.011

Spratt DE, 2016, CLIN LUNG CANCER, V17, P177, DOI 10.1016/j.cllc.2015.09.006

Storey JD, 2003, ANN STAT, V31, P2013, DOI 10.1214/aos/1074290335

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Tsuchiya T, 2007, LUNG CANCER, V56, P341, DOI 10.1016/j.lungcan.2007.01.019

Varma S, 2006, BMC BIOINFORMATICS, V7, DOI 10.1186/1471-2105-7-91

Viera AJ, 2005, FAM MED, V37, P360

WEBB WR, 1978, RADIOLOGY, V127, P309, DOI 10.1148/127.2.309

Yamamoto T, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0343-6

Zhang X, 2012, INT J RADIAT ONCOL, V83, P1558, DOI 10.1016/j.ijrobp.2011.10.035

NR 39

TC 40

Z9 44

U1 0

U2 13

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD AUG

PY 2017

VL 44

IS 8

BP 4341

EP 4349

DI 10.1002/mp.12309

PG 9

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA FD1GZ

UT WOS:000407286900046

PM 28464316

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Hwang, JH

Lim, SC

Kim, YC

Park, KO

Ahn, SJ

Chung, WK

AF Hwang, JH

Lim, SC

Kim, YC

Park, KO

Ahn, SJ

Chung, WK

TI Apoptosis and bcl-2 expression as predictors of survival in

radiation-treated non-small-cell lung cancer

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article; Proceedings Paper

CT Annual Meeting of the American-Thoracic-Society

CY APR 24-29, 1998

CL CHICAGO, ILLINOIS

SP Amer Thorac Soc

DE apoptosis; bcl-2; p53; c-myc; radiation therapy; NSCLC

ID IRRADIATED MURINE TUMORS; WILD-TYPE P53; C-MYC; CARCINOMA; PROTEIN;

DEATH; INDUCTION; THERAPY

AB Objectives: We assessed the role of apoptosis and the expression of bcl-2, p53, and c-myc oncoproteins in pretreatment histologic specimens as a predictor of response to radiation therapy and survival in non-small-cell lung cancer (NSCLC) patients.

Methods: Pretreatment biopsy specimens of 68 patients with NSCLC (62 squamous cell carcinoma, 6 adenocarcinoma) were stained with hematoxylin and eosin, From 5 high-powered fields, the apoptotic index (AI) was calculated as the ratio of apoptotic tumor cells to the total number of tumor cells. Bcl-2, p53, and c-myc oncoprotein expression was detected by immunohistochemical staining.

Results: Twenty-nine cases showed partial or complete remission, whereas 39 showed no response. AI ranged from 0.2 to 12.0% (mean +/- SD; 4.3 +/- 2.6%, median 4.0%), There was no difference in AI between responders (4.0 +/- 2.3) and nonresponders (4.5 +/- 2.8, p > 0.05). However, in the responders, AI was correlated with the degree of change in tumor volume (r = 0.41, p < 0.05). In an analysis of 53 subjects who survived more than I month after the completion of radiation therapy, the patients with a higher AI (n = 27, MST = 22.8 m) survived longer than those with a fewer AI (n = 26, MST = 9.2, log-rank, p = 0.03). Patients expressing bcl-2 had poorer survival (n = 22, MST = 6.0 m) than patients without bcl-2 (n = 31, 22.8 m,p < 0.003). According to multivariate analysis, three variables, bcl-2 expression, AI, and response to radiation, were independent prognostic factors for survival.

Conclusion: A low level of spontaneous apoptosis and expression of apoptosis blocking bcl-2 protein in pretreatment histology predict a poor prognosis for radiation-treated NSCLC patients. (C) 2001 Elsevier Science Inc.

C1 Chonnam Natl Univ, Sch Med, Dept Internal Med, Kwangju 501757, South Korea.

Chonnam Natl Univ, Sch Med, Dept Radiat Oncol, Kwangju, South Korea.

RP Kim, YC (通讯作者)，Chonnam Natl Univ, Sch Med, Dept Internal Med, 8 Hak Dong, Kwangju 501757, South Korea.

CR Anton RC, 1997, HUM PATHOL, V28, P1079, DOI 10.1016/S0046-8177(97)90062-9

BISSONNETTE RP, 1992, NATURE, V359, P552, DOI 10.1038/359552a0

EVAN GI, 1992, CELL, V69, P119, DOI 10.1016/0092-8674(92)90123-T

GAFFNEY EF, 1994, NEW ENGL J MED, V330, P1757

HOCKENBERY D, 1990, NATURE, V348, P334, DOI 10.1038/348334a0

KERR JFR, 1994, CANCER-AM CANCER SOC, V73, P2013, DOI 10.1002/1097-0142(19940415)73:8<2013::AID-CNCR2820730802>3.0.CO;2-J

Kim YC, 1998, LUNG CANCER-J IASLC, V22, P181, DOI 10.1016/S0169-5002(98)00086-5

Komaki R, 1996, INT J RADIAT ONCOL, V36, P601, DOI 10.1016/S0360-3016(96)00351-3

LOWE SW, 1993, NATURE, V362, P847, DOI 10.1038/362847a0

MCDONNELL TJ, 1993, RADIAT RES, V136, P307, DOI 10.2307/3578541

MEYN RE, 1993, INT J RADIAT BIOL, V64, P583, DOI 10.1080/09553009314551801

MILLER AB, 1981, CANCER, V47, P207, DOI 10.1002/1097-0142(19810101)47:1<207::AID-CNCR2820470134>3.0.CO;2-6

MOUNTAIN CF, 1986, CHEST, V89, pS225, DOI 10.1378/chest.89.4.225S

Okada S, 1970, RAD BIOCH, P247

ONeill AJ, 1996, HISTOPATHOLOGY, V29, P45, DOI 10.1046/j.1365-2559.1996.d01-478.x

PEREZ CA, 1986, INT J RADIAT ONCOL, V12, P539, DOI 10.1016/0360-3016(86)90061-1

PEZZELLA F, 1993, NEW ENGL J MED, V329, P690, DOI 10.1056/NEJM199309023291003

REED JA, 1992, BIOTECHNIQUES, V13, P434

Rupnow BA, 1998, CANCER RES, V58, P1779

SHAW P, 1992, P NATL ACAD SCI USA, V89, P4495, DOI 10.1073/pnas.89.10.4495

SHI YF, 1992, SCIENCE, V257, P212, DOI 10.1126/science.1378649

STAUNTON MJ, 1995, AM J CLIN PATHOL, V103, P300, DOI 10.1093/ajcp/103.3.300

STEPHENS LC, 1991, RADIAT RES, V127, P308, DOI 10.2307/3577946

Takayama K, 1996, Cancer J Sci Am, V2, P212

TORMANEN U, 1995, CANCER RES, V55, P5595

Wagner H, 1997, SEMIN ONCOL, V24, P423

WHEELER JA, 1995, INT J RADIAT ONCOL, V32, P1487, DOI 10.1016/0360-3016(95)00156-S

WYLLIE AH, 1993, BRIT J CANCER, V67, P205, DOI 10.1038/bjc.1993.40

YONISHROUACH E, 1991, NATURE, V352, P345, DOI 10.1038/352345a0

NR 29

TC 33

Z9 36

U1 0

U2 2

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA 655 AVENUE OF THE AMERICAS, NEW YORK, NY 10010 USA

SN 0360-3016

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD MAY 1

PY 2001

VL 50

IS 1

BP 13

EP 18

DI 10.1016/S0360-3016(00)01558-3

PG 6

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Conference Proceedings Citation Index - Science (CPCI-S); Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA 425XD

UT WOS:000168316200002

PM 11316541

DA 2022-08-24

ER

PT J

AU Ebrahimi, S

Lim, GJ

AF Ebrahimi, Saba

Lim, Gino J.

TI A reinforcement learning approach for finding optimal policy of adaptive

radiation therapy considering uncertain tumor biological response

SO ARTIFICIAL INTELLIGENCE IN MEDICINE

LA English

DT Article

DE Reinforcement learning; Radiotherapy; Biological tumor response

ID LINEAR-QUADRATIC MODEL; CELL LUNG-CANCER; NECK-CANCER; RADIOTHERAPY;

OPTIMIZATION; FRACTIONATION; DECISION; STRATEGIES; SHRINKAGE;

SENSITIVITY

AB Recent studies have shown that a tumor's biological response to radiation varies over time and has a dynamic nature. Dynamic biological features of tumor cells underscore the importance of using fractionation and adapting the treatment plan to tumor volume changes in radiation therapy treatment. Adaptive radiation therapy (ART) is an iterative process to adjust the dose of radiation in response to potential changes during the treatment. One of the key challenges in ART is how to determine the optimal timing of adaptations corresponding to tumor response to radiation. This paper aims to develop an automated treatment planning framework incorporating the biological uncertainties to find the optimal adaptation points to achieve a more effective treatment plan. First, a dynamic tumor-response model is proposed to predict weekly tumor volume regression during the period of radiation therapy treatment based on biological factors. Second, a Reinforcement Learning (RL) framework is developed to find the optimal adaptation points for ART considering the uncertainty in biological factors with the goal of achieving maximum final tumor control while minimizing or maintaining the toxicity level of the organs at risk (OARs) per the decision-maker's preference. Third, a beamlet intensity optimization model is solved using the predicted tumor volume at each adaptation point. The performance of the proposed RT treatment planning framework is tested using a clinical non-small cell lung cancer (NSCLC) case. The results are compared with the conventional fractionation schedule (i.e., equal dose fractionation) as a reference plan. The results show that the proposed approach performed well in achieving a robust optimal ART treatment plan under high uncertainty in the biological parameters. The ART plan outperformed the reference plan by increasing the mean biological effective dose (BED) value of the tumor by 2.01%, while maintaining the OAR BED within +0.5% and reducing the variability, in terms of the interquartile range (IQR) of tumor BED, by 25%.

C1 [Ebrahimi, Saba; Lim, Gino J.] Univ Houston, Dept Ind Engn, 4800 Calhoun Rd, Houston, TX 77204 USA.

RP Lim, GJ (通讯作者)，Univ Houston, Dept Ind Engn, 4800 Calhoun Rd, Houston, TX 77204 USA.

EM sebrahimi@uh.edu; ginolim@uh.edu

RI Lim, Gino/J-4607-2014

OI Lim, Gino/0000-0003-2259-2310

CR [Anonymous], 2013, NONLINEAR PROGRAMMIN

[Anonymous], 2011, IIE T HEALTHC SYST E

Ashrafi H, 2021, OPER RES PERSPECT, V8, DOI 10.1016/j.orp.2021.100178

Bai XM, 2020, MED PHYS, V47, P3816, DOI 10.1002/mp.14335

Belfatto A, 2016, IEEE J BIOMED HEALTH, V20, P802, DOI 10.1109/JBHI.2015.2453437

Berkovic P, 2015, ACTA ONCOL, V54, P1438, DOI 10.3109/0284186X.2015.1061209

Bibault JE, 2013, CANCER METAST REV, V32, P479, DOI 10.1007/s10555-013-9419-7

Bortfeld T, 2015, INFORMS J COMPUT, V27, P788, DOI 10.1287/ijoc.2015.0659

BRENNER DJ, 1995, INT J RADIAT ONCOL, V32, P379, DOI 10.1016/0360-3016(95)00544-9

Carlson DJ, 2006, MED PHYS, V33, P3105, DOI 10.1118/1.2229427

Coronato A, 2020, ARTIF INTELL MED, V109, DOI 10.1016/j.artmed.2020.101964

Dial C, 2016, MED PHYS, V43, P1787, DOI 10.1118/1.4943564

Douglas BG, 2012, RADIAT RES, V178, pAV125, DOI 10.1667/RRAV10.1

El Naqa I, 2016, INT J RADIAT ONCOL, V96, pS45, DOI 10.1016/j.ijrobp.2016.06.119

El Sharouni SY, 2003, BRIT J CANCER, V89, P2184, DOI 10.1038/sj.bjc.6601418

Fowler JF, 2001, ACTA ONCOL, V40, P712, DOI 10.1080/02841860152619124

FOWLER JF, 1989, BRIT J RADIOL, V62, P679, DOI 10.1259/0007-1285-62-740-679

Fox I, 2019, REINFORCEMENT LEARNI

Futoma J, 2018, LEARNING TREAT SEPSI

Ghate A., 2011, TUTORIALS OPERATIONS, P60

Glavic M, 2017, IFAC PAPERSONLINE, V50, P6918, DOI 10.1016/j.ifacol.2017.08.1217

Guckenberger M, 2011, INT J RADIAT ONCOL, V81, pE275, DOI 10.1016/j.ijrobp.2011.01.067

Guidi G, 2016, PHYS MEDICA, V32, P1659, DOI 10.1016/j.ejmp.2016.10.005

Hassler DM, 2014, SCIENCE, V343, DOI 10.1126/science.1244797

Jalalimanesh A, 2017, MATH COMPUT SIMULAT, V133, P235, DOI 10.1016/j.matcom.2016.05.008

Jeong J, 2013, PHYS MED BIOL, V58, P4897, DOI 10.1088/0031-9155/58/14/4897

Jeong J, 2017, CLIN CANCER RES, V23, P5469, DOI 10.1158/1078-0432.CCR-16-3277

Kawata Y, 2017, PHYS MEDICA, V42, P141, DOI 10.1016/j.ejmp.2017.08.012

Khaled S., 2012, RAD BIOL HDB TEACHER

Kim M, 2009, PHYS MED BIOL, V54, P4455, DOI 10.1088/0031-9155/54/14/007

Kim M, 2012, EUR J OPER RES, V219, P541, DOI 10.1016/j.ejor.2011.10.039

Kober J, 2013, INT J ROBOT RES, V32, P1238, DOI 10.1177/0278364913495721

Lawrence YR, 2008, FUTURE ONCOL, V4, P689, DOI 10.2217/14796694.4.5.689

Lee H, 2014, HEAD NECK-J SCI SPEC, V36, P499, DOI 10.1002/hed.23328

Li YZ, 2020, IEEE T COGN COMMUN, V6, P464, DOI 10.1109/TCCN.2020.2982895

Lim GJ, 2020, EUR J OPER RES, V280, P266, DOI 10.1016/j.ejor.2019.06.041

Lim GJ, 2012, EUR J OPER RES, V217, P609, DOI 10.1016/j.ejor.2011.09.038

Ling Y, 2017, DIAGNOSTIC INFERENCI, P271

Liu X, 2021, COMPUT COMMUN, V168, P20, DOI 10.1016/j.comcom.2020.12.013

Liu Z, 2019, FUTURE GENER COMP SY, V97, P1, DOI 10.1016/j.future.2019.02.068

McMahon SJ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf26a

Mnih V., 2013, P ADV NEUR INF PROC, P1

Mnih V, 2015, NATURE, V518, P529, DOI 10.1038/nature14236

Montgomery D., 2014, APPL STAT PROBABILIT, V6

Naeem M, 2020, IEEE ACCESS, V8, P209320, DOI 10.1109/ACCESS.2020.3038605

Nahum A, 2007, HDB RADIOTHERAPY PHY, P731

Nahum AE, 2012, COMPUT MATH METHOD M, V2012, DOI 10.1155/2012/329214

Nemati S, 2019, ARXIV PREPRINT ARXIV

Paul-Gilloteaux P, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-01757-6

Petersen B. K., 2018, ARXIV PREPRINT ARXIV

Ramella S, 2017, J THORAC ONCOL, V12, P1122, DOI 10.1016/j.jtho.2017.03.025

Roach MC, 2018, J THORAC DIS, V10, pS2465, DOI 10.21037/jtd.2018.01.153

Saberian F, 2016, MATH MED BIOL, V33, P211, DOI 10.1093/imammb/dqv015

Santiago A, 2016, RADIAT ONCOL, V11, DOI 10.1186/s13014-016-0643-5

Scott JG, 2017, LANCET ONCOL, V18, P202, DOI 10.1016/S1470-2045(16)30648-9

Seppenwoolde Y, 2003, INT J RADIAT ONCOL, V55, P724, DOI 10.1016/S0360-3016(02)03986-X

Siegel R, 2012, CA-CANCER J CLIN, V62, P10, DOI 10.3322/caac.20138

Sonke JJ, 2019, SEMIN RADIAT ONCOL, V29, P245, DOI 10.1016/j.semradonc.2019.02.007

South CP, 2008, MED PHYS, V35, P4599, DOI 10.1118/1.2975229

STEEL GG, 1989, INT J RADIAT BIOL, V56, P1045, DOI 10.1080/09553008914552491

Stember J., 2020, ARXIV PREPRINT ARXIV

Stuschke M, 2010, FRONT RADIAT THER ON, V42, P150, DOI 10.1159/000262470

Surucu M, 2016, TECHNOL CANCER RES T, V15, P139, DOI 10.1177/1533034615572638

Tejedor M, 2020, ARTIF INTELL MED, V104, DOI 10.1016/j.artmed.2020.101836

Tseng HH, 2017, MED PHYS, V44, P6690, DOI 10.1002/mp.12625

Unkelbach J, 2014, PHYS MED BIOL, V59, P3059, DOI 10.1088/0031-9155/59/12/3059

Uzan J, 2012, BRIT J RADIOL, V85, P1279, DOI 10.1259/bjr/20476567

van de Schoot AJAJ, 2017, ACTA ONCOL, V56, P667, DOI 10.1080/0284186X.2017.1287949

van Hasselt H, 2016, AAAI CONF ARTIF INTE, P2094

van Leeuwen CM, 2018, RADIAT ONCOL, V13, DOI 10.1186/s13014-018-1040-z

Veresezan O, 2017, JPN J RADIOL, V35, P43, DOI 10.1007/s11604-016-0604-9

Watanabe Y, 2016, THEOR BIOL MED MODEL, V13, DOI 10.1186/s12976-016-0032-7

Wein LM, 2000, INT J RADIAT ONCOL, V47, P1073, DOI 10.1016/S0360-3016(00)00534-4

Wen Z, 2015, IEEE T SMART GRID, V6, P2312, DOI 10.1109/TSG.2015.2396993

Withers H.R., 1975, ADV RADIAT BIOL, V5, P241, DOI [10.1016/B978-0-12-035405-4.50012-8, DOI 10.1016/B978-0-12-035405-4.50012-8]

Wouters BG, 2009, BASIC CLIN RADIOBIOL, P27

Yang Y, 2005, MED PHYS, V32, P3666, DOI 10.1118/1.2126167

Yousefi S, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-11817-6

Yu C, 2019, BMC MED INFORM DECIS, V19, DOI 10.1186/s12911-019-0755-6

Zaghian M, 2018, EUR J OPER RES, V266, P736, DOI 10.1016/j.ejor.2017.10.018

Zaghian M, 2017, J APPL CLIN MED PHYS, V18, P15, DOI 10.1002/acm2.12033

Zarepisheh M, 2014, MED PHYS, V41, DOI 10.1118/1.4875700

Zhang P, 2015, INT J RADIAT ONCOL, V93, pE557, DOI 10.1016/j.ijrobp.2015.07.1974

Zheng Y, 2015, INT J RADIAT ONCOL, V93, pS29, DOI 10.1016/j.ijrobp.2015.07.073

Zhu XF, 2011, MED PHYS, V38, P719, DOI 10.1118/1.3539749

NR 85

TC 3

Z9 3

U1 2

U2 2

PU ELSEVIER

PI AMSTERDAM

PA RADARWEG 29, 1043 NX AMSTERDAM, NETHERLANDS

SN 0933-3657

EI 1873-2860

J9 ARTIF INTELL MED

JI Artif. Intell. Med.

PD NOV

PY 2021

VL 121

AR 102193

DI 10.1016/j.artmed.2021.102193

EA OCT 2021

PG 20

WC Computer Science, Artificial Intelligence; Engineering, Biomedical;

Medical Informatics

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Computer Science; Engineering; Medical Informatics

GA WO1JT

UT WOS:000712218500006

PM 34763808

DA 2022-08-24

ER

PT J

AU Dissaux, G

Visvikis, D

Da-ano, R

Pradier, O

Chajon, E

Barillot, I

Duverge, L

Masson, I

Abgral, R

Ribeiro, MJS

Devillers, A

Pallardy, A

Fleury, V

Mahe, MA

De Crevoisier, R

Hatt, M

Schick, U

AF Dissaux, Gurvan

Visvikis, Dimitris

Da-ano, Ronrick

Pradier, Olivier

Chajon, Enrique

Barillot, Isabelle

Duverge, Loig

Masson, Ingrid

Abgral, Ronan

Ribeiro, Maria-Joao Santiago

Devillers, Anne

Pallardy, Amandine

Fleury, Vincent

Mahe, Marc-Andre

De Crevoisier, Renaud

Hatt, Mathieu

Schick, Ulrike

TI Pretreatment F-18-FDG PET/CT Radiomics Predict Local Recurrence in

Patients Treated with Stereotactic Body Radiotherapy for Early-Stage

Non-Small Cell Lung Cancer: A Multicentric Study

SO JOURNAL OF NUCLEAR MEDICINE

LA English

DT Article

DE PET/CT; radiomics; early-stage NSCLC; stereotactic body radiotherapy

ID ABLATIVE RADIOTHERAPY; RADIATION-THERAPY; FEATURES; HETEROGENEITY;

VARIABILITY; GUIDELINES; OUTCOMES

AB The aim of this retrospective multicentric study was to develop and evaluate a prognostic F-18-FDG PET/CT radiomic signature in early-stage non-small cell lung cancer patients treated with stereotactic body radiotherapy (SBRT). Methods: Patients from 3 different centers (n 5 27, 29, and 8) were pooled to constitute the training set, whereas the patients from a fourth center (n 5 23) were used as the testing set. The primary endpoint was local control. The primary tumor was semiautomatically delineated in the PET images using the fuzzy locally adaptive Bayesian algorithm, and manually in the low-dose CT images. In total, 184 Image Biomarkers Standardization Initiative-compliant radiomic features were extracted. Seven clinical and treatment parameters were included. We used ComBat to harmonize radiomic features extracted from the 4 institutions relying on different PET/ CT scanners. In the training set, variables found significant in the univariate analysis were fed into a multivariate regression model, and models were built by combining independent prognostic factors. Results: Median follow-up was 21.1 mo (range, 1.7-63.4 mo) and 25.5 mo (range, 7.7-57.8 mo) in training and testing sets, respectively. In univariate analysis, none of the clinical variables, 2 PET features, and 2 CT features were significantly predictive of local control. The best predictive models in the training set were obtained by combining one feature from PET (Information Correlation 2) and one feature from CT (flatness), reaching a sensitivity of 100% and a specificity of 96%. Another model combining 2 PET features (Information Correlation 2 and strength) reached sensitivity of 100% and specificity of 88%, both with an undefined hazard ratio (P < 0.001). The latter model obtained an accuracy of 0.91 (sensitivity, 100%; specificity, 81%), with a hazard ratio undefined (P = 0.023) in the testing set; however, other models relying on CT radiomic features only or the combination of PET and CT features failed to validate in the testing set. Conclusion: We showed that 2 radiomic features derived from F-18-FDG PET were independently associated with local control in patients with non-small cell lung cancer undergoing SBRT and could be combined in an accurate predictive model. This model could provide local relapse-related information and could be helpful in clinical decision making.

C1 [Dissaux, Gurvan; Pradier, Olivier; Schick, Ulrike] Univ Hosp, Radiat Oncol Dept, Brest, France.

[Dissaux, Gurvan; Visvikis, Dimitris; Da-ano, Ronrick; Pradier, Olivier; Hatt, Mathieu; Schick, Ulrike] Univ Brest, INSERM, LaTIM, UMR 1101, Brest, France.

[Chajon, Enrique; Duverge, Loig; De Crevoisier, Renaud] Ctr Eugene Marquis, Radiotherapy Dept, Rennes, France.

[Barillot, Isabelle] Univ Hosp, Dept Radiat Oncol, Tours, France.

[Masson, Ingrid; Mahe, Marc-Andre] ICO, Dept Radiat Oncol, St Herblain, France.

[Abgral, Ronan] Univ Hosp, Nucl Med Dept, Brest, France.

[Ribeiro, Maria-Joao Santiago] Univ Hosp, Nucl Med Dept, Tours, France.

[Devillers, Anne] Ctr Eugene Marquis, Nucl Med Dept, Rennes, France.

[Pallardy, Amandine] Univ Hosp, Nucl Med Dept, Nantes, France.

[Fleury, Vincent] Nucl Med Dept, ICO, St Herblain, France.

RP Dissaux, G (通讯作者)，CHRU Morvan, Radiat Oncol Dept, 2 Ave Foch, F-29609 Brest, France.

EM gurvan.dissaux@chu-brest.fr

RI de Crevoisier, Renaud/ABD-7321-2020; Hatt, Mathieu/M-8917-2017;

Visvikis, Dimitris/AAM-7865-2021; Visvikis, Dimitris/AAM-7868-2021;

Devillers, Anne/ABD-9055-2020

OI Hatt, Mathieu/0000-0002-8938-8667; abgral, ronan/0000-0002-5585-2564;

Masson, Ingrid/0000-0003-3921-9782

FU Canceropole du Grand Ouest; region of Bretagne; region of Pays de la

Loire; region of Centre-Val de Loire; H2020 Marie Curie ETN PREDICT

project

FX This work is part of the MuMoFraT project supported by the Canceropole

du Grand Ouest and the regions of Bretagne, Pays de la Loire, and

Centre-Val de Loire. The PhD of Ronrick Daano is funded by the H2020

Marie Curie ETN PREDICT project. No other potential conflict of interest

relevant to this article was reported.

CR [Anonymous], 2016, RADIOLOGY

Boellaard R, 2015, EUR J NUCL MED MOL I, V42, P328, DOI 10.1007/s00259-014-2961-x

Chalkidou A, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0124165

Chang JY, 2015, LANCET ONCOL, V16, P630, DOI 10.1016/S1470-2045(15)70168-3

Desseroit MC, 2017, J NUCL MED, V58, P406, DOI 10.2967/jnumed.116.180919

Desseroit MC, 2016, EUR J NUCL MED MOL I, V43, P1477, DOI 10.1007/s00259-016-3325-5

Eminowicz G, 2015, RADIOTHER ONCOL, V117, P542, DOI 10.1016/j.radonc.2015.10.007

Ettinger DS, 2017, J NATL COMPR CANC NE, V15, P504, DOI 10.6004/jnccn.2017.0050

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Girard N, 2011, CANCER RADIOTHER, V15, P522, DOI 10.1016/j.canrad.2011.07.241

Grootjans W, 2016, J NUCL MED, V57, P1692, DOI 10.2967/jnumed.116.173112

Haasbeek CJA, 2011, J THORAC ONCOL, V6, P2036, DOI 10.1097/JTO.0b013e31822e71d8

Hatt M, 2018, MED IMAGE ANAL, V44, P177, DOI 10.1016/j.media.2017.12.007

Hatt M, 2011, EUR J NUCL MED MOL I, V38, P663, DOI 10.1007/s00259-010-1688-6

Lovinfosse P, 2016, EUR J NUCL MED MOL I, V43, P1453, DOI 10.1007/s00259-016-3314-8

Lucia F, 2019, EUR J NUCL MED MOL I, V46, P864, DOI 10.1007/s00259-018-4231-9

Mukaka MM, 2012, MALAWI MED J, V24, P69

Murray L, 2016, CLIN ONCOL-UK, V28, P4, DOI 10.1016/j.clon.2015.09.007

Oikonomou A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-22357-y

Orlhac F, 2018, J NUCL MED, V59, P1321, DOI 10.2967/jnumed.117.199935

Pyka T, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0407-7

Schneider BJ, 2018, J CLIN ONCOL, V36, P710, DOI 10.1200/JCO.2017.74.9671

Sharma A, 2018, CLIN NUCL MED, V43, pE8, DOI 10.1097/RLU.0000000000001886

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Vallieres M, 2018, J NUCL MED, V59, P189, DOI 10.2967/jnumed.117.200501

Velazquez ER, 2017, CANCER RES, V77, P3922, DOI 10.1158/0008-5472.CAN-17-0122

Videtic GMM, 2017, PRACT RADIAT ONCOL, V7, P295, DOI 10.1016/j.prro.2017.04.014

Wu J, 2016, RADIOLOGY, V281, P270, DOI 10.1148/radiol.2016151829

NR 28

TC 65

Z9 66

U1 3

U2 22

PU SOC NUCLEAR MEDICINE INC

PI RESTON

PA 1850 SAMUEL MORSE DR, RESTON, VA 20190-5316 USA

SN 0161-5505

EI 1535-5667

J9 J NUCL MED

JI J. Nucl. Med.

PD JUN 1

PY 2020

VL 61

IS 6

BP 814

EP 820

DI 10.2967/jnumed.119.228106

PG 7

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA LW5AR

UT WOS:000539159900019

PM 31732678

OA Bronze

DA 2022-08-24

ER

PT J

AU Yu, H

Wu, HM

Wang, WL

Jolly, S

Jin, JY

Hu, C

Kong, FM

AF Yu, Hao

Wu, Huanmei

Wang, Weili

Jolly, Shruti

Jin, Jian-Yue

Hu, Chen

Kong, Feng-Ming (Spring)

TI Machine Learning to Build and Validate a Model for Radiation Pneumonitis

Prediction in Patients with Non-Small Cell Lung Cancer

SO CLINICAL CANCER RESEARCH

LA English

DT Article

ID SINGLE-NUCLEOTIDE POLYMORPHISM; PLASMA PROTEOMIC ANALYSIS; CONCURRENT

CHEMORADIOTHERAPY; SUPEROXIDE-DISMUTASE; TGF-BETA-1 GENE; TOXICITY;

RADIOTHERAPY; THERAPY; RISK; PARAMETERS

AB Purpose: Radiation pneumonitis is an important adverse event in patients with non-small cell lung cancer (NSCLC) receiving thoracic radiotherapy. However, the risk of radiation pneumonitis grade >= 2 (RP2) has not been well predicted. This study hypothesized that inflammatory cytokines or the dynamic changes during radiotherapy can improve predictive accuracy for RP2.

Experimental Design: Levels of 30 inflammatory cytokines and clinical information in patients with stages I-III NSCLC treated with radiotherapy were from our prospective studies. Statistical analysis was used to select predictive cytokine candidates and clinical covariates for adjustment. Machine learning algorithm was used to develop the generalized linear model for predicting risk RP2.

Results: A total of 131 patients were eligible and 17 (13.0%) developed RP2. IL8 and CCL2 had significantly (Bonferroni) lower expression levels in patients with RP2 than without RP2. But none of the changes in cytokine levels during radiotherapy was significantly associated with RP2. The final predictiveGLM model for RP2 was established, including IL8 and CCL2 at baseline level and two clinical variables. Nomogram was constructed based on the GLM model. The model's predicting ability was validated in the completely independent test set (AUC = 0.863, accuracy = 80.0%, sensitivity = 100%, specificity = 76.5%).

Conclusions: Bymachine learning, this study has developed and validated a comprehensive model integrating inflammatory cytokines with clinical variables to predict RP2 before radiotherapy that provides an opportunity to guide clinicians.

C1 [Yu, Hao] Shenzhen Polytech, Biomed Engn, Shenzhen, Peoples R China.

[Yu, Hao; Wu, Huanmei] Indiana Univ Purdue Univ, Sch Informat & Comp, BioHlth Informat, Indianapolis, IN 46202 USA.

[Wang, Weili; Jin, Jian-Yue; Kong, Feng-Ming (Spring)] Case Western Reserve Univ, Univ Hosp Cleveland, Med Ctr, Seidman Canc Ctr, Cleveland, OH 44106 USA.

[Wang, Weili; Jin, Jian-Yue; Kong, Feng-Ming (Spring)] Case Western Reserve Univ, Case Comprehens Canc Ctr, Cleveland, OH 44106 USA.

[Jolly, Shruti] Univ Michigan, Radiat Oncol, Ann Arbor, MI 48109 USA.

[Hu, Chen] Johns Hopkins Univ, Sch Med, Sidney Kimmel Comprehens Canc Ctr, Baltimore, MD USA.

[Kong, Feng-Ming (Spring)] Univ Hong Kong, LKS Fac Med, Dept Clin Oncol, Hong Kong, Peoples R China.

[Kong, Feng-Ming (Spring)] Univ Hong Kong & Shenzhen Hosp, Dept Clin Oncol, Hong Kong, Peoples R China.

RP Kong, FM (通讯作者)，Case Western Reserve Univ, Case Comprehens Canc Ctr, Cleveland, OH 44106 USA.; Kong, FM (通讯作者)，Case Western Reserve Univ, Seidman Canc Ctr, Univ Hosp, Cleveland, OH 44106 USA.

EM kong0001@hku.hk

RI Wang, Weili/A-5336-2013; Kong, Feng-Ming/Y-2825-2019; Hu,

Chen/AAX-4202-2020

OI Wang, Weili/0000-0002-1627-3025; Kong, Feng-Ming/0000-0003-2652-098X;

Hu, Chen/0000-0003-4672-1981; Wu, Huanmei/0000-0003-0346-6044

FU NIHNCI [R01 CA142840]; Province Natural Science Foundation of Guangdong

[2015A030313593]; Science and Technology Planning Project of Shenzhen,

China [JCYJ20160413164156155]

FX The Project was supported in part by NIHNCI R01 CA142840 [to F.M.

(Spring) Kong], and supported by Province Natural Science Foundation of

Guangdong (grant no. 2015A030313593; to H. Yu); Science and Technology

Planning Project of Shenzhen, China (grant no. JCYJ20160413164156155; to

H. Yu).

CR [Anonymous], R LANG ENV STAT COMP

Arpin D, 2005, J CLIN ONCOL, V23, P8748, DOI 10.1200/JCO.2005.01.7145

Barriger RB, 2010, INT J RADIAT ONCOL, V78, P1381, DOI 10.1016/j.ijrobp.2009.09.030

Briere TM, 2016, INT J RADIAT ONCOL, V94, P377, DOI 10.1016/j.ijrobp.2015.10.002

Cai XW, 2011, J THORAC ONCOL, V6, P1073, DOI 10.1097/JTO.0b013e3182152ba6

Cai XW, 2010, INT J RADIAT ONCOL, V77, P867, DOI 10.1016/j.ijrobp.2010.01.038

Chen YY, 2005, INT J RADIAT ONCOL, V62, P260, DOI 10.1016/j.ijrobp.2005.01.041

De Jaeger K, 2004, INT J RADIAT ONCOL, V58, P1378, DOI 10.1016/j.ijrobp.2003.09.078

Dinh QN, 2014, BIOMED RES INT, V2014, DOI 10.1155/2014/406960

Du S, 2016, INT J RADIAT ONCOL, V96, P519

Ellsworth SG, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0183239

Fleckenstein K, 2007, SEMIN RADIAT ONCOL, V17, P89, DOI 10.1016/j.semradonc.2006.11.004

Hart JP, 2005, INT J RADIAT ONCOL, V63, P1448, DOI 10.1016/j.ijrobp.2005.05.032

Hildebrandt MAT, 2010, PLOS ONE, V5, DOI 10.1371/journal.pone.0012402

Kang KH, 2015, CANCERS, V7, P981, DOI 10.3390/cancers7020820

Kim JY, 2009, RADIAT ONCOL, V4, DOI 10.1186/1748-717X-4-59

Kim TH, 2005, RADIOLOGY, V235, P208, DOI 10.1148/radiol.2351040248

Kong FM, 2006, INT J RADIAT ONCOL, V65, P1075, DOI 10.1016/j.ijrobp.2006.01.051

Kong FM, 2017, TRANSL LUNG CANCER R, V6, P625, DOI 10.21037/tlcr.2017.09.13

Kong FS, 2018, INT J RAD ONCOL BI S, P34014

Li P, 2016, CLIN LUNG CANCER, V17, P253, DOI 10.1016/j.cllc.2015.11.008

Mak RH, 2012, CANCER-AM CANCER SOC, V118, P3654, DOI 10.1002/cncr.26667

Meirovitz A, 2010, RADIAT ONCOL, V5, DOI 10.1186/1748-717X-5-16

Niu XM, 2012, J THORAC ONCOL, V7, P1668, DOI 10.1097/JTO.0b013e318267cf5b

Park EM, 2007, FREE RADICAL BIO MED, V42, P280, DOI 10.1016/j.freeradbiomed.2006.10.044

Phernambucq ECJ, 2011, ANN ONCOL, V22, P132, DOI 10.1093/annonc/mdq316

Seppenwoolde Y, 2004, INT J RADIAT ONCOL, V60, P748, DOI 10.1016/j.ijrobp.2004.04.037

Stenmark MH, 2012, INT J RADIAT ONCOL, V84, pE217, DOI 10.1016/j.ijrobp.2012.03.067

Tsoutsou PG, 2006, INT J RADIAT ONCOL, V66, P1281, DOI 10.1016/j.ijrobp.2006.08.058

Tsujino K, 2003, INT J RADIAT ONCOL, V55, P110, DOI 10.1016/S0360-3016(02)03807-5

Valdes G, 2016, PHYS MED BIOL, V61, P6105, DOI 10.1088/0031-9155/61/16/6105

Wang DQ, 2012, BIOMARKERS, V17, P455, DOI 10.3109/1354750X.2012.685952

Wang J, 2017, SCIENCE, V358, P111, DOI 10.1126/science.aam9690

Wang JB, 2013, INT J RADIAT ONCOL, V85, P798, DOI 10.1016/j.ijrobp.2012.06.040

Wang SL, 2017, INT J RADIAT ONCOL, V98, P615, DOI 10.1016/j.ijrobp.2017.03.011

Wang WL, 2013, INT J RADIAT ONCOL, V86, P956, DOI 10.1016/j.ijrobp.2013.05.003

Ward PA, 1998, AM J RESP CRIT CARE, V157, pS123, DOI 10.1164/ajrccm.157.4.nhlbi-10

Wen JY, 2018, J THORAC ONCOL, V13, P660, DOI 10.1016/j.jtho.2018.01.028

Werner-Wasik M, 2011, CLIN LUNG CANCER, V12, P245, DOI 10.1016/j.cllc.2011.03.026

Yuan XL, 2009, J CLIN ONCOL, V27, P3370, DOI 10.1200/JCO.2008.20.6763

Zhao L, 2008, LUNG CANCER, V59, P232, DOI 10.1016/j.lungcan.2007.08.010

Zhao LJ, 2009, INT J RADIAT ONCOL, V74, P1385, DOI 10.1016/j.ijrobp.2008.10.065

Zheng Y, 2018, CLIN LUNG CANCER, P30351

NR 43

TC 9

Z9 11

U1 1

U2 14

PU AMER ASSOC CANCER RESEARCH

PI PHILADELPHIA

PA 615 CHESTNUT ST, 17TH FLOOR, PHILADELPHIA, PA 19106-4404 USA

SN 1078-0432

EI 1557-3265

J9 CLIN CANCER RES

JI Clin. Cancer Res.

PD JUL 15

PY 2019

VL 25

IS 14

BP 4343

EP 4350

DI 10.1158/1078-0432.CCR-18-1084

PG 8

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA IM5EW

UT WOS:000478018100017

PM 30992302

OA Green Published

DA 2022-08-24

ER

PT J

AU Lafata, KJ

Hong, JC

Geng, RQ

Ackerson, BC

Liu, JG

Zhou, ZN

Torok, J

Kelsey, CR

Yin, FF

AF Lafata, Kyle J.

Hong, Julian C.

Geng, Ruiqi

Ackerson, Bradley C.

Liu, Jian-Guo

Zhou, Zhennan

Torok, Jordan

Kelsey, Chris R.

Yin, Fang-Fang

TI Association of pre-treatment radiomic features with lung cancer

recurrence following stereotactic body radiation therapy

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE radiomics; stereotactic body radiation therapy; non-small cell lung

cancer; treatment outcomes

ID STAGE-I; SURVIVAL

AB The purpose of this work was to investigate the potential relationship between radiomic features extracted from pre-treatment x-ray CT images and clinical outcomes following stereotactic body radiation therapy (SBRT) for non-small-cell lung cancer (NSCLC).

Seventy patients who received SBRT for stage-1 NSCLC were retrospectively identified. The tumor was contoured on pre-treatment free-breathing CT images, from which 43 quantitative radiomic features were extracted to collectively capture tumor morphology, intensity, fine-texture, and coarse-texture. Treatment failure was defined based on cancer recurrence, local cancer recurrence, and non-local cancer recurrence following SBRT. The univariate association between each radiomic feature and each clinical endpoint was analyzed using Welch's t-test, and p-values were corrected for multiple hypothesis testing. Multivariate associations were based on regularized logistic regression with a singular value decomposition to reduce the dimensionality of the radiomics data.

Two features demonstrated a statistically significant association with local failure: Homogeneity2 (p = 0.022) and Long-Run-High-Gray-Level-Emphasis (p = 0.048). These results indicate that relatively dense tumors with a homogenous coarse texture might be linked to higher rates of local recurrence. Multivariable logistic regression models produced maximum AUC values of 0.72 +/- 0.04, 0.83 +/- 0.03, and 0.60 +/- 0.04, for the recurrence, local recurrence, and non-local recurrence endpoints, respectively.

The CT-based radiomic features used in this study may be more associated with local failure than non-local failure following SBRT for stage I NSCLC. This finding is supported by both univariate and multivariate analyses.

C1 [Lafata, Kyle J.; Hong, Julian C.; Geng, Ruiqi; Ackerson, Bradley C.; Torok, Jordan; Kelsey, Chris R.; Yin, Fang-Fang] Duke Univ, Dept Radiat Oncol, Med Ctr, Durham, NC 27710 USA.

[Lafata, Kyle J.; Geng, Ruiqi; Yin, Fang-Fang] Duke Univ, Med Phys Grad Program, Durham, NC 27710 USA.

[Lafata, Kyle J.; Liu, Jian-Guo] Duke Univ, Dept Phys, Durham, NC 27710 USA.

[Liu, Jian-Guo] Duke Univ, Dept Math, Durham, NC 27710 USA.

[Zhou, Zhennan] Peking Univ, Beijing Int Ctr Math Res, Beijing 100871, Peoples R China.

RP Lafata, KJ (通讯作者)，Duke Univ, Dept Radiat Oncol, Med Ctr, Durham, NC 27710 USA.; Lafata, KJ (通讯作者)，Duke Univ, Med Phys Grad Program, Durham, NC 27710 USA.; Lafata, KJ (通讯作者)，Duke Univ, Dept Phys, Durham, NC 27710 USA.

EM kyle.lafata@duke.edu; fangfang.yin@duke.edu

RI Hong, Julian/X-6397-2018

OI Hong, Julian/0000-0001-5172-6889; Yin, Fang-Fang/0000-0002-2025-4740;

Ackerson, Bradley/0000-0001-9722-4593

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Apte AP, 2018, MED PHYS, V45, P3713, DOI 10.1002/mp.13046

Bonferroni C. E., 1936, TEORIA STAT CLASSI C

BURMAN P, 1989, BIOMETRIKA, V76, P503, DOI 10.1093/biomet/76.3.503

Chaddad A, 2017, ONCOTARGET, V8, P104393, DOI 10.18632/oncotarget.22251

Chang JY, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-152

Chen BJ, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0885-x

D'Angelo Gina M, 2009, BMC Proc, V3 Suppl 7, pS62

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Li Q, 2017, RADIOTHER ONCOL, P12

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

Murphy K.P., 2012, MACHINE LEARNING PRO

Oikonomou A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-22357-y

Tang XO, 1998, IEEE T IMAGE PROCESS, V7, P1602, DOI 10.1109/83.725367

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

Velden F, 2016, MOL IMAGING BIOL, V18, P788

Videtic GMM, 2015, INT J RADIAT ONCOL, V93, P757, DOI 10.1016/j.ijrobp.2015.07.2260

WELCH BL, 1947, BIOMETRIKA, V34, P28, DOI 10.2307/2332510

Ye J, 2015, ONCOLOGY WILLISTON P, V29

Yu W, 2018, INT J RADIAT ONCOL, V102, P1090, DOI 10.1016/j.ijrobp.2017.10.046

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

Zhang YC, 2017, SCI REP-UK, V7, DOI 10.1038/srep46349

NR 28

TC 27

Z9 29

U1 1

U2 6

PU IOP PUBLISHING LTD

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD JAN

PY 2019

VL 64

IS 2

AR 025007

DI 10.1088/1361-6560/aaf5a5

PG 9

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA HH6EY

UT WOS:000455823300004

PM 30524018

DA 2022-08-24

ER

PT J

AU Kirienko, M

Gallivanone, F

Sollini, M

Veronesi, G

Voulaz, E

Antunovic, L

Leonardi, L

Testanera, G

Castiglioni, I

Chiti, A

AF Kirienko, Margarita

Gallivanone, Francesca

Sollini, Martina

Veronesi, Giulia

Voulaz, Emanuele

Antunovic, Lidjia

Leonardi, Lorenzo

Testanera, Giorgio

Castiglioni, Isabella

Chiti, Arturo

TI FDG PET/CT as theranostic imaging in diagnosis of non-small cell lung

cancer

SO FRONTIERS IN BIOSCIENCE-LANDMARK

LA English

DT Article

DE Lung cancer; Non small cell lung cancer; PET/CT; Texture; Radiomics;

Diagnosis

ID RADIATION-THERAPY; TEXTURAL FEATURES; PROGNOSTIC VALUE; F-18-FDG PET/CT;

QUANTITATIVE ASSESSMENT; COMPUTED-TOMOGRAPHY; HETEROGENEITY; SURVIVAL;

PRETREATMENT; IMAGES

AB Objective of this work was to evaluate the role of 18F-fluorodeoxyglucose (FDG) positron-emission tomography features as theranostic imaging biomarkers in non-small cell lung cancer. In a retrospective protocol, 31 stage I-III NSCLC patients were enrolled. Patients underwent FDG PET/CT for staging purposes before surgery and were followed for two years after surgery. PET images were quantitatively analyzed. For the primary lesion, metabolic tumour volume, maximum standardized uptake value (SUV), SUV corrected for partial volume effect, total lesion glycolysis, 14 histogram and four shape-and-size features were extracted as PET imaging features. PET features were correlated with histology and 2-year disease-free survival (DFS). Significant correlations were found between grading, T parameter, N status, pathological stage and different FDG PET features. Histogrambased features "energy" and "kurtosis" resulted to be predictive for DFS. The cut-off value identified for "kurtosis" was able to separate the adenocarcinoma patients with different outcomes. FDG PET features are able to characterize lung cancer lesions, suggesting the possibility of reliable "imaging biopsy", and have a predictive role in adenocarcinoma patients undergoing surgery.

C1 [Kirienko, Margarita; Sollini, Martina; Chiti, Arturo] Humanitas Univ, Dept Biomed Sci, Milan, Italy.

[Gallivanone, Francesca; Castiglioni, Isabella] CNR, IBFM, Milan, Italy.

[Veronesi, Giulia; Voulaz, Emanuele] Humanitas Clin & Res Ctr, Thorac Surg, Milan, Italy.

[Antunovic, Lidjia; Leonardi, Lorenzo; Testanera, Giorgio; Chiti, Arturo] Humanitas Clin & Res Ctr, Nucl Med, Milan, Italy.

RP Kirienko, M (通讯作者)，Humanitas Univ, Dept Biomed Sci, Milan, Italy.

EM margarita.kirienko@icloud.com

RI Veronesi, Giulia/AAA-6327-2021; Castiglioni, Isabella/AAC-4949-2022;

Chiti, Arturo/K-6524-2016; Antunovic, Lidija/AEY-5948-2022; voulaz,

emanuele/K-9667-2016; Kirienko, Margarita/K-6552-2016

OI Veronesi, Giulia/0000-0001-9032-1278; Chiti, Arturo/0000-0002-5806-1856;

Antunovic, Lidija/0000-0003-1832-1083; Leonardi,

Lorenzo/0000-0002-1932-3120; Castiglioni, Isabella/0000-0001-7191-5417;

Sollini, Martina/0000-0003-2214-6492; voulaz,

emanuele/0000-0002-9091-6797; Kirienko, Margarita/0000-0002-3923-1151

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Apostolova I, 2014, BMC CANCER, V14, DOI 10.1186/1471-2407-14-896

Boellaard R, 2015, EUR J NUCL MED MOL I, V42, P328, DOI 10.1007/s00259-014-2961-x

Buvat I, 2015, J NUCL MED, V56, P1642, DOI 10.2967/jnumed.115.163469

Carles M., 2016, IEEE NUCL SCI S MED

Cheng NM, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0150509

Cook GJR, 2015, RADIOLOGY, V276, P883, DOI 10.1148/radiol.2015141309

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

De Leyn P, 2014, TRANSL LUNG CANCER R, V3, P225, DOI 10.3978/j.issn.2218-6751.2014.08.05

Desseroit MC, 2016, EUR J NUCL MED MOL I, V43, P1477, DOI 10.1007/s00259-016-3325-5

ESR, 2015, INSIGHTS IMAGING, V6, P141, DOI 10.1007/s13244-015-0394-0

European Soc Radiology, 2015, INSIGHTS IMAGING, V6, P403, DOI 10.1007/s13244-015-0409-x

Fried DV, 2016, RADIOLOGY, V278, P214, DOI 10.1148/radiol.2015142920

Gallivanone F, 2016, J INSTRUM, V11, DOI 10.1088/1748-0221/11/01/C01022

Gallivanone F, 2013, BIOMED RES INT, V2013, DOI 10.1155/2013/780458

Gester F, 2016, Rev Med Liege, V71, P34

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Gomez-Caro A, 2012, EUR J CARDIO-THORAC, V42, P93, DOI 10.1093/ejcts/ezr272

Grootjans W, 2016, J NUCL MED, V57, P1692, DOI 10.2967/jnumed.116.173112

Guo WT, 2015, J MED IMAGING, V2, DOI 10.1117/1.JMI.2.4.041007

Ha S, 2014, NUCL MED MOLEC IMAG, V48, P278, DOI 10.1007/s13139-014-0283-3

Hatt M, 2015, J NUCL MED, V56, P38, DOI 10.2967/jnumed.114.144055

Hyun SH, 2016, EUR J NUCL MED MOL I, V43, P1461, DOI 10.1007/s00259-016-3316-6

Kang SR, 2014, NUCL MED MOLEC IMAG, V48, P16, DOI 10.1007/s13139-013-0231-7

KESSLER RM, 1984, J COMPUT ASSIST TOMO, V8, P514, DOI 10.1097/00004728-198406000-00028

Kim DH, 2015, CLIN NUCL MED, V40, P708, DOI 10.1097/RLU.0000000000000867

Lee PC, 2007, ANN THORAC SURG, V84, P177, DOI 10.1016/j.athoracsur.2007.03.081

Lopez OV, 2014, MOL IMAGING, V13, DOI 10.2310/7290.2014.00032

Lovinfosse P, 2016, EUR J NUCL MED MOL I, V43, P1453, DOI 10.1007/s00259-016-3314-8

Ma WH, 2014, THERANOSTICS, V4, P736, DOI 10.7150/thno.8725

Ohri N, 2016, J NUCL MED, V57, P842, DOI 10.2967/jnumed.115.166934

Prescott JW, 2013, J DIGIT IMAGING, V26, P97, DOI 10.1007/s10278-012-9465-7

Pyka T, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0407-7

Rahim MK, 2014, NUCL MED MOLEC IMAG, V48, P1, DOI 10.1007/s13139-013-0260-2

Silvestri GA, 2007, CHEST, V132, p178S, DOI 10.1378/chest.07-1360

Silvestri GA, 2013, CHEST, V143, pE211, DOI 10.1378/chest.12-2355

Tixier F, 2016, J NUCL MED, V57, P1033, DOI 10.2967/jnumed.115.166918

Tixier F, 2014, J NUCL MED, V55, P1235, DOI 10.2967/jnumed.113.133389

Toloza EM, 2003, CHEST, V123, p137S, DOI 10.1378/chest.123.1\_suppl.137S

Tripoli V, 2011, SOFTW ENG, V1, P1

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

van Velden FHP, 2011, EUR J NUCL MED MOL I, V38, P1636, DOI 10.1007/s00259-011-1845-6

Wang J, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0143308

Wang JB, 2012, CLIN LUNG CANCER, V13, P81, DOI 10.1016/j.cllc.2011.08.002

Win T, 2013, CLIN CANCER RES, V19, P3591, DOI 10.1158/1078-0432.CCR-12-1307

Yip S, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0115510

Yip SSF, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00072

NR 48

TC 8

Z9 8

U1 1

U2 24

PU FRONTIERS IN BIOSCIENCE INC

PI IRVINE

PA 16471 SCIENTIFIC WAY, IRVINE, CA 92618 USA

SN 1093-9946

EI 1093-4715

J9 FRONT BIOSCI-LANDMRK

JI Front. Biosci.

PD JUN 1

PY 2017

VL 22

BP 1713

EP 1723

PG 11

WC Biochemistry & Molecular Biology; Cell Biology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Biochemistry & Molecular Biology; Cell Biology

GA EQ2RC

UT WOS:000397916900008

PM 28410141

DA 2022-08-24

ER

PT J

AU Huynh, E

Coroller, TP

Narayan, V

Agrawal, V

Hou, Y

Romano, J

Franco, I

Mak, RH

Aerts, HJWL

AF Huynh, Elizabeth

Coroller, Thibaud P.

Narayan, Vivek

Agrawal, Vishesh

Hou, Ying

Romano, John

Franco, Idalid

Mak, Raymond H.

Aerts, Hugo J. W. L.

TI CT-based radiomic analysis of stereotactic body radiation therapy

patients with lung cancer

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Radiomics; Imaging; Stereotactic body radiation therapy; Lung cancer

ID EARLY-STAGE; RADIOTHERAPY; OUTCOMES; SCANS; PERFORMANCE; CARCINOMA;

DIAGNOSIS; FEATURES; MODELS

AB Background: Radiomics uses a large number of quantitative imaging features that describe the tumor phenotype to develop imaging biomarkers for clinical outcomes. Radiomic analysis of pre-treatment computed-tomography (CT) scans was investigated to identify imaging predictors of clinical outcomes in early stage non-small cell lung cancer (NSCLC) patients treated with stereotactic body radiation therapy (SBRT).

Materials and methods: CT images of 113 stage I-II NSCLC patients treated with SBRT were analyzed. Twelve radiomic features were selected based on stability and variance. The association of features with clinical outcomes and their prognostic value (using the concordance index (CI)) was evaluated. Radiomic features were compared with conventional imaging metrics (tumor volume and diameter) and clinical parameters.

Results: Overall survival was associated with two conventional features (volume and diameter) and two radiomic features (LoG 3D run low gray level short run emphasis and stats median). One radiomic feature (Wavelet LLH stats range) was significantly prognostic for distant metastasis (CI = 0.67, q-value < 0.1), while none of the conventional and clinical parameters were. Three conventional and four radiomic features were prognostic for overall survival.

Conclusion: This exploratory analysis demonstrates that radiomic features have potential to be prognostic for some outcomes that conventional imaging metrics cannot predict in SBRT patients. (C) 2016 Elsevier Ireland Ltd. All rights reserved.

C1 [Huynh, Elizabeth; Coroller, Thibaud P.; Narayan, Vivek; Agrawal, Vishesh; Hou, Ying; Romano, John; Franco, Idalid; Mak, Raymond H.; Aerts, Hugo J. W. L.] Harvard Med Sch, Brigham & Womens Hosp, Dept Radiat Oncol, Dana Farber Canc Inst, Boston, MA 02115 USA.

[Aerts, Hugo J. W. L.] Harvard Med Sch, Brigham & Womens Hosp, Dept Radiol, Dana Farber Canc Inst, Boston, MA 02115 USA.

RP Huynh, E (通讯作者)，Harvard Med Sch, Brigham & Womens Hosp, Dept Radiat Oncol, Dana Farber Canc Inst, Boston, MA 02115 USA.

EM ehuynh@lroc.harvard.edu

RI Aerts, Hugo/P-6350-2015; Aerts, Hugo/ABF-2821-2020

OI Aerts, Hugo/0000-0002-2122-2003; Aerts, Hugo/0000-0002-2122-2003; Mak,

Raymond/0000-0002-8754-0565; Coroller, Thibaud/0000-0001-7662-8724

FU National Institute of Health [NIH-USA U24CA194354, NIH-USA U01CA190234];

Kaye Scholar Award; Brigham and Women's Hospital Department of Radiation

Oncology Clinical Translational Grant

FX Authors acknowledge financial support from the National Institute of

Health (NIH-USA U24CA194354, and NIH-USA U01CA190234). This project was

partially funded by the Kaye Scholar Award and the Brigham and Women's

Hospital Department of Radiation Oncology Clinical Translational Grant.

The study sponsors had no role in study design, data collection and

analysis, decision to publish, or preparation of the manuscript.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

[Anonymous], 2015, LANG ENV STAT COMP

Baumann P, 2009, J CLIN ONCOL, V27, P3290, DOI 10.1200/JCO.2008.21.5681

BENJAMINI Y, 1995, J R STAT SOC B, V57, P289, DOI 10.1111/j.2517-6161.1995.tb02031.x

Chen YS, 2008, RADIOTHER ONCOL, V88, P351, DOI 10.1016/j.radonc.2008.07.013

Chi A, 2010, RADIOTHER ONCOL, V94, P1, DOI 10.1016/j.radonc.2009.12.008

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Coroller TP, 2016, RADIOTHER ONCOL

Crino L, 2010, ANN ONCOL, V21, pv103, DOI 10.1093/annonc/mdq207

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

De Ruysscher D, 2013, ACTA ONCOL, V52, P1405, DOI 10.3109/0284186X.2013.813074

Defraene G, 2015, RADIOTHER ONCOL

Fakiris AJ, 2009, INT J RADIAT ONCOL, V75, P677, DOI 10.1016/j.ijrobp.2008.11.042

Gamer M., 2012, IRR VARIOUS COEFFICI

Gentleman RC, 2004, GENOME BIOL, V5, DOI 10.1186/gb-2004-5-10-r80

Grills IS, 2010, J CLIN ONCOL, V28, P928, DOI 10.1200/JCO.2009.25.0928

Haibe-Kains B, 2008, BIOINFORMATICS, V24, P2200, DOI 10.1093/bioinformatics/btn374

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Husson F, 2015, FACTOMINER MULTIVARI

Kim H, 2015, INVEST RADIOL, V50, P571, DOI 10.1097/RLI.0000000000000152

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Kyas I, 2007, INT J RADIAT ONCOL, V67, P768, DOI 10.1016/j.ijrobp.2006.08.066

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Lo A, 2015, P NATL ACAD SCI USA, V112, P13892, DOI 10.1073/pnas.1518285112

Mak RH, 2015, CLIN LUNG CANCER, V16, P24, DOI 10.1016/j.cllc.2014.09.005

Mattonen SA, 2014, MED PHYS, V41, DOI 10.1118/1.4866219

Muren LP, 2013, RADIOTHER ONCOL, V109, P337, DOI 10.1016/j.radonc.2013.11.007

Network NCC, 2015, NCCN GUID NONSM CELL

Onishi H, 2004, CANCER-AM CANCER SOC, V101, P1623, DOI 10.1002/cncr.20539

Palma DA, 2011, INT J RADIAT ONCOL, V81, P974, DOI 10.1016/j.ijrobp.2010.07.025

Pan H, 2011, CANCER-AM CANCER SOC, V117, P4566, DOI 10.1002/cncr.26067

Parmar C, 2015, FRONT ONCOL, V5, DOI 10.3389/fonc.2015.00272

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Pieper S, P 1 IEEE INT S BIOM, P632

Potters L, 2010, INT J RADIAT ONCOL, V76, P326, DOI 10.1016/j.ijrobp.2009.09.042

Raykar V. C., 2008, ADV NEURAL INF PROCE, P1209

Schroder MS, 2011, BIOINFORMATICS, V27, P3206, DOI 10.1093/bioinformatics/btr511

Segal E, 2007, NAT BIOTECHNOL, V25, P675, DOI 10.1038/nbt1306

Solda F, 2013, RADIOTHER ONCOL, V109, P1, DOI 10.1016/j.radonc.2013.09.006

Storey JD, 2003, ANN STAT, V31, P2013, DOI 10.1214/aos/1074290335

Therneau T., 2015, SURVIVAL PACKAGE SUR

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Velazquez ER, 2012, RADIOTHER ONCOL, V105, P167, DOI 10.1016/j.radonc.2012.09.023

Visbal AL, 2005, CHEST, V128, P2933, DOI 10.1378/chest.128.4.2933

Zhao BS, 2009, RADIOLOGY, V252, P263, DOI 10.1148/radiol.2522081593

Zinn PO, 2011, PLOS ONE, V6, DOI 10.1371/journal.pone.0025451

NR 49

TC 115

Z9 127

U1 3

U2 43

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD AUG

PY 2016

VL 120

IS 2

BP 258

EP 266

DI 10.1016/j.radonc.2016.05.024

PG 9

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA DW0EQ

UT WOS:000383314100013

PM 27296412

DA 2022-08-24

ER

PT J

AU Dalwadi, SM

Lewis, GD

Bernicker, EH

Butler, EB

Teh, BS

Farach, AM

AF Dalwadi, Shraddha M.

Lewis, Gary D.

Bernicker, Eric H.

Butler, E. Brian

Teh, Bin S.

Farach, Andrew M.

TI Disparities in the Treatment and Outcome of Stage I Non-Small-Cell Lung

Cancer in the 21st Century

SO CLINICAL LUNG CANCER

LA English

DT Article

DE Access; Race; SBRT; SEER; Surgery

ID RACIAL DISPARITIES; RADIATION-THERAPY; AFRICAN-AMERICANS; UNITED-STATES;

SURVIVAL; SURVEILLANCE; RACE; CARE; EPIDEMIOLOGY; STATISTICS

AB Racial disparities are historically profound and affect outcomes in early stage non small-cell lung cancer. We aimed to explore if recent advances in radiotherapy and surgery have improved epidemiological differences in outcomes related to race. African American patients continued to do worse in a contemporary Surveillance, Epidemiology, and End Results data set, because of increased association with T2 disease, older age, squamous histology, male sex, and suboptimal treatment.

Background: African American (AA) individuals are less likely to receive treatment and more likely to die from cancer compared with Caucasian (C) individuals. Recent advancements in surgery and radiation have improved outcomes in early stage non-small-cell lung cancer (ESNSCLC). We studied racial disparities in ESNSCLC in the past decade. Patients and Methods: The Surveillance, Epidemiology, and End Results database was used to retrieve data of 62,312 ESNSCLC patients age 60 years and older diagnosed between 2004 and 2012. Patients were divided into racial cohorts: C, AA, American Indian (AI), Asian/Pacific Islander (API), or unknown. Demographics characteristics, therapy, and survival were compared using chi(2) test, Kaplan-Meier method, and Cox multivariate analysis. Results: AA and AI individuals were less likely to receive surgery than typical ESNSCLC patients (55.9% and 57.6% vs. 66.7%; P < .0001). Two-year overall survival (OS) for C individuals was 70%, for AA 65%, AI 60%, and API 76% (P < .0001). Two-year cancer-specific survival (CSS) for C individuals was 79%, AA 76%, AI 73%, and API 84% (P < .0001). Median CSS for AI and AA individuals was less than that of typical ESNSCLC patients (49 and 80 months vs. 107 months; P < .0001). This difference disappeared in multivariate analysis, accounted by sex, age, treatment, histology, and T stage (all P < .0001). Conclusion: Despite treatment advancements in the past decade, AA and AI individuals continue to have worse OS and CSS from ESNSCLC. This might be because of the association with more adverse risk factors, including older age, squamous histology, male sex, T2 stage, and tendency to forgo treatment. (C) 2018 Elsevier Inc. All rights reserved.

C1 [Dalwadi, Shraddha M.] Baylor Coll Med, Dept Radiat Oncol, Houston, TX 77030 USA.

[Lewis, Gary D.] Univ Texas Med Branch, Dept Radiat Oncol, Galveston, TX 77555 USA.

[Bernicker, Eric H.] Houston Methodist Hosp, Res Inst, Inst Acad Med, Houston, TX USA.

[Butler, E. Brian; Teh, Bin S.; Farach, Andrew M.] Houston Methodist Hosp, Res Inst, Inst Acad Med, Dept Radiat Oncol, Houston, TX USA.

RP Farach, AM (通讯作者)，Houston Methodist, Dept Radiat Oncol, 6565 Fannin St, Houston, TX 77030 USA.

EM amfarach@houstomethodist.org

OI Farach, Andrew/0000-0002-9982-4557

CR Albain KS, 2009, JNCI-J NATL CANCER I, V101, P984, DOI 10.1093/jnci/djp175

Albano JD, 2007, JNCI-J NATL CANCER I, V99, P1384, DOI 10.1093/jnci/djm127

Antoch G, 2003, RADIOLOGY, V229, P526, DOI 10.1148/radiol.2292021598

Byers T, 1999, CANCER, V86, P715, DOI 10.1002/(SICI)1097-0142(19990815)86:4<715::AID-CNCR22>3.0.CO;2-O

Call KT, 2006, MED CARE, V44, P595, DOI 10.1097/01.mlr.0000215901.37144.94

DeSantis CE, 2016, CA-CANCER J CLIN, V66, P290, DOI 10.3322/caac.21340

Farjah F, 2009, ARCH SURG-CHICAGO, V144, P14, DOI 10.1001/archsurg.2008.519

Fiscella K, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0143789

FREEMAN HP, 1989, CA-CANCER J CLIN, V39, P266, DOI 10.3322/canjclin.39.5.266

George M, 2010, ONCOL NURS FORUM, V37, P740, DOI 10.1188/10.ONF.740-748

Gordon HS, 2006, CANCER-AM CANCER SOC, V107, P1313, DOI 10.1002/cncr.22122

Gordon HS, 2006, J CLIN ONCOL, V24, P904, DOI 10.1200/JCO.2005.03.1955

Gould MK, 2011, J THORAC ONCOL, V6, P875, DOI 10.1097/JTO.0b013e31821671b6

Gritz ER, 2006, CANCER-AM CANCER SOC, V106, P17, DOI 10.1002/cncr.21598

Gross GR, 2008, CANCER-AM CANCER SOC, V112, P900, DOI 10.1002/cncr.23228

Hardy D, 2009, CANCER-AM CANCER SOC, V115, P2199, DOI 10.1002/cncr.24248

Janne PA, 2005, J CLIN ONCOL, V23, P3227, DOI 10.1200/JCO.2005.09.985

Jemal A, 2008, CA-CANCER J CLIN, V58, P71, DOI 10.3322/CA.2007.0010

Margolis ML, 2003, ANN INTERN MED, V139, P558, DOI 10.7326/0003-4819-139-7-200310070-00007

Moyer VA, 2014, ANN INTERN MED, V160, P330, DOI 10.7326/M13-2771

Olsson JK, 2009, THORAX, V64, P749, DOI 10.1136/thx.2008.109330

Owonikoko TK, 2007, J CLIN ONCOL, V25, P5570, DOI 10.1200/JCO.2007.12.5435

POWE BD, 1995, CANCER NURS, V18, P385

Rubin MS, 2014, SOC SCI MED, V100, P54, DOI 10.1016/j.socscimed.2013.10.026

Rutten LF, 2009, J CANCER EDUC, V24, P40, DOI 10.1080/08858190802664610

SAMET J, 1986, JAMA-J AM MED ASSOC, V255, P3385, DOI 10.1001/jama.255.24.3385

Shavers-Hornaday V L, 1997, Ethn Health, V2, P31

Shugarman LR, 2009, MED CARE, V47, P774, DOI 10.1097/MLR.0b013e3181a393fe

Simone CB, 2015, TRANSL LUNG CANCER R, V4, P545, DOI 10.3978/j.issn.2218-6751.2015.10.05

Smith TJ, 1995, LUNG CANCER-J IASLC, V13, P235, DOI 10.1016/0169-5002(95)00496-3

Stewart B., 2015, WORLD CANC REPORT 20

Tanner NT, 2015, AM J RESP CRIT CARE, V192, P200, DOI 10.1164/rccm.201502-0259OC

Timmerman RD, 2014, INT J RADIAT ONCOL, V90, pS30, DOI 10.1016/j.ijrobp.2014.05.135

Vincent G., 2010, NEXT 4 DECADES OLDER

Walker GV, 2013, INT J RADIAT ONCOL, V86, P686, DOI 10.1016/j.ijrobp.2013.03.016

Ward E, 2004, CA-CANCER J CLIN, V54, P78, DOI 10.3322/canjclin.54.2.78

White A, 2010, CANCER-AM CANCER SOC, V116, P4622, DOI 10.1002/cncr.25395

Yuankai S, 2014, J THORAC ONCOL, V9, P154

Zeng CJ, 2015, JAMA ONCOL, V1, P88, DOI 10.1001/jamaoncol.2014.161

2011, J NATL MED ASS, V103, P711

2008, NICOTINE TOB RES, V10, P1559, DOI DOI 10.1080/14622200802325873

2008, ANN THORAC SURG, V86, P2008, DOI DOI 10.1016/J.ATHORACSUR.2008.07.009

NR 42

TC 15

Z9 15

U1 0

U2 2

PU CIG MEDIA GROUP, LP

PI DALLAS

PA 3500 MAPLE AVENUE, STE 750, DALLAS, TX 75219-3931 USA

SN 1525-7304

EI 1938-0690

J9 CLIN LUNG CANCER

JI Clin. Lung Cancer

PD MAY

PY 2019

VL 20

IS 3

BP 194

EP 200

DI 10.1016/j.cllc.2018.11.004

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED); Social Science Citation Index (SSCI)

SC Oncology

GA HY2VM

UT WOS:000467981200035

PM 30655194

DA 2022-08-24

ER

PT J

AU Brada, M

Ball, C

Mitchell, S

Forbes, H

Ashley, S

AF Brada, Michael

Ball, Christine

Mitchell, Susan

Forbes, Helen

Ashley, Susan

TI Improving outcomes in non-small cell lung cancer; population analysis of

radical radiotherapy

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Non-small cell lung cancer; Big data; Radical radiotherapy; Radiotherapy

utilisation; Dose fractionation

ID METAANALYSIS; SURGERY

AB Aim: Regional utilisation of radical radiotherapy (RT) in non-small cell lung cancer (NSCLC) was used to define optimal utilisation to improve outcome and as a surrogate for evidence of RT efficacy.

Patients & methods: 65,412 NSCLC cases diagnosed in England 2012-13 were linked to comprehensive national radiotherapy dataset, hospital admissions and the Office of National Statistics. Geographical variation in utilisation was determined using a multivariate binary logistic regression analysis after adjusting for age, stage, deprivation, comorbidity and other radical treatment and the effect of radical RT utilisation on survival was investigated. Survival was adjusted for dependent and independent variables and the effect of differing levels of utilisation was assessed by the log likelihood test.

Results: 17.6% cases potentially eligible for radical RT (stages 0-III) received radiotherapy with radical intent. Utilisation of radical RT had an impact on survival (p < 0.00001). Adjusting for all prognostic and treatment variables counties with lowest utilisation (<= 15%) had the worst survival (HR = 1.13). The highest utilisation quintile counties (>= 25%) had worse survival compared to counties with lower utilisation (approximate to 20%) (p < 0.0001). Analysis of stages II&III showed the same pattern; increase in utilisation from 20% to >= 25% resulting in a 3% drop in 2-year population survival (p = 0.001).

Conclusion: The utilisation of radical RT has a significant impact on NSCLC population survival. Improvement in survival of NSCLC population can be achieved by offering radical RT to a larger proportion of patients while avoiding excessive use. Geographical variation in RT utilisation provides indirect evidence of survival benefit of radical radiotherapy. (C) 2018 Elsevier B.V. All rights reserved.

C1 [Brada, Michael; Forbes, Helen; Ashley, Susan] Clatterbridge Canc Ctr NHS Fdn Trust, Dept Radiat Oncol, Bebington, England.

[Ball, Christine; Mitchell, Susan; Forbes, Helen] Clatterbridge Canc Ctr NHS Fdn Trust, Natl Clin Anal & Specialised Applicat Team NATCAN, Bebington, England.

[Brada, Michael] Univ Liverpool, Inst Translat Med, Dept Mol & Clin Canc Med, Liverpool, Merseyside, England.

RP Brada, M (通讯作者)，Clatterbridge Canc Ctr NHS Fdn Trust, Wirral CH63 4JY, Merseyside, England.

EM michael.brada@liverpool.ac.uk

FU Clatterbridge Cancer Centre; Clatterbridge Charitable Fund [743]

FX This work was supported by Clatterbridge Cancer Centre who funded

NATCANSAT and Clatterbridge Charitable Fund 743.

CR ALBERTI W, 1995, BRIT MED J, V311, P899

Auperin A, 2006, ANN ONCOL, V17, P473, DOI 10.1093/annonc/mdj117

Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

CHARLSON ME, 1987, J CHRON DIS, V40, P373, DOI 10.1016/0021-9681(87)90171-8

Gildea GMS, DERIVATION CHARLSON

Government DoCaL, 2015, ENGL IND DEPR 2015

Henson KE, 2018, BR J CANC

Maringe C, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0172814

Moller H, 2018, THORAX, V73, P530, DOI 10.1136/thoraxjnl-2017-210710

Murage P, 2016, HEALTH PLACE, V42, P11, DOI 10.1016/j.healthplace.2016.08.014

Riaz SP, 2012, EUR J CANCER, V48, P54, DOI 10.1016/j.ejca.2011.07.012

Rowell NP, 2001, THORAX, V56, P628, DOI 10.1136/thorax.56.8.628

Solda F, 2013, RADIOTHER ONCOL, V109, P1, DOI 10.1016/j.radonc.2013.09.006

Zhang BL, 2014, RADIOTHER ONCOL, V112, P250, DOI 10.1016/j.radonc.2014.08.031

NR 14

TC 6

Z9 7

U1 0

U2 5

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD MAR

PY 2019

VL 132

BP 204

EP 210

DI 10.1016/j.radonc.2018.10.015

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA HN3VF

UT WOS:000460111700029

PM 30392781

DA 2022-08-24

ER

PT J

AU Ratto, GB

Cafferata, MA

Scolaro, G

Bruzzi, P

Alloisio, A

Costa, R

Spessa, E

Semino, C

Melioli, G

AF Ratto, GB

Cafferata, MA

Scolaro, G

Bruzzi, P

Alloisio, A

Costa, R

Spessa, E

Semino, C

Melioli, G

TI Phase II study of combined immunotherapy, chemotherapy, and radiotherapy

in the postoperative treatment of advanced non-small-cell lung cancer

SO JOURNAL OF IMMUNOTHERAPY

LA English

DT Article

DE non-small-cell lung cancer; chemotherapy; radiotherapy; adoptive

immunotherapy; tumor-infiltrating lymphocytes

ID TUMOR-INFILTRATING LYMPHOCYTES; RECOMBINANT INTERLEUKIN-2; ADOPTIVE

IMMUNOTHERAPY; COMBINATION; CISPLATIN; CARCINOMA; MELANOMA; INFUSION

AB The association of adoptive immunotherapy (AI) and radiotherapy has been shown to be effective in the control of residual intrathoracic disease, while having no systemic advantages, in patients operated on for locally advanced non-small-cell lung cancer (NSCLC). The potential synergy of coupling immunotherapy and chemotherapy has been emphasized in several tumors including NSCLC, The aim of this work was to determine the feasibility and activity of a combined therapeutic program, including Al, chemotherapy, and radiotherapy in patients who had undergone incomplete resections for NSCLC, In a phase II trial, 13 patients received the combined treatment. Al was given from week 4 after surgery until week 8. Concurrent chemo(cisplatin and etoposide)-radiotherapy (60 Gy) was given from week 9 to week 14. Twenty eligible patients received chemoradiotherapy only and were used as a nonrandomized concomitant group for merely descriptive purposes. At 9-month followup, 10 of the 13 patients had progression of disease and the study was stopped. Progression-free survival and survival were similar to those of the chemoradiotherapy group. The present study showed that the sequence of immunotherapy followed by chemotherapy is not effective as adjuvant treatment in patients operated on for stage In. NSCLC, at least when used according to the adopted schedule.

C1 Univ Genoa, Cattedra Chirurg Torac, I-16132 Genoa, Italy.

Ist Nazl Ric Canc, Unita Immunoterapia Cellulare, I-16132 Genoa, Italy.

Ist Nazl Ric Canc, Unita Oncol Med 1, I-16132 Genoa, Italy.

Ist Nazl Ric Canc, Unita Radioterapia, I-16132 Genoa, Italy.

Ist Nazl Ric Canc, Unita Epidemiol Clin, I-16132 Genoa, Italy.

RP Ratto, GB (通讯作者)，Univ Genoa, Cattedra Chirurg Torac, Largo Rosanna Benzi 10, I-16132 Genoa, Italy.

RI Bruzzi, Paolo/AAU-3363-2021

OI Bruzzi, Paolo/0000-0002-7874-2077

CR AOKI Y, 1991, CANCER RES, V51, P1934

FRIESS GG, 1987, CANCER TREAT REP, V71, P681

GAMBACORTIPASSERINI C, 1988, CANCER RES, V48, P2372

Karp DD, 1996, CANCER, V78, P195, DOI 10.1002/(SICI)1097-0142(19960715)78:2<195::AID-CNCR1>3.0.CO;2-L

KRADIN RL, 1989, LANCET, V1, P577

LEGHA SS, 1993, SEMIN ONCOL, V20, P27

MELIOLI G, 1994, EUR J CANCER, V30A, P97, DOI 10.1016/S0959-8049(05)80027-9

Melioli G, 1996, J IMMUNOTHER, V19, P224, DOI 10.1097/00002371-199605000-00007

META M, 1995, CANCER IMMUNOL IMMUN, V40, P235

PACIUCCI PA, 1989, CANCER TREAT REV, V16, P67, DOI 10.1016/0305-7372(89)90026-1

Ratto GB, 1996, CANCER, V78, P244, DOI 10.1002/(SICI)1097-0142(19960715)78:2<244::AID-CNCR9>3.0.CO;2-L

RATTO GB, 1995, CHIRURGIA, V8, P140

RATTO GB, 1995, J THORAC CARDIOVASC, V105, P1212

ROSENBERG SA, 1988, NEW ENGL J MED, V319, P1676, DOI 10.1056/NEJM198812223192527

SZNOL M, 1993, SEMIN ONCOL, V20, P80

TRILLETLENOIR V, 1993, EUR J CANCER, V29A, P1917, DOI 10.1016/0959-8049(93)90561-S

NR 16

TC 14

Z9 15

U1 0

U2 6

PU LIPPINCOTT WILLIAMS & WILKINS

PI PHILADELPHIA

PA 530 WALNUT ST, PHILADELPHIA, PA 19106-3621 USA

SN 1053-8550

J9 J IMMUNOTHER

JI J. Immunother.

PD JAN

PY 2000

VL 23

IS 1

BP 161

EP 167

DI 10.1097/00002371-200001000-00019

PG 7

WC Oncology; Immunology; Medicine, Research & Experimental

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Immunology; Research & Experimental Medicine

GA 280WV

UT WOS:000085127500018

PM 10687149

DA 2022-08-24

ER

PT J

AU Fan, LY

Cao, Q

Ding, XP

Gao, DN

Yang, QW

Li, BH

AF Fan, Liyuan

Cao, Qiang

Ding, Xiuping

Gao, Dongni

Yang, Qiwei

Li, Baosheng

TI Radiotranscriptomics signature-based predictive nomograms for

radiotherapy response in patients with nonsmall cell lung cancer:

Combination and association of CT features and serum miRNAs levels

SO CANCER MEDICINE

LA English

DT Article

DE CT texture features; miRNAs; nomogram; nonsmall cell lung cancer;

radiotherapy response

ID RADIOMICS; RADIOGENOMICS; BIOMARKERS; ROLES

AB Purpose We aimed to establish radiotranscriptomics signatures based on serum miRNA levels and computed tomography (CT) texture features and develop nomogram models for predicting radiotherapy response in patients with nonsmall cell lung cancer (NSCLC).

Methods We first used established radioresistant NSCLC cell lines for miRNA selection. At the same time, patients (103 for training set and 71 for validation set) with NSCLC were enrolled. Their pretreatment contrast-enhanced CT texture features were extracted and their serum miRNA levels were obtained. Then, radiotranscriptomics feature selection was implemented with the least absolute shrinkage and selection operator (LASSO), and signatures were generated by logistic or Cox regression for objective response rate (ORR), overall survival (OS), and progression-free survival (PFS). Afterward, radiotranscriptomics signature-based nomograms were constructed and assessed for clinical use.

Results Four miRNAs and 22 reproducible contrast-enhanced CT features were used for radiotranscriptomics feature selection and we generated ORR-, OS-, and PFS- related radiotranscriptomics signatures. In patients with NSCLC who received radiotherapy, the radiotranscriptomics signatures were independently associated with ORR, OS, and PFS in both the training (OR: 2.94, P < .001; HR: 2.90, P < .001; HR: 3.58, P = .001) and validation set (OR: 2.94, P = .026; HR: 2.14, P = .004; HR: 2.64, P = .016). We also obtained a satisfactory nomogram for ORR. The C-index values for the ORR nomogram were 0.86 [95% confidence interval (CI), 0.75 to 0.92] in the training set and 0.81 (95% CI, 0.69 to 0.89) in the validation set. The calibration-in-the-large and calibration slope performed well. Decision curve analysis indicated a satisfactory net benefit.

Conclusions The radiotranscriptomics signature could be an independent biomarker for evaluating radiotherapeutic responses in patients with NSCLC. The radiotranscriptomics signature-based nomogram could be used to predict patients' ORR, which would represent progress in individualized medicine.

C1 [Fan, Liyuan; Gao, Dongni; Yang, Qiwei] Shandong Univ, Cheeloo Coll Med, 44 Wenhuaxi Rd, Jinan 250112, Shandong, Peoples R China.

[Fan, Liyuan; Ding, Xiuping; Li, Baosheng] Shandong First Med Univ & Shandong Acad Med Sci, Shandong Canc Hosp & Inst, Dept Radiat Oncol, 440 Jiyan Rd, Jinan 250117, Shandong, Peoples R China.

[Cao, Qiang] Southeast Univ, Sch Comp Sci & Engn, Nanjing, Jiangsu, Peoples R China.

RP Li, BH (通讯作者)，Shandong Univ, Cheeloo Coll Med, 44 Wenhuaxi Rd, Jinan 250112, Shandong, Peoples R China.; Li, BH (通讯作者)，Shandong First Med Univ & Shandong Acad Med Sci, Shandong Canc Hosp & Inst, Dept Radiat Oncol, 440 Jiyan Rd, Jinan 250117, Shandong, Peoples R China.

EM baoshli1963@163.com

OI Li, Baosheng/0000-0001-9952-8312

FU Taishan Scholar Construction Project [ts20120505]; National Key Research

and Develop Program of China [2016YFC0105106]; Key Research and

Development Program of Shandong Province of China [2016GSF201123,

2017CXZC1206]; National Natural Science Foundation of China [81530060,

81874224]; Academic promotion program of Shandong First Medical

University [2019LJ004]

FX Taishan Scholar Construction Project, Grant/Award Number: ts20120505;

National Key Research and Develop Program of China, Grant/Award Number:

2016YFC0105106; Key Research and Development Program of Shandong

Province of China, Grant/Award Number: 2016GSF201123 and 2017CXZC1206;

National Natural Science Foundation of China, Grant/Award Number:

81530060 and 81874224; Academic promotion program of Shandong First

Medical University, Grant/Award Number: 2019LJ004

CR Alipoor SD, 2016, EUR J PHARMACOL, V791, P395, DOI 10.1016/j.ejphar.2016.09.015

Backes C, 2016, MOL DIAGN THER, V20, P509, DOI 10.1007/s40291-016-0221-4

Balachandran VP, 2015, LANCET ONCOL, V16, pE173, DOI 10.1016/S1470-2045(14)71116-7

Bashir U, 2016, AM J ROENTGENOL, V207, P534, DOI 10.2214/AJR.15.15864

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Christophe N, 2018, CANCER RES, V78, P4786

Cozzi L, 2017, BMC CANCER, V17, DOI 10.1186/s12885-017-3847-7

Das AK, 2010, SEMIN RADIAT ONCOL, V20, P149, DOI 10.1016/j.semradonc.2010.01.002

Ding JL, 2018, EUR J RADIOL, V103, P51, DOI 10.1016/j.ejrad.2018.04.013

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

El Naqa I, 2017, PHYS MED BIOL, V62, pR179, DOI 10.1088/1361-6560/aa7c55

Guerrisi A, 2020, CANCER MED-US, V9, P1603, DOI 10.1002/cam4.2709

Huang YQ, 2016, J CLIN ONCOL, V34, P2157, DOI 10.1200/JCO.2015.65.9128

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Hummel R, 2010, EUR J CANCER, V46, P298, DOI 10.1016/j.ejca.2009.10.027

Katrib Amal, 2016, Quant Biol, V4, P1, DOI 10.1007/s40484-016-0061-6

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lockhart DJ, 2000, NATURE, V405, P827, DOI 10.1038/35015701

Nie K, 2016, CLIN CANCER RES, V22, P5256, DOI 10.1158/1078-0432.CCR-15-2997

Peeken JC, 2017, STRAHLENTHER ONKOL, V193, P767, DOI 10.1007/s00066-017-1175-0

SHROUT PE, 1979, PSYCHOL BULL, V86, P420, DOI 10.1037/0033-2909.86.2.420

Siegel RL., 2020, CA-CANCER J CLIN, V70, P7, DOI [DOI 10.3322/caac.21551, 10.3322/caac.21590]

Sun YL, 2018, INT J RADIAT ONCOL, V100, P107, DOI 10.1016/j.ijrobp.2017.08.039

Thawani R, 2018, LUNG CANCER, V115, P34, DOI 10.1016/j.lungcan.2017.10.015

Wang XH, 2020, BRIT J CANCER, V122, P978, DOI 10.1038/s41416-019-0706-0

Yao Q, 2019, CURR OPIN CHEM BIOL, V51, P11, DOI 10.1016/j.cbpa.2019.01.024

Zhou M, 2018, RADIOLOGY, V286, P307, DOI 10.1148/radiol.2017161845

NR 27

TC 5

Z9 5

U1 2

U2 6

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 2045-7634

J9 CANCER MED-US

JI Cancer Med.

PD JUL

PY 2020

VL 9

IS 14

BP 5065

EP 5074

DI 10.1002/cam4.3115

EA MAY 2020

PG 10

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA ML5DU

UT WOS:000535488600001

PM 32458566

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Ramella, S

Fiore, M

Greco, C

Cordelli, E

Sicilia, R

Merone, M

Molfese, E

Miele, M

Cornacchione, P

Ippolito, E

Lannello, G

D'Angelillo, RM

Soda, P

AF Ramella, Sara

Fiore, Michele

Greco, Carlo

Cordelli, Ermanno

Sicilia, Rosa

Merone, Mario

Molfese, Elisabetta

Miele, Marianna

Cornacchione, Patrizia

Ippolito, Edy

Lannello, Giulio

D'Angelillo, Rolando Maria

Soda, Paolo

TI A radiomic approach for adaptive radiotherapy in non-small cell lung

cancer patients

SO PLOS ONE

LA English

DT Article

ID TUMOR VOLUME CHANGES; MEGAVOLTAGE CT; FEATURES

AB The primary goal of precision medicine is to minimize side effects and optimize efficacy of treatments. Recent advances in medical imaging technology allow the use of more advanced image analysis methods beyond simple measurements of tumor size or radio tracer uptake metrics. The extraction of quantitative features from medical images to characterize tumor pathology or heterogeneity is an interesting process to investigate, in order to provide information that may be useful to guide the therapies and predict survival. This paper discusses the rationale supporting the concept of radiomics and the feasibility of its application to Non-Small Cell Lung Cancer in the field of radiation oncology research. We studied 91 stage III patients treated with concurrent chemoradiation and adaptive approach in case of tumor reduction during treatment. We considered 12 statistics features and 230 textural features extracted from the CT images. In our study, we used an ensemble learning method to classify patients' data into either the adaptive or non-adaptive group during chemoradiation on the basis of the starting CT simulation. Our data supports the hypothesis that a specific signature can be identified (AUC 0.82). In our experience, a radiomic signature mixing semantic and image-based features has shown promising results for personalized adaptive radiotherapy in non-small cell lung cancer.

C1 [Ramella, Sara; Fiore, Michele; Greco, Carlo; Molfese, Elisabetta; Miele, Marianna; Cornacchione, Patrizia; Ippolito, Edy; D'Angelillo, Rolando Maria] Campus Biomed Univ, Radiotherapy Unit, Rome, Italy.

[Cordelli, Ermanno; Sicilia, Rosa; Merone, Mario; Lannello, Giulio; Soda, Paolo] Campus Biomed Univ, Integrated Res Ctr, Comp Sci & Bioinformat Lab, Rome, Italy.

RP Greco, C (通讯作者)，Campus Biomed Univ, Radiotherapy Unit, Rome, Italy.

EM c.greco@unicampus.it

RI RAMELLA, SARA/AAC-6523-2022; Michele, Fiore/AAC-6070-2022; Cornacchione,

Patrizia/AAA-3420-2022; Merone, Mario/AAA-8945-2019; Sicilia,

Rosa/AAC-6012-2022; Soda, Paolo/K-8126-2016

OI RAMELLA, SARA/0000-0002-5782-7717; Cornacchione,

Patrizia/0000-0002-5573-6352; Merone, Mario/0000-0002-9406-2397;

Sicilia, Rosa/0000-0002-2513-0827; ippolito, edy/0000-0003-1775-2009;

Soda, Paolo/0000-0003-2621-072X; Fiore, Michele/0000-0003-1889-4578;

Iannello, Giulio/0000-0003-3864-5800

CR Aerts HJWL, 2016, JAMA ONCOL, V2, P1636, DOI 10.1001/jamaoncol.2016.2631

Alan Agresti, 2003, CATEGORICAL DATA ANA, V482

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Burrell RA, 2013, NATURE, V501, P338, DOI 10.1038/nature12625

Cho Paik Myunghee, 2013, STAT METHODS RATES P

Collins FS, 2015, NEW ENGL J MED, V372, P793, DOI 10.1056/NEJMp1500523

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Fox J, 2009, INT J RADIAT ONCOL, V74, P341, DOI 10.1016/j.ijrobp.2008.07.063

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

HANLEY JA, 1982, RADIOLOGY, V29, P143, DOI DOI 10.1148/RADI0L0GY.143.1.7063747

Hua JP, 2005, BIOINFORMATICS, V21, P1509, DOI 10.1093/bioinformatics/bti171

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Knap MM, 2010, ACTA ONCOL, V49, P1077, DOI 10.3109/0284186X.2010.498434

Kohavi R., 1995, IJCAI, V14, P2

Kupelian PA, 2005, INT J RADIAT ONCOL, V63, P1024, DOI 10.1016/j.ijrobp.2005.04.046

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Li Q, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0892-y

Lim G, 2011, J THORAC ONCOL, V6, P531, DOI 10.1097/JTO.0b013e31820b8a52

Mackinnon A, 2000, COMPUT BIOL MED, V30, P127, DOI 10.1016/S0010-4825(00)00006-8

Manrai AK, 2014, JAMA INTERN MED, V174, P991, DOI 10.1001/jamainternmed.2014.1059

Ramella S, 2017, J THORAC ONCOL, V12, P1122, DOI 10.1016/j.jtho.2017.03.025

Saad M, 2017, COMPUT BIOL MED, V91, P222, DOI 10.1016/j.compbiomed.2017.10.029

Saeys Y, 2007, BIOINFORMATICS, V23, P2507, DOI 10.1093/bioinformatics/btm344

Siker ML, 2006, INT J RADIAT ONCOL, V66, P135, DOI 10.1016/j.ijrobp.2006.03.064

Stork D. G, 2012, PATTERN CLASSIFICATI

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

Velazquez ER, 2017, CANCER RES, V77, P3922, DOI 10.1158/0008-5472.CAN-17-0122

Wang H, 2015, CLIN LUNG CANCER, V16, pE141, DOI 10.1016/j.cllc.2015.05.007

Woodford C, 2007, INT J RADIAT ONCOL, V69, P1316, DOI 10.1016/j.ijrobp.2007.07.2369

Zhao GY, 2007, IEEE T PATTERN ANAL, V29, P915, DOI 10.1109/TPAMI.2007.1110

NR 31

TC 24

Z9 24

U1 1

U2 4

PU PUBLIC LIBRARY SCIENCE

PI SAN FRANCISCO

PA 1160 BATTERY STREET, STE 100, SAN FRANCISCO, CA 94111 USA

SN 1932-6203

J9 PLOS ONE

JI PLoS One

PD NOV 21

PY 2018

VL 13

IS 11

AR e0207455

DI 10.1371/journal.pone.0207455

PG 14

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA HB4VL

UT WOS:000451054800059

PM 30462705

OA Green Published, Green Submitted, gold

DA 2022-08-24

ER

PT J

AU Primakov, SP

Ibrahim, A

van Timmeren, JE

Wu, GY

Keek, SA

Beuque, M

Granzier, RWY

Lavrova, E

Scrivener, M

Sanduleanu, S

Kayan, E

Halilaj, I

Lenaers, A

Wu, JL

Monshouwer, R

Geets, X

Gietema, HA

Hendriks, LEL

Morin, O

Jochems, A

Woodruff, HC

Lambin, P

AF Primakov, Sergey P.

Ibrahim, Abdalla

van Timmeren, Janita E.

Wu, Guangyao

Keek, Simon A.

Beuque, Manon

Granzier, Renee W. Y.

Lavrova, Elizaveta

Scrivener, Madeleine

Sanduleanu, Sebastian

Kayan, Esma

Halilaj, Iva

Lenaers, Anouk

Wu, Jianlin

Monshouwer, Rene

Geets, Xavier

Gietema, Hester A.

Hendriks, Lizza E. L.

Morin, Olivier

Jochems, Arthur

Woodruff, Henry C.

Lambin, Philippe

TI Automated detection and segmentation of non-small cell lung cancer

computed tomography images

SO NATURE COMMUNICATIONS

LA English

DT Article

ID RADIOMICS; VARIABILITY; INTEROBSERVER; RADIOTHERAPY; INFORMATION; TUMOR

AB Correct interpretation of computer tomography (CT) scans is important for the correct assessment of a patient's disease but can be subjective and timely. Here, the authors develop a system that can automatically segment the non-small cell lung cancer on CT images of patients and show in an in silico trial that the method was faster and more reproducible than clinicians.

Detection and segmentation of abnormalities on medical images is highly important for patient management including diagnosis, radiotherapy, response evaluation, as well as for quantitative image research. We present a fully automated pipeline for the detection and volumetric segmentation of non-small cell lung cancer (NSCLC) developed and validated on 1328 thoracic CT scans from 8 institutions. Along with quantitative performance detailed by image slice thickness, tumor size, image interpretation difficulty, and tumor location, we report an in-silico prospective clinical trial, where we show that the proposed method is faster and more reproducible compared to the experts. Moreover, we demonstrate that on average, radiologists & radiation oncologists preferred automatic segmentations in 56% of the cases. Additionally, we evaluate the prognostic power of the automatic contours by applying RECIST criteria and measuring the tumor volumes. Segmentations by our method stratified patients into low and high survival groups with higher significance compared to those methods based on manual contours.

C1 [Primakov, Sergey P.; Ibrahim, Abdalla; van Timmeren, Janita E.; Wu, Guangyao; Keek, Simon A.; Beuque, Manon; Lavrova, Elizaveta; Sanduleanu, Sebastian; Kayan, Esma; Halilaj, Iva; Lenaers, Anouk; Jochems, Arthur; Woodruff, Henry C.; Lambin, Philippe] Maastricht Univ, GROW Sch Oncol & Reprod, Dept Precis Med, D Lab, Maastricht, Netherlands.

[Ibrahim, Abdalla; Gietema, Hester A.; Woodruff, Henry C.; Lambin, Philippe] Maastricht Univ, GROW Sch Oncol & Reprod, Dept Radiol & Nucl Med, Med Ctr, Maastricht, Netherlands.

[Ibrahim, Abdalla] Univ Liege, Dept Med Phys, Div Nucl Med & Oncol Imaging, Hosp Ctr, Liege, Belgium.

[Ibrahim, Abdalla] Univ Hosp RWTH Aachen Univ, Dept Nucl Med, Aachen, Germany.

[Ibrahim, Abdalla] Univ Hosp RWTH Aachen Univ, Comprehens Diagnost Ctr Aachen CDCA, Aachen, Germany.

[Ibrahim, Abdalla] Columbia Univ, Dept Radiol, Irving Med Ctr, New York, NY USA.

[van Timmeren, Janita E.] Univ Hosp Zurich, Dept Radiat Oncol, Zurich, Switzerland.

[van Timmeren, Janita E.] Univ Zurich, Zurich, Switzerland.

[Wu, Guangyao] Huazhong Univ Sci & Technol, Union Hosp, Tongji Med Coll, Dept Radiol, Wuhan, Peoples R China.

[Granzier, Renee W. Y.; Lenaers, Anouk] Maastricht Univ, GROW Sch Oncol & Reprod, Dept Surg, Med Ctr, Maastricht, Netherlands.

[Lavrova, Elizaveta] Univ Liege, GIGA Cyclotron Res Ctr In Vivo Imaging, Liege, Belgium.

[Scrivener, Madeleine; Geets, Xavier] Clin Univ St Luc, Dept Radiat Oncol, Brussels, Belgium.

[Wu, Jianlin] Dalian Univ, Dept Radiol, Affiliated Zhongshan Hosp, Dalian, Peoples R China.

[Monshouwer, Rene] Radboud Univ Nijmegen, Dept Radiat Oncol, Med Ctr, Nijmegen, Netherlands.

[Hendriks, Lizza E. L.] Maastricht Univ, GROW Sch Oncol & Reprod, Dept Pulm Dis, Med Ctr, Maastricht, Netherlands.

[Morin, Olivier] Univ Calif San Francisco, Dept Radiat Oncol, San Francisco, CA USA.

RP Lambin, P (通讯作者)，Maastricht Univ, GROW Sch Oncol & Reprod, Dept Precis Med, D Lab, Maastricht, Netherlands.; Lambin, P (通讯作者)，Maastricht Univ, GROW Sch Oncol & Reprod, Dept Radiol & Nucl Med, Med Ctr, Maastricht, Netherlands.

EM philippe.lambin@maastrichtuniversity.nl

RI van Timmeren, Janita/AAL-4456-2020; Monshouwer, R./L-4527-2015

OI van Timmeren, Janita/0000-0002-8166-6853; Ibrahim,

Abdalla/0000-0003-4138-5755; Beuque, Manon/0000-0001-6804-5908; Lavrova,

Elizaveta/0000-0003-2751-790X; Granzier, Renee/0000-0003-1398-7249

FU Marie Skodowska-Curie grant (PREDICT - ITN) [766276]; ERC advanced grant

[694812, 813200, 957565, 673780]; EUROSTARS (DART, DECIDE)

[COMPACT-12053]; European Union [733008, 899549, 952172, 952103];

TRANSCAN [UM 2017-8295]; Interreg V-A Euregio Meuse-Rhine (EURADIOMICS)

[EMR4]

FX S.P.P., M.B., and I.H. acknowledge the financial support of the Marie

Skodowska-Curie grant (PREDICT - ITN - No. 766276). A.I. acknowledges

the financial support from the Liege-Maastricht imaging valley grant.

P.L. and H.C.W. acknowledge financial support from ERC advanced grant

(ERC-ADG-2015 n degrees 694812 - Hypoximmuno), ERC-2018-PoC:

813200-CL-IO, ERC-2020-PoC: 957565-AUTO.DISTINCT, SME Phase 2 (RAIL n

degrees 673780), EUROSTARS (DART, DECIDE, COMPACT-12053), the European

Union's Horizon 2020 research and innovation program under grant

agreement: ImmunoSABR n degrees 733008, FETOPEN- SCANnTREAT n degrees

899549, CHAIMELEON n degrees 952172, EuCanImage n degrees 952103,

TRANSCAN Joint Transnational Call 2016 (JTC2016 CLEARLY n degrees UM

2017-8295), and Interreg V-A Euregio Meuse-Rhine (EURADIOMICS n degrees

EMR4).

CR Aerts H, 2015, DATA NSCLC RADIOMICS

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ardila D, 2019, NAT MED, V25, P954, DOI 10.1038/s41591-019-0447-x

Bakr S, 2018, SCI DATA, V5, DOI 10.1038/sdata.2018.202

Barrett A., 2009, PRACTICAL RADIOTHERA, V4th

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Cicek Ozgun, 2016, Medical Image Computing and Computer-Assisted Intervention - MICCAI 2016. 19th International Conference. Proceedings: LNCS 9901, P424, DOI 10.1007/978-3-319-46723-8\_49

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Clevert D.A., 2015, P 4 INT C LEARN REPR, DOI DOI 10.48550/ARXIV.1511.07289

Cohen JF, 2016, BMJ OPEN, V6, DOI 10.1136/bmjopen-2016-012799

DILLENCOURT MB, 1992, J ACM, V39, P253, DOI 10.1145/128749.128750

Erasmus JJ, 2003, J CLIN ONCOL, V21, P2574, DOI 10.1200/JCO.2003.01.144

Habibzadeh F., 2017, J PUBLIC HLTH EMERG, V1, P90, DOI [10.21037/jphe.2017.12.02, DOI 10.21037/JPHE.2017.12.02]

Hashimoto F, 2019, RADIOL PHYS TECHNOL, V12, P210, DOI 10.1007/s12194-019-00512-y

Ibrahim A, 2019, SEMIN NUCL MED, V49, P438, DOI 10.1053/j.semnuclmed.2019.06.005

Jaffray DA, 2012, NAT REV CLIN ONCOL, V9, P688, DOI 10.1038/nrclinonc.2012.194

Jiang J, 2019, IEEE T MED IMAGING, V38, P134, DOI 10.1109/TMI.2018.2857800

Kalmet PHS, 2020, ACTA ORTHOP, V91, P215, DOI 10.1080/17453674.2019.1711323

Kamal Uday, 2020, Thoracic Image Analysis. Second International Workshop, TIA 2020. Held in Conjunction with MICCAI 2020. Proceedings. Lecture Notes in Computer Science (LNCS 12502), P36, DOI 10.1007/978-3-030-62469-9\_4

Kingma D, 2014, ARXIV

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Livne M, 2019, FRONT NEUROSCI-SWITZ, V13, DOI 10.3389/fnins.2019.00097

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Nikolov Stanislav, 2021, J Med Internet Res, V23, pe26151, DOI 10.2196/26151

Norman B, 2018, RADIOLOGY, V288, P177, DOI 10.1148/radiol.2018172322

Postmus PE, 2017, ANN ONCOL, V28, P1, DOI 10.1093/annonc/mdx222

Primakov S., PREPRINT ARXIV EESSI

Ray A., 2016, CS 231N

Revel MP, 2004, RADIOLOGY, V231, P453, DOI 10.1148/radiol.2312030167

Ronneberger O., 2015, P MED IM COMP ASS IN, DOI [10.1007/978-3-319-24574-4\_28, DOI 10.1007/978-3-319-24574-4\_28]

Srivastava N, 2014, J MACH LEARN RES, V15, P1929

Stroom JC, 2002, RADIOTHER ONCOL, V64, P75, DOI 10.1016/S0167-8140(02)00140-8

Szegedy C., 2015, PROC CVPR IEEE, P1, DOI DOI 10.1109/CVPR.2015.7298594

Vaassen F, 2020, PHYS IMAG RADIAT ONC, V13, P1, DOI 10.1016/j.phro.2019.12.001

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

Velazquez ER, 2012, RADIOTHER ONCOL, V105, P167, DOI 10.1016/j.radonc.2012.09.023

Wolchok JD, 2009, CLIN CANCER RES, V15, P7412, DOI 10.1158/1078-0432.CCR-09-1624

Wu J, 2021, NAT MACH INTELL, V3, P787, DOI 10.1038/s42256-021-00377-0

Wu WH, 2020, MED PHYS, V47, P4054, DOI 10.1002/mp.14248

Yu LQ, 2017, AAAI CONF ARTIF INTE, P66

Zhang FL, 2020, TECHNOL CANCER RES T, V19, DOI 10.1177/1533033820947484

NR 43

TC 0

Z9 0

U1 7

U2 7

PU NATURE PORTFOLIO

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

EI 2041-1723

J9 NAT COMMUN

JI Nat. Commun.

PD JUN 14

PY 2022

VL 13

IS 1

AR 3423

DI 10.1038/s41467-022-30841-3

PG 12

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA 2D4RF

UT WOS:000811535600004

PM 35701415

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Shi, LT

Rong, Y

Daly, M

Dyer, B

Benedict, S

Qiu, JF

Yamamoto, T

AF Shi, Liting

Rong, Yi

Daly, Megan

Dyer, Brandon

Benedict, Stanley

Qiu, Jianfeng

Yamamoto, Tokihiro

TI Cone-beam computed tomography-based delta-radiomics for early response

assessment in radiotherapy for locally advanced lung cancer

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE cone-beam computed tomography (CBCT); delta-radiomics; early response

assessment; non-small cell lung cancer

ID DEFORMABLE IMAGE REGISTRATION; RADIATION-THERAPY; TUMOR-REGRESSION;

VOLUME; PREDICTION; SURVIVAL; PERFORMANCE; MODEL

AB Cone-beam computed tomography (CBCT) images acquired during radiotherapy may allow early response assessment. Previous studies have reported inconsistent findings on an association of CBCT-measured tumor volume changes with clinical outcomes. The purpose of this pilot study was twofold: (1) to characterize changes in CBCT-based radiomics features during treatment; and (2) to quantify the potential association of CBCT-based delta-radiomics features with overall survival in locally advanced lung cancer.

We retrospectively identified 23 patients and calculated 658 radiomics features from each of 11 CBCT images per patient. Feature selection was performed based on repeatability, robustness against contouring uncertainties, and non-redundancy. We calculated the coefficient of determination (R-2) for the relationship between the actual feature value at the end of treatment and predicted value based on linear models fitted using features between the first and kth fractions. We also quantified the predictive ability for survival with two methods by: (1) comparing delta-radiomics features (defined as the mean change between the first and kth fractions) between two groups of patients divided by a cutoff survival time of 18 months using the t-test or Wilcoxon rank-sum test; and (2) quantifying univariate discrimination of two groups divided by the median of delta-radiomics feature.

All selected seven radiomics features during treatment (as early as the 10th fraction) were predictive of those at the end of treatment (R-2 > 0.64). Three delta-radiomics features demonstrated significant differences (q < 0.05, as early as the 10th fraction) between the two groups of patients divided by the cutoff survival time. Two of those three features were also predictive of survival according to the log-rank statistics.

We provided the first demonstration of a potential association of CBCT-based delta-radiomics features early during treatment with overall survival in locally advanced lung cancer. Our preliminary findings should be validated for a larger cohort of patients.

C1 [Shi, Liting; Rong, Yi; Daly, Megan; Dyer, Brandon; Benedict, Stanley; Yamamoto, Tokihiro] Univ Calif Davis, Dept Radiat Oncol, Sch Med, Sacramento, CA 95817 USA.

[Shi, Liting; Qiu, Jianfeng] Shandong First Med Univ & Shandong Acad Med Sci, Med Engn & Technol Res Ctr, Tai An 271016, Shandong, Peoples R China.

[Shi, Liting; Qiu, Jianfeng] Shandong First Med Univ & Shandong Acad Med Sci, Imaging X Joint Lab, Tai An 271016, Shandong, Peoples R China.

[Shi, Liting; Qiu, Jianfeng] Shandong First Med Univ & Shandong Acad Med Sci, Dept Radiol, Tai An 271016, Shandong, Peoples R China.

[Qiu, Jianfeng] Shandong First Med Univ & Shandong Acad Med Sci, 619 Changcheng Rd, Tai An 271016, Shandong, Peoples R China.

RP Yamamoto, T (通讯作者)，Univ Calif Davis, Dept Radiat Oncol, Sch Med, Sacramento, CA 95817 USA.; Qiu, JF (通讯作者)，Shandong First Med Univ & Shandong Acad Med Sci, Med Engn & Technol Res Ctr, Tai An 271016, Shandong, Peoples R China.; Qiu, JF (通讯作者)，Shandong First Med Univ & Shandong Acad Med Sci, Imaging X Joint Lab, Tai An 271016, Shandong, Peoples R China.; Qiu, JF (通讯作者)，Shandong First Med Univ & Shandong Acad Med Sci, Dept Radiol, Tai An 271016, Shandong, Peoples R China.; Qiu, JF (通讯作者)，Shandong First Med Univ & Shandong Acad Med Sci, 619 Changcheng Rd, Tai An 271016, Shandong, Peoples R China.

EM jfqiu100@gmail.com; toyamamoto@ucdavis.edu

OI Shi, Liting/0000-0002-7771-2001; Rong, Yi/0000-0002-2620-1893; Yamamoto,

Tokihiro/0000-0002-6790-6523

FU China National Key Research and Development Program [2016YFC0103400];

Taishan Scholars Program of Shandong Province

FX This study was supported in part by the China National Key Research and

Development Program (2016YFC0103400) (LS and JQ) and Taishan Scholars

Program of Shandong Province (LS and JQ). Dr Kun Hou at Taishan Medical

University provided writing assistance. Dr Weizhao Lu and Dr Dong Cui at

Taishan Medical University provided assistance in statistical analysis.

Dr Wen Chen at University of California Davis assisted with CBCT image

analysis.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

BENJAMINI Y, 1995, J R STAT SOC B, V57, P289, DOI 10.1111/j.2517-6161.1995.tb02031.x

Bradshaw TJ, 2015, INT J RADIAT ONCOL, V91, P787, DOI 10.1016/j.ijrobp.2014.12.011

Bral S, 2011, INT J RADIAT ONCOL, V80, P1338, DOI 10.1016/j.ijrobp.2010.04.002

Brink C, 2014, INT J RADIAT ONCOL, V89, P916, DOI 10.1016/j.ijrobp.2014.03.038

Carvalho S, 2016, RADIOTHER ONCOL, V118, pS20, DOI DOI 10.1016/S0167-8140(16)30042-1

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

Dong XZ, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0157836

Dubben HH, 1998, RADIOTHER ONCOL, V47, P167, DOI 10.1016/S0167-8140(97)00215-6

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

Guckenberger M, 2011, INT J RADIAT ONCOL, V79, P901, DOI 10.1016/j.ijrobp.2010.04.050

Hoang T, 2005, J CLIN ONCOL, V23, P175, DOI 10.1200/JCO.2005.04.177

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Jabbour SK, 2015, INT J RADIAT ONCOL, V92, P627, DOI 10.1016/j.ijrobp.2015.02.017

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Kupelian PA, 2005, INT J RADIAT ONCOL, V63, P1024, DOI 10.1016/j.ijrobp.2005.04.046

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Loi G, 2018, MED PHYS, V45, P748, DOI 10.1002/mp.12737

Mattonen SA, 2016, INT J RADIAT ONCOL, V94, P1121, DOI 10.1016/j.ijrobp.2015.12.369

Mattonen SA, 2014, MED PHYS, V41, DOI 10.1118/1.4866219

Mazzola R, 2016, BRIT J RADIOL, V89, DOI 10.1259/bjr.20160146

Molina JR, 2008, MAYO CLIN PROC, V83, P584, DOI 10.4065/83.5.584

Mozley PD, 2012, TRANSL ONCOL, V5, P19, DOI 10.1593/tlo.11232

Oberije C, 2014, RADIOTHER ONCOL, V112, P37, DOI 10.1016/j.radonc.2014.04.012

Smith RA, 2018, CA-CANCER J CLIN, V68, P297, DOI 10.3322/caac.21446

Storey JD, 2002, J ROY STAT SOC B, V64, P479, DOI 10.1111/1467-9868.00346

van Baardwijk A, 2007, RADIOTHER ONCOL, V82, P145, DOI 10.1016/j.radonc.2007.01.007

van Timmeren JE, 2017, ACTA ONCOL, V56, P1537, DOI 10.1080/0284186X.2017.1350285

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

Weistrand O, 2015, MED PHYS, V42, P40, DOI 10.1118/1.4894702

Wen Q, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-14548-w

Willner J, 2002, INT J RADIAT ONCOL, V52, P382, DOI 10.1016/S0360-3016(01)01823-5

Zayed N, 2015, INT J BIOMED IMAGING, V2015, DOI 10.1155/2015/267807

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

NR 35

TC 20

Z9 20

U1 2

U2 18

PU IOP PUBLISHING LTD

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD JAN

PY 2020

VL 65

IS 1

AR 015009

DI 10.1088/1361-6560/ab3247

PG 10

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA KV0FT

UT WOS:000520100800001

PM 31307024

DA 2022-08-24

ER

PT J

AU Huang, CY

Lee, CC

Yang, HC

Lin, CJ

Wu, HM

Chung, WY

Shiau, CY

Guo, WY

Pan, DHC

Peng, SJ

AF Huang, Chih-Ying

Lee, Cheng-Chia

Yang, Huai-Che

Lin, Chung-Jung

Wu, Hsiu-Mei

Chung, Wen-Yuh

Shiau, Cheng-Ying

Guo, Wan-Yuo

Pan, David Hung-Chi

Peng, Syu-Jyun

TI Radiomics as prognostic factor in brain metastases treated with Gamma

Knife radiosurgery

SO JOURNAL OF NEURO-ONCOLOGY

LA English

DT Article

DE Radiomics; Gamma knife radiosurgery; Brain metastasis; Magnetic

resonance imaging; Prognosis

ID STEREOTACTIC RADIOSURGERY; RADIATION-THERAPY; TUMOR-CONTROL; STEM

METASTASES; CANCER PATIENTS; LUNG-CANCER; SURVIVAL; FAILURE;

RADIOTHERAPY; MANAGEMENT

AB Purpose Gamma Knife radiosurgery (GKRS) is a non-invasive procedure for the treatment of brain metastases. This study sought to determine whether radiomic features of brain metastases derived from pre-GKRS magnetic resonance imaging (MRI) could be used in conjunction with clinical variables to predict the effectiveness of GKRS in achieving local tumor control. Methods We retrospectively analyzed 161 patients with non-small cell lung cancer (576 brain metastases) who underwent GKRS for brain metastases. The database included clinical data and pre-GKRS MRI. Brain metastases were demarcated by experienced neurosurgeons, and radiomic features of each brain metastasis were extracted. Consensus clustering was used for feature selection. Cox proportional hazards models and cause-specific proportional hazards models were used to correlate clinical variables and radiomic features with local control of brain metastases after GKRS. Results Multivariate Cox proportional hazards model revealed that higher zone percentage (hazard ratio, HR 0.712; P = .022) was independently associated with superior local tumor control. Similarly, multivariate cause-specific proportional hazards model revealed that higher zone percentage (HR 0.699; P = .014) was independently associated with superior local tumor control. Conclusions The zone percentage of brain metastases, a radiomic feature derived from pre-GKRS contrast-enhanced T1-weighted MRIs, was found to be an independent prognostic factor of local tumor control following GKRS in patients with non-small cell lung cancer and brain metastases. Radiomic features indicate the biological basis and characteristics of tumors and could potentially be used as surrogate biomarkers for predicting tumor prognosis following GKRS.

C1 [Huang, Chih-Ying] Taipei Vet Gen Hosp, Dept Med Educ, Taipei, Taiwan.

[Huang, Chih-Ying; Lee, Cheng-Chia; Yang, Huai-Che; Lin, Chung-Jung; Wu, Hsiu-Mei; Chung, Wen-Yuh; Shiau, Cheng-Ying; Guo, Wan-Yuo] Natl Yang Ming Univ, Sch Med, Taipei, Taiwan.

[Lee, Cheng-Chia; Yang, Huai-Che; Chung, Wen-Yuh; Pan, David Hung-Chi] Taipei Vet Gen Hosp, Neurol Inst, Dept Neurosurg, Taipei, Taiwan.

[Lee, Cheng-Chia] Natl Yang Ming Univ, Brain Res Ctr, Taipei, Taiwan.

[Lin, Chung-Jung; Wu, Hsiu-Mei; Guo, Wan-Yuo] Taipei Vet Gen Hosp, Dept Radiol, Taipei, Taiwan.

[Shiau, Cheng-Ying] Taipei Vet Gen Hosp, Canc Ctr, Taipei, Taiwan.

[Pan, David Hung-Chi] Taipei Med Univ, Shuang Ho Hosp, Dept Neurosurg, Taipei, Taiwan.

[Peng, Syu-Jyun] Taipei Med Univ, Coll Med, Profess Master Program Artificial Intelligence Me, Taipei, Taiwan.

RP Peng, SJ (通讯作者)，Taipei Med Univ, Coll Med, Profess Master Program Artificial Intelligence Me, Taipei, Taiwan.

EM sjpeng2019@tmu.edu.tw

OI Peng, Syu-Jyun/0000-0001-5002-6581

FU Ministry of Science and Technology, Taiwan [MOST 108-2221-E-038-019,

MOST 108-2634-F-010-002]; Research Grants for Newly Hired Faculty by the

Taipei Medical University in Taiwan [TMU 108-AE1-B04]; Brain Research

Center, National Yang-Ming University from The Featured Areas Research

Center Program by the Ministry of Education (MOE) in Taiwan

FX The authors would like to thank all colleagues who contributed to this

study. We are grateful to our research assistants, Fong-Jiao Lee,

Hsueh-Jen Huang, Wen-Chi Ku, Yi-Bei Tseng, and Jr Lan Huang for their

data recording and transcription. We thank the editor and series editor

for constructive criticisms of an earlier version of this article. This

work was financially supported in part by the Ministry of Science and

Technology, Taiwan, under the project MOST 108-2221-E-038-019 and the

project MOST 108-2634-F-010-002, in part by the Research Grants for

Newly Hired Faculty by the Taipei Medical University in Taiwan, under

the project TMU 108-AE1-B04, and in part by the Brain Research Center,

National Yang-Ming University from The Featured Areas Research Center

Program within the framework of the Higher Education Sprout Project by

the Ministry of Education (MOE) in Taiwan.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ali A, 2013, CURR ONCOL, V20, pE300, DOI 10.3747/co.20.1481

Andrews DW, 2004, LANCET, V363, P1665, DOI 10.1016/S0140-6736(04)16250-8

Aoyama H, 2006, JAMA-J AM MED ASSOC, V295, P2483, DOI 10.1001/jama.295.21.2483

Ayala-Peacock DN, 2014, NEURO-ONCOLOGY, V16, P1283, DOI 10.1093/neuonc/nou018

Baschnagel AM, 2013, J NEUROSURG, V119, P1139, DOI 10.3171/2013.7.JNS13431

Braman NM, 2017, BREAST CANCER RES, V19, DOI 10.1186/s13058-017-0846-1

Dignam JJ, 2012, CLIN CANCER RES, V18, P2301, DOI 10.1158/1078-0432.CCR-11-2097

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Gorovets D, 2017, INT J RADIAT ONCOL, V97, P246, DOI 10.1016/j.ijrobp.2016.09.043

Hussain A, 2007, INT J RADIAT ONCOL, V67, P521, DOI 10.1016/j.ijrobp.2006.08.081

Jawahar A, 2004, J NEUROSURG, V100, P842, DOI 10.3171/jns.2004.100.5.0842

Kaal EC, 2005, LANCET NEUROL, V4, P289, DOI 10.1016/S1474-4422(05)70072-7

Kim DG, 2000, J NEUROSURG, V93, P23, DOI 10.3171/jns.2000.93.supplement\_3.0023

Kniep HC, 2019, RADIOLOGY, V290, P479, DOI 10.1148/radiol.2018180946

Kuhnt T, 2005, J CANCER RES CLIN, V131, P758, DOI 10.1007/s00432-005-0018-z

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lee CC, 2020, J NEUROSURG, V133, P313, DOI 10.3171/2019.4.JNS19446

Lee CC, 2018, J NEURO-ONCOL, V140, P547, DOI 10.1007/s11060-018-2980-8

Lee CC, 2014, J NEURO-ONCOL, V118, P351, DOI 10.1007/s11060-014-1439-9

Lee CC, 2014, J NEUROSURG, V120, P52, DOI 10.3171/2013.9.JNS131163

Lee CC, 2012, J NEUROSURG, V117, P164, DOI 10.3171/2012.8.GKS121066

Lee HL, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-181

Li Z, 2016, INT CONF INSTR MEAS, P311, DOI 10.1109/IMCCC.2016.198

Martens K, 2013, RADIAT ONCOL, V8, DOI 10.1186/1748-717X-8-162

McTyre E, 2018, ANN ONCOL, V29, P497, DOI 10.1093/annonc/mdx740

Monti S, 2003, MACH LEARN, V52, P91, DOI 10.1023/A:1023949509487

Noordzij M, 2013, NEPHROL DIAL TRANSPL, V28, P2670, DOI 10.1093/ndt/gft355

Pai FY, 2019, NEUROSURGERY, V85, pE20, DOI 10.1093/neuros/nyy410

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Peterson AM, 1999, RADIOLOGY, V211, P807, DOI 10.1148/radiology.211.3.r99jn48807

Petrovich Z, 2002, J NEUROSURG, V97, P499, DOI 10.3171/jns.2002.97.supplement\_5.0499

Rizzo Stefania, 2018, Eur Radiol Exp, V2, P36, DOI 10.1186/s41747-018-0068-z

Rockwell S, 2009, CURR MOL MED, V9, P442, DOI 10.2174/156652409788167087

Schouten LJ, 2002, CANCER, V94, P2698, DOI 10.1002/cncr.10541

Schuette W, 2004, LUNG CANCER, V45, pS253, DOI 10.1016/j.lungcan.2004.07.967

Shaw E, 2000, INT J RADIAT ONCOL, V47, P291, DOI 10.1016/S0360-3016(99)00507-6

Snell JW, 2006, J NEUROSURG, V104, P157, DOI 10.3171/jns.2006.104.1.157

SORENSEN JB, 1988, J CLIN ONCOL, V6, P1474, DOI 10.1200/JCO.1988.6.9.1474

Stadler P, 1999, INT J RADIAT ONCOL, V44, P749, DOI 10.1016/S0360-3016(99)00115-7

Therneau T. M., 2000, MODELING SURVIVAL DA, P7

Trifiletti DM, 2016, INT J RADIAT ONCOL, V96, P280, DOI 10.1016/j.ijrobp.2016.06.009

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Zhang ZH, 2017, ANN TRANSL MED, V5, DOI 10.21037/atm.2016.08.62

Zindler JD, 2014, RADIOTHER ONCOL, V112, P212, DOI 10.1016/j.radonc.2014.07.007

NR 46

TC 15

Z9 17

U1 0

U2 3

PU SPRINGER

PI NEW YORK

PA ONE NEW YORK PLAZA, SUITE 4600, NEW YORK, NY, UNITED STATES

SN 0167-594X

EI 1573-7373

J9 J NEURO-ONCOL

JI J. Neuro-Oncol.

PD FEB

PY 2020

VL 146

IS 3

SI SI

BP 439

EP 449

DI 10.1007/s11060-019-03343-4

PG 11

WC Oncology; Clinical Neurology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Neurosciences & Neurology

GA KJ4DF

UT WOS:000512007700006

PM 32020474

DA 2022-08-24

ER

PT J

AU Katsuta, Y

Kadoya, N

Sugai, Y

Katagiri, Y

Yamamoto, T

Takeda, K

Tanaka, S

Jingu, K

AF Katsuta, Yoshiyuki

Kadoya, Noriyuki

Sugai, Yuto

Katagiri, Yu

Yamamoto, Takaya

Takeda, Kazuya

Tanaka, Shohei

Jingu, Keiichi

TI Feasibility of Differential Dose-Volume Histogram Features in

Multivariate Prediction Model for Radiation Pneumonitis Occurrence

SO DIAGNOSTICS

LA English

DT Article

DE radiotherapy; NSCLC; radiation pneumonitis; machine learning; artificial

intelligence

ID LUNG

AB Purpose The purpose of this study is to introduce differential dose-volume histogram (dDVH) features into machine learning for radiation pneumonitis (RP) prediction and to demonstrate the predictive performance of the developed model based on integrated cumulative dose-volume histogram (cDVH) and dDVH features. Materials and methods: cDVH and dDVH features were calculated for 153 patients treated for non-small-cell lung cancer with 60-66 Gy and dose bins ranging from 2 to 8 Gy in 2 Gy increments. RP prediction models were developed with the least absolute shrinkage and selection operator (LASSO) through fivefold cross-validation. Results: Among the 152 patients in the patient cohort, 41 presented >= grade 2 RP. The interdependencies between cDVH features evaluated by Spearman's correlation were significantly resolved by the inclusion of dDVH features. The average area under curve for the RP prediction model using cDVH and dDVH model was 0.73, which was higher than the average area under curve using cDVH model for 0.62 with statistically significance (p < 0.01). An analysis using the entire set of regression coefficients determined by LASSO demonstrated that dDVH features represented four of the top five frequently selected features in the model fitting, regardless of dose bin. Conclusions: We successfully developed an RP prediction model that integrated cDVH and dDVH features. The best RP prediction model was achieved using dDVH (dose bin = 4 Gy) features in the machine learning process.

C1 [Katsuta, Yoshiyuki; Kadoya, Noriyuki; Sugai, Yuto; Yamamoto, Takaya; Takeda, Kazuya; Tanaka, Shohei; Jingu, Keiichi] Tohoku Univ, Dept Radiat Oncol, Grad Sch Med, Aoba Ku, 1-1 Seiryo Machi, Sendai, Miyagi 9808574, Japan.

[Katagiri, Yu] Japan Red Cross Ishinomaki Hosp, Dept Radiat Oncol, Ishinomaki, Miyagi 9868522, Japan.

RP Katsuta, Y (通讯作者)，Tohoku Univ, Dept Radiat Oncol, Grad Sch Med, Aoba Ku, 1-1 Seiryo Machi, Sendai, Miyagi 9808574, Japan.

EM yoshiyuki.katsuta.a7@tohoku.ac.jp; kadoya.n@rad.med.tohoku.ac.jp;

sugai.y@med.tohoku.ac.jp; ykhasedo@yahoo.co.jp; priere\_for@yahoo.co.jp;

takeda7616@gmail.com; s1290169@gmail.com; kjingu-jr@rad.med.tohoku.ac.jp

OI Katsuta, Yoshiyuki/0000-0001-5984-9226; Tanaka,

Shohei/0000-0002-4257-5342; Jingu, Keiichi/0000-0002-7032-1577

FU JSPS [KAKENHI 20K16815]

FX This research was funded by JSPS grant number KAKENHI 20K16815.

CR Benadjaoud MA, 2014, INT J RADIAT ONCOL, V90, P654, DOI 10.1016/j.ijrobp.2014.07.008

Chalkidou A, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0124165

Chen S, 2007, MED PHYS, V34, P3808, DOI 10.1118/1.2776669

Chun SG, 2017, J CLIN ONCOL, V35, P56, DOI 10.1200/JCO.2016.69.1378

Dormann CF, 2013, ECOGRAPHY, V36, P27, DOI 10.1111/j.1600-0587.2012.07348.x

Graham MV, 1999, INT J RADIAT ONCOL, V45, P323, DOI 10.1016/S0360-3016(99)00183-2

Hernando ML, 2001, INT J RADIAT ONCOL, V51, P650, DOI 10.1016/S0360-3016(01)01685-6

Hope AJ, 2006, INT J RADIAT ONCOL, V65, P112, DOI 10.1016/j.ijrobp.2005.11.046

Kang J, 2015, INT J RADIAT ONCOL, V93, P1127, DOI 10.1016/j.ijrobp.2015.07.2286

Krafft SP, 2018, MED PHYS, V45, P5317, DOI 10.1002/mp.13150

Liu K, 2020, CELL DISCOV, V6, DOI 10.1038/s41421-019-0132-8

Luna JM, 2019, RADIOTHER ONCOL, V133, P106, DOI 10.1016/j.radonc.2019.01.003

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Matzner-Lober E, 2018, DIAGN INTERV IMAG, V99, P269, DOI 10.1016/j.diii.2018.04.011

Peng YT, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.01646

Seppenwoolde Y, 2002, INT J RADIAT ONCOL, V53, P822, DOI 10.1016/S0360-3016(02)02803-1

Shi LL, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.618677

Tucker SL, 2004, INT J RADIAT ONCOL, V60, P1589, DOI 10.1016/j.ijrobp.2004.07.712

Yom SS, 2007, INT J RADIAT ONCOL, V68, P94, DOI 10.1016/j.ijrobp.2006.12.031

NR 19

TC 0

Z9 0

U1 0

U2 0

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2075-4418

J9 DIAGNOSTICS

JI Diagnostics

PD JUN

PY 2022

VL 12

IS 6

AR 1354

DI 10.3390/diagnostics12061354

PG 12

WC Medicine, General & Internal

WE Science Citation Index Expanded (SCI-EXPANDED)

SC General & Internal Medicine

GA 2K6NA

UT WOS:000816448800001

PM 35741164

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Li, Q

Kim, J

Balagurunathan, Y

Qi, J

Liu, Y

Latifi, K

Moros, EG

Schabath, MB

Ye, ZX

Gillies, RJ

Dilling, TJ

AF Li, Qian

Kim, Jongphil

Balagurunathan, Yoganand

Qi, Jin

Liu, Ying

Latifi, Kujtim

Moros, Eduardo G.

Schabath, Matthew B.

Ye, Zhaoxiang

Gillies, Robert J.

Dilling, Thomas J.

TI CT imaging features associated with recurrence in non-small cell lung

cancer patients after stereotactic body radiotherapy

SO RADIATION ONCOLOGY

LA English

DT Article

DE Stereotactic body radiotherapy (SBRT); Computed tomography; Survival;

Radiomics; Semantics; Image features

ID POSITRON-EMISSION-TOMOGRAPHY; RADIATION-THERAPY; ABLATIVE RADIOTHERAPY;

LOCAL RECURRENCE; VESSEL INVASION; PROGNOSTIC-FACTOR; F-18-FDG PET/CT;

GROWTH-FACTOR; IMAGES; CARCINOMA

AB Background: Predicting recurrence after stereotactic body radiotherapy (SBRT) in non-small cell lung cancer (NSCLC) patients is problematic, but critical for the decision of following treatment. This study aims to investigate the association of imaging features derived from the first follow-up computed tomography (CT) on lung cancer patient outcomes following SBRT, and identify patients at high risk of recurrence.

Methods: Fifty nine biopsy-proven non-small cell lung cancer patients were qualified for this study. The first follow-up CTs were performed about 3 months after SBRT (median time: 91 days). Imaging features included 34 manually scored radiological features (semantics) describing the lesion, lung and thorax and 219 quantitative imaging features (radiomics) extracted automatically after delineation of the lesion. Cox proportional hazard models and Harrel's C-index were used to explore predictors of overall survival (OS), recurrence-free survival (RFS), and loco-regional recurrence-free survival (LR-RFS). Five-fold cross validation was performed on the final prognostic model.

Results: The median follow-up time was 42 months. The model for OS contained Eastern Cooperative Oncology Group (ECOG) performance status (HR = 3.13, 95% CI: 1.17-8.41), vascular involvement (HR = 3.21, 95% CI: 1.29-8.03), lymphadenopathy (HR = 3.59, 95% CI: 1.58-8.16) and the 1st principle component of radiomic features (HR = 1.24, 95% CI: 1.02-1.51). The model for RFS contained vascular involvement (HR = 3.06, 95% CI: 1.40-6.70), vessel attachment (HR = 3.46, 95% CI: 1.65-7.25), pleural retraction (HR = 3.24, 95% CI: 1.41-7.42), lymphadenopathy (HR = 6.41, 95% CI: 2.58-15.90) and relative enhancement (HR = 1.40, 95% CI: 1.00-1.96). The model for LR-RFS contained vascular involvement (HR = 4.96, 95% CI: 2.23-11.03), lymphadenopathy (HR = 2.64, 95% CI: 1.19-5.82), circularity (F13, HR = 1.60, 95% CI: 1.10-2.32) and 3D Laws feature (F92, HR = 1.96, 95% CI: 1.35-2.83). Five-fold cross-validated the areas under the receiver operating characteristic curves (AUC) of these three models were all above 0.8.

Conclusions: Our analysis reveals disease progression could be prognosticated as early as 3 months after SBRT using CT imaging features, and these features would be helpful in clinical decision-making.

C1 [Li, Qian; Qi, Jin; Liu, Ying; Ye, Zhaoxiang] Tianjin Med Univ Canc Inst & Hosp, Dept Radiol, Natl Clin Res Ctr Canc, Tianjins Clin Res Ctr Canc,Key Lab Canc Prevent &, Huan Hu Xi Rd, Tianjin 300060, Peoples R China.

[Balagurunathan, Yoganand; Qi, Jin; Moros, Eduardo G.; Gillies, Robert J.] H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Imaging & Metab, Tampa, FL USA.

[Balagurunathan, Yoganand; Qi, Jin; Moros, Eduardo G.; Gillies, Robert J.] H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Imaging & Metab, Tampa, FL USA.

[Kim, Jongphil] H Lee Moffitt Canc Ctr & Res Inst, Dept Biostat & Bioinformat, Tampa, FL USA.

[Latifi, Kujtim; Moros, Eduardo G.; Dilling, Thomas J.] H Lee Moffitt Canc Ctr & Res Inst, Dept Radiat Oncol, 12902 Magnolia Dr, Tampa, FL 33612 USA.

[Schabath, Matthew B.] H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Epidemiol, Tampa, FL USA.

RP Ye, ZX (通讯作者)，Tianjin Med Univ Canc Inst & Hosp, Dept Radiol, Natl Clin Res Ctr Canc, Tianjins Clin Res Ctr Canc,Key Lab Canc Prevent &, Huan Hu Xi Rd, Tianjin 300060, Peoples R China.; Dilling, TJ (通讯作者)，H Lee Moffitt Canc Ctr & Res Inst, Dept Radiat Oncol, 12902 Magnolia Dr, Tampa, FL 33612 USA.

EM yezhaoxiang@163.com; Thomas.Dilling@moffitt.org

RI Kim, Jongphil/ABU-5779-2022; Schabath, Matthew B./J-3763-2016; YE,

ZHAOXIANG/B-8969-2016; Moros, Eduardo G./AAY-2771-2020; Balagurunathan,

Yoganand/AAH-9139-2021; Balagurunathan, Yoganand/AAF-9163-2020

OI Schabath, Matthew B./0000-0003-3241-3216; YE,

ZHAOXIANG/0000-0003-3157-8393; Moros, Eduardo G./0000-0003-1964-2460;

Balagurunathan, Yoganand/0000-0002-5598-4727; Gillies,

Robert/0000-0002-8888-7747

FU National Cancer Institute [U01 CA143062, P50 CA119997]; Florida

Biomedical Research Programs, King Team Science [2KT01]; Biostatistics

Core shared resources at the H. Lee Moffitt Cancer Center & Research

Institute; NCI designated Comprehensive Cancer Center [P30-CA076292];

NATIONAL CANCER INSTITUTE [P50CA119997, P30CA076292, U01CA143062]

Funding Source: NIH RePORTER

FX This research was supported by the National Cancer Institute (grants U01

CA143062 and P50 CA119997), Florida Biomedical Research Programs, King

Team Science (grant 2KT01), and in part by Biostatistics Core shared

resources at the H. Lee Moffitt Cancer Center & Research Institute, an

NCI designated Comprehensive Cancer Center (P30-CA076292).

CR Abdi H, 2010, WIRES COMPUT STAT, V2, P433, DOI 10.1002/wics.101

Baatz M, 2009, COMB CHEM HIGH T SCR, V12, P908, DOI 10.2174/138620709789383196

Balagurunathan Y, 2014, J DIGIT IMAGING, V27, P805, DOI 10.1007/s10278-014-9716-x

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Bollineni VR, 2012, INT J RADIAT ONCOL, V83, pE551, DOI 10.1016/j.ijrobp.2012.01.012

Burdick MJ, 2010, INT J RADIAT ONCOL, V78, P1033, DOI 10.1016/j.ijrobp.2009.09.081

Chang JY, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-152

Chang YL, 2012, ANN SURG ONCOL, V19, P3057, DOI 10.1245/s10434-012-2354-y

Clarke K, 2012, RADIOTHER ONCOL, V104, P62, DOI 10.1016/j.radonc.2012.04.019

Dahele M, 2011, J THORAC ONCOL, V6, P1221, DOI 10.1097/JTO.0b013e318219aac5

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Grutters JPC, 2010, RADIOTHER ONCOL, V95, P32, DOI 10.1016/j.radonc.2009.08.003

Gu YH, 2013, PATTERN RECOGN, V46, P692, DOI 10.1016/j.patcog.2012.10.005

Gupta NC, 2001, CHEST, V120, P521, DOI 10.1378/chest.120.2.521

Halpenny D, 2015, CLIN IMAG, V39, P254, DOI 10.1016/j.clinimag.2014.12.005

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Huang K, 2013, RADIOTHER ONCOL, V109, P51, DOI 10.1016/j.radonc.2013.06.047

Huang K, 2012, RADIOTHER ONCOL, V102, P335, DOI 10.1016/j.radonc.2011.12.018

Hwang SH, 2013, EUR RADIOL, V23, P1573, DOI 10.1007/s00330-012-2755-0

Kato S, 2010, JPN J RADIOL, V28, P259, DOI 10.1007/s11604-009-0415-3

Kessler R, 1996, ANN THORAC SURG, V62, P1489, DOI 10.1016/0003-4975(96)00540-1

Laws K.I., 1980, TEXTURED IMAGE SEGME

Liu Y, 2016, RADIOLOGY, V280, P271, DOI 10.1148/radiol.2016151455

MACCHIARINI P, 1992, J THORAC CARDIOV SUR, V104, P892

Matsuo Y, 2007, INT J CLIN ONCOL, V12, P356, DOI 10.1007/s10147-007-0691-9

Mattonen SA, 2014, MED PHYS, V41, DOI 10.1118/1.4866219

Na FF, 2014, J THORAC ONCOL, V9, P834, DOI 10.1097/JTO.0000000000000185

National Comprehensive Cancer Network, 2017, NCCN GUID NONSM CELL

Ruffini E, 2011, J THORAC ONCOL, V6, P319, DOI 10.1097/JTO.0b013e3182011f70

Satoh Y, 2012, EUR J RADIOL, V81, P3530, DOI 10.1016/j.ejrad.2011.11.047

Shultz DB, 2014, CLIN LUNG CANCER, V15, P294, DOI 10.1016/j.cllc.2013.12.011

Takeda A, 2013, LUNG CANCER, V79, P248, DOI 10.1016/j.lungcan.2012.11.008

Tsuchiya T, 2007, LUNG CANCER, V56, P341, DOI 10.1016/j.lungcan.2007.01.019

Viera AJ, 2005, FAM MED, V37, P360

Vu CC, 2013, NUCL MED COMMUN, V34, P959, DOI 10.1097/MNM.0b013e32836491a9

Wang H, 2015, CLIN LUNG CANCER, V16, pE141, DOI 10.1016/j.cllc.2015.05.007

WEBB WR, 1991, RADIOLOGY, V178, P705, DOI 10.1148/radiology.178.3.1847239

YAMASHITA K, 1995, RADIOLOGY, V196, P401, DOI 10.1148/radiology.196.2.7617852

Yi CA, 2004, RADIOLOGY, V233, P191, DOI 10.1148/radiol.2331031535

Zhang X, 2012, INT J RADIAT ONCOL, V83, P1558, DOI 10.1016/j.ijrobp.2011.10.035

NR 40

TC 45

Z9 47

U1 0

U2 8

PU BIOMED CENTRAL LTD

PI LONDON

PA 236 GRAYS INN RD, FLOOR 6, LONDON WC1X 8HL, ENGLAND

SN 1748-717X

J9 RADIAT ONCOL

JI Radiat. Oncol.

PD SEP 25

PY 2017

VL 12

AR 158

DI 10.1186/s13014-017-0892-y

PG 10

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA FI2IN

UT WOS:000411762400001

PM 28946909

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Ren, YJ

Tang, H

Zhang, J

She, YL

Sun, XT

Xie, D

Chen, C

AF Ren, Yijiu

Tang, Hai

Zhang, Jie

She, Yunlang

Sun, Xiaoting

Xie, Dong

Chen, Chang

TI Bayesian network meta-analysis of efficacy and safety of neoadjuvant

therapy for non-small-cell lung cancer

SO THERAPEUTIC ADVANCES IN MEDICAL ONCOLOGY

LA English

DT Article

DE neoadjuvant therapy; network meta-analysis; non-small cell lung cancer

(NSCLC); randomized controlled trial; targeted therapy

ID COMPARING PERIOPERATIVE CHEMOTHERAPY; RANDOMIZED CONTROLLED-TRIAL;

PREOPERATIVE CHEMOTHERAPY; PHASE-II; INDUCTION CHEMOTHERAPY; SURGERY;

RADIOTHERAPY; SURVIVAL; CHEMORADIOTHERAPY; CHEMORADIATION

AB Objective:

Neoadjuvant chemotherapy has increased the survival benefit of non-small cell lung cancer (NSCLC) patients. The effects of different neoadjuvant therapies are still controversial. We carried out the study to evaluate the efficacy and safety of neoadjuvant therapy.

Methods:

We performed a search of electronic databases (PubMed, Embase, MEDLINE, Cochrane) for randomized controlled trials (RCTs) comparing neoadjuvant treatment. After literature screening and data extraction, efficacy, and safety were analyzed by the Bayesian network meta-analysis (NMA).

Results:

A total of 19 RCTs were included, covering 3276 patients and six kinds of neoadjuvant therapies, including immunotherapy, targeted therapy, chemotherapy drugs and radiotherapy. Erlotinib, the first-generation epidermal growth factor receptor tyrosine inhibitors (EGFR TKIs), neoadjuvant targeted therapy is best for improving overall survival (OS) and progression-free survival (PFS), which is superior to other neoadjuvant therapy, such as neoadjuvant chemotherapy with platinum drugs [hazard ratio (HR) 0.39, 95% confidence intervals (CIs) 0.16-0.96], neoadjuvant chemoradiotherapy (HR 0.37, 95% CI 0.14-0.96) and neoadjuvant chemotherapy with non-platinum drugs (HR 0.25, 95% CI 0.07-0.90). OS of all neoadjuvant therapies is superior to surgery alone, but only neoadjuvant chemotherapy with platinum drugs showed a significant advantage (HR 0.76, 95% CI 0.59-0.93). Besides, for the stage IIIA N2 NSCLC patients, no significant difference was found between neoadjuvant therapies.

Conclusions:

Targeted neoadjuvant therapy is the best treatment for prolonging PFS. The neoadjuvant chemotherapy with platinum drugs was associated with the better OS benefits for patients with NSCLC, compared with surgery alone. There is no significant difference in the efficacy of neoadjuvant therapy for the stage IIIA N2 NSCLC.

C1 [Ren, Yijiu; Tang, Hai; She, Yunlang; Xie, Dong; Chen, Chang] Tongji Univ, Sch Med, Shanghai Pulm Hosp, Dept Thorac Surg, 507 Zheng Min Rd, Shanghai 200433, Peoples R China.

[Zhang, Jie] Tongji Univ, Shanghai Pulm Hosp, Dept Med Oncol, Sch Med, Shanghai, Peoples R China.

[Sun, Xiaoting] Tongji Univ, Sch Med, Shanghai, Peoples R China.

RP Chen, C (通讯作者)，Tongji Univ, Sch Med, Shanghai Pulm Hosp, Dept Thorac Surg, 507 Zheng Min Rd, Shanghai 200433, Peoples R China.

EM changchenc@tongji.edu.cn

OI Chen, Chang/0000-0003-2841-1250

FU Shanghai Hospital Development Center [SHDC12017114]; Shanghai Pulmonary

Hospital Innovation Team [FKCX1906, FKXY1902]; Shanghai Science and

Technology Committee [20YF1441100, 20XD1403000, 18DZ2293400]

FX The author(s) disclosed receipt of the following financial support for

the research, authorship, and/or publication of this article: It was

supported by projects from the Shanghai Hospital Development Center

(SHDC12017114), Shanghai Pulmonary Hospital Innovation Team (FKCX1906,

FKXY1902), and the Shanghai Science and Technology Committee

(20YF1441100, 20XD1403000, 18DZ2293400).

CR Albain KS, 2009, LANCET, V374, P379, DOI 10.1016/S0140-6736(09)60737-6

Blumenthal GM, 2018, J THORAC ONCOL, V13, P1818, DOI 10.1016/j.jtho.2018.09.017

Brooks SP, 1998, J COMPUT GRAPH STAT, V7, P434, DOI 10.2307/1390675

Chaimani A, 2013, PLOS ONE, V8, DOI 10.1371/journal.pone.0076654

Cloughesy TF, 2019, NAT MED, V25, P477, DOI 10.1038/s41591-018-0337-7

Cottrell TR, 2018, ANN ONCOL, V29, P1853, DOI 10.1093/annonc/mdy218

DAUTZENBERG B, 1990, CANCER, V65, P2435, DOI 10.1002/1097-0142(19900601)65:11<2435::AID-CNCR2820651105>3.0.CO;2-2

Depierre A, 2002, J CLIN ONCOL, V20, P247, DOI 10.1200/JCO.20.1.247

Dias S, 2010, STAT MED, V29, P932, DOI 10.1002/sim.3767

Edelman MJ, 2017, J THORAC ONCOL, V12, P1413, DOI 10.1016/j.jtho.2017.06.007

Elias Anthony D, 2002, Clin Lung Cancer, V4, P95, DOI 10.3816/CLC.2002.n.019

Forde PM, 2018, NEW ENGL J MED, V378, P1976, DOI 10.1056/NEJMoa1716078

Garon EB, 2019, J CLIN ONCOL, V37, P2518, DOI 10.1200/JCO.19.00934

Gettinger S, 2018, J CLIN ONCOL, V36, P1675, DOI 10.1200/JCO.2017.77.0412

Gilligan D, 2007, LANCET, V369, P1929, DOI 10.1016/S0140-6736(07)60714-4

Herbst RS, 2019, ANN ONCOL, V30, P281, DOI 10.1093/annonc/mdy545

Higgins JPT, 2003, BRIT MED J, V327, P557, DOI 10.1136/bmj.327.7414.557

Higgins JPT, 2011, BMJ-BRIT MED J, V343, DOI 10.1136/bmj.d5928

Hutton B, 2015, ANN INTERN MED, V162, P777, DOI 10.7326/M14-2385

Jansen JP, 2011, VALUE HEALTH, V14, P417, DOI 10.1016/j.jval.2011.04.002

Katakami N, 2012, CANCER-AM CANCER SOC, V118, P6126, DOI 10.1002/cncr.26689

Kunitoh H, 2008, BRIT J CANCER, V99, P852, DOI 10.1038/sj.bjc.6604613

Li J, 2009, ASIA-PAC J CLIN ONCO, V5, P87, DOI 10.1111/j.1743-7563.2009.01196.x

Liu J, 2016, CANCER DISCOV, V6, P1382, DOI 10.1158/2159-8290.CD-16-0577

MANTEL N, 1959, J NATL CANCER I, V22, P719

Mattson KV, 2003, ANN ONCOL, V14, P116, DOI 10.1093/annonc/mdg009

Nagai K, 2003, J THORAC CARDIOV SUR, V125, P254, DOI 10.1067/mtc.2003.15

Nagasaka M, 2018, EXPERT REV ANTICANC, V18, P63, DOI 10.1080/14737140.2018.1409624

Parmar MKB, 1998, STAT MED, V17, P2815, DOI 10.1002/(SICI)1097-0258(19981230)17:24<2815::AID-SIM110>3.0.CO;2-8

PASS HI, 1992, ANN THORAC SURG, V53, P992, DOI 10.1016/0003-4975(92)90373-C

Pataer A, 2012, J THORAC ONCOL, V7, P825, DOI 10.1097/JTO.0b013e318247504a

Pisters KMW, 2005, J CLIN ONCOL, V23, P3270, DOI 10.1200/JCO.2005.11.478

Pless M, 2015, LANCET, V386, P1049, DOI 10.1016/S0140-6736(15)60294-X

Rosell R, 1999, LUNG CANCER, V26, P7, DOI 10.1016/S0169-5002(99)00045-8

ROSELL R, 1994, NEW ENGL J MED, V330, P153, DOI 10.1056/NEJM199401203300301

Roth JA, 1998, LUNG CANCER-J IASLC, V21, P1, DOI 10.1016/S0169-5002(98)00046-4

ROTH JA, 1994, J NATL CANCER I, V86, P673, DOI 10.1093/jnci/86.9.673

Salanti G, 2011, J CLIN EPIDEMIOL, V64, P163, DOI 10.1016/j.jclinepi.2010.03.016

Shepherd FA, 1998, BRIT J CANCER, V78, P683, DOI 10.1038/bjc.1998.560

Siegel RL., 2020, CA-CANCER J CLIN, V70, P7, DOI [DOI 10.3322/caac.21551, 10.3322/caac.21590]

Sutton AJ., 2014, NICE DSU TECHNICAL S

Sutton A, 2008, PHARMACOECONOMICS, V26, P753, DOI 10.2165/00019053-200826090-00006

Thomas M, 2008, LANCET ONCOL, V9, P636, DOI 10.1016/S1470-2045(08)70156-6

Tierney JF, 2007, TRIALS, V8, DOI 10.1186/1745-6215-8-16

Tonin FS, 2017, PHARM PRACT-GRANADA, V15, DOI [10.18549/PharmPract.2017.01.943, 10.18549/pharmpract.2017.01.943]

Topalian SL, 2019, JAMA ONCOL, V5, P1411, DOI 10.1001/jamaoncol.2019.2187

van Meerbeeck JP, 2007, JNCI-J NATL CANCER I, V99, P442, DOI 10.1093/jnci/djk093

Yang X, 2018, NEW ENGL J MED, V379, DOI 10.1056/NEJMc1808251

Zhong WZ, 2019, J CLIN ONCOL, V37, P2235, DOI 10.1200/JCO.19.00075

NR 49

TC 1

Z9 1

U1 1

U2 5

PU SAGE PUBLICATIONS LTD

PI LONDON

PA 1 OLIVERS YARD, 55 CITY ROAD, LONDON EC1Y 1SP, ENGLAND

SN 1758-8340

EI 1758-8359

J9 THER ADV MED ONCOL

JI Ther. Adv. Med. Oncol.

PD NOV

PY 2020

VL 12

AR 1758835920973567

DI 10.1177/1758835920973567

PG 14

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA OX3SD

UT WOS:000593487700001

PM 33240402

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU van Timmeren, JE

Leijenaar, RTH

van Elmpt, W

Reymen, B

Lambin, P

AF van Timmeren, Janna E.

Leijenaar, Ralph T. H.

van Elmpt, Wouter

Reymen, Bart

Lambin, Philippe

TI Feature selection methodology for longitudinal cone-beam CT radiomics

SO ACTA ONCOLOGICA

LA English

DT Article; Proceedings Paper

CT 15th Acta Oncologica Symposium - Biology-Guided Adaptive Radiotherapy

(BiGART)

CY JUN 13-16, 2017

CL Aarhus, DENMARK

ID CELL LUNG-CANCER; LEARNING HEALTH-CARE; COMPUTED-TOMOGRAPHY; PROGNOSTIC

VALUE; TEST-RETEST; RADIATION-THERAPY; TEXTURE FEATURES; IMAGES;

REPRODUCIBILITY; RADIOTHERAPY

AB Background: Cone-beam CT (CBCT) scans are typically acquired daily for positioning verification of non-small cell lung cancer (NSCLC) patients. Quantitative information, derived using radiomics, can potentially contribute to (early) treatment adaptation. The aims of this study were to (1) describe and investigate a methodology for feature selection of a longitudinal radiomics approach (2) investigate which time-point during treatment is potentially useful for early treatment response assessment.

Material and methods: For 90 NSCLC patients CBCT scans of the first two fractions of treatment (considered as 'test-retest' scans) were analyzed, as well as weekly CBCT images. One hundred and sixteen radiomic features were extracted from the GTV of all scans and subsequently absolute and relative differences were calculated between weekly CBCT images and the CBCT of the first fraction. Test-retest scans were used to determine the smallest detectable change (C = 1.96 \* SD) allowing for feature selection by choosing a minimum number of patients for which a feature should change more than 'C' to be considered as relevant. Analysis of which features change at which moment during treatment was used to investigate which time-point is potentially relevant to extract longitudinal radiomics information for early treatment response assessment.

Results: A total of six absolute delta features changed for at least ten patients at week 2 of treatment and increased to 61 at week 3, 79 at week 4 and 85 at week 5. There was 93% overlap between features selected at week 3 and the other weeks.

Conclusions: This study describes a feature selection methodology for longitudinal radiomics that is able to select reproducible delta radiomics features that are informative due to their change during treatment, which can potentially be used for treatment decisions concerning adaptive radiotherapy. Nonetheless, the prognostic value of the selected delta radiomic features should be investigated in future studies.

C1 [van Timmeren, Janna E.; Leijenaar, Ralph T. H.; van Elmpt, Wouter; Reymen, Bart; Lambin, Philippe] Maastricht Univ, Med Ctr, Dept Radiat Oncol MAASTRO, GROW Sch Oncol & Dev Biol, Maastricht, Netherlands.

RP van Timmeren, JE (通讯作者)，GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Dr Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

EM janita.vantimmeren@maastro.nl

RI van Timmeren, Janita/AAL-4456-2020

OI van Timmeren, Janita/0000-0002-8166-6853

FU ERC advanced grant (ERC-ADG) [694812 - Hypoximmuno]; Dutch Technology

Foundation STW [10696 DuCAT, P14-19 Radiomics STRaTegy]; Technology

Programme of the Ministry of Economic Affairs; EU [257144, 601826]; SME

Phase 2 (EU) [673780 - RAIL]; EUROSTARS (DART); European Program H2020

[BD2Decide - PHC30-689715]; European Program H2020 (ImmunoSABR)

[733008]; Interreg V-A Euregio Meuse-Rhine ("Euradiomics");

Kankeronderzoekfonds Limburg from the Health Foundation Limburg; Dutch

Cancer Society

FX Author PL acknowledges financial support from ERC advanced grant

(ERC-ADG-2015, no 694812 - Hypoximmuno). This research is also supported

by the Dutch Technology Foundation STW (grant no 10696 DuCAT & no P14-19

Radiomics STRaTegy), which is the applied science division of NWO, and

the Technology Programme of the Ministry of Economic Affairs. Author PL

also acknowledges financial support from the EU 7th framework program

(ARTFORCE - no 257144, REQUITE - no 601826), SME Phase 2 (EU proposal

673780 - RAIL), EUROSTARS (DART), the European Program H2020-2015-17

(BD2Decide - PHC30-689715 and ImmunoSABR - no 733008), Interreg V-A

Euregio Meuse-Rhine ("Euradiomics"), Kankeronderzoekfonds Limburg from

the Health Foundation Limburg and the Dutch Cancer Society.

CR Aerts HJWL, 2016, JAMA ONCOL, V2, P1636, DOI 10.1001/jamaoncol.2016.2631

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ahn SY, 2015, INVEST RADIOL, V50, P719, DOI 10.1097/RLI.0000000000000174

Balagurunathan Y, 2014, J DIGIT IMAGING, V27, P805, DOI 10.1007/s10278-014-9716-x

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Berkovic P, 2015, ACTA ONCOL, V54, P1438, DOI 10.3109/0284186X.2015.1061209

Bernchou U, 2015, RADIOTHER ONCOL, V117, P17, DOI 10.1016/j.radonc.2015.07.021

Bertelsen A, 2011, RADIOTHER ONCOL, V100, P351, DOI 10.1016/j.radonc.2011.08.012

BLAND JM, 1986, LANCET, V1, P307, DOI 10.1016/s0140-6736(86)90837-8

Brink C, 2014, INT J RADIAT ONCOL, V89, P916, DOI 10.1016/j.ijrobp.2014.03.038

Carvalho S, 2013, ACTA ONCOL, V52, P1398, DOI 10.3109/0284186X.2013.812795

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

FELDKAMP LA, 1984, J OPT SOC AM A, V1, P612, DOI 10.1364/JOSAA.1.000612

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Janssens G, 2011, INT J BIOMED IMAGING, V2011, DOI 10.1155/2011/891585

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2015, ACTA ONCOL, V54, P1289, DOI 10.3109/0284186X.2015.1062136

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Leijenaar RTH, 2015, ACTA ONCOL, V54, P1423, DOI 10.3109/0284186X.2015.1061214

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Shafiq-ul-Hassan M, 2017, MED PHYS, V44, P1050, DOI 10.1002/mp.12123

Tang C, 2016, ACTA ONCOL, V55, P1022, DOI 10.3109/0284186X.2016.1154602

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

van Timmeren JE, 2016, TOMOGRAPHY, V2, P361, DOI 10.18383/j.tom.2016.00208

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

NR 29

TC 39

Z9 39

U1 0

U2 4

PU TAYLOR & FRANCIS LTD

PI ABINGDON

PA 2-4 PARK SQUARE, MILTON PARK, ABINGDON OR14 4RN, OXON, ENGLAND

SN 0284-186X

EI 1651-226X

J9 ACTA ONCOL

JI Acta Oncol.

PY 2017

VL 56

IS 11

BP 1537

EP 1543

DI 10.1080/0284186X.2017.1350285

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED); Conference Proceedings Citation Index - Science (CPCI-S)

SC Oncology

GA FT9IA

UT WOS:000423464400028

PM 28826307

OA Green Submitted, hybrid

DA 2022-08-24

ER

PT J

AU Zheng, K

Wang, XR

Jiang, CZ

Tang, YX

Fang, ZH

Hou, JL

Zhu, ZH

Hu, S

AF Zheng, Kai

Wang, Xinrong

Jiang, Chengzhi

Tang, Yongxiang

Fang, Zhihui

Hou, Jiale

Zhu, Zehua

Hu, Shuo

TI Pre-Operative Prediction of Mediastinal Node Metastasis Using Radiomics

Model Based on F-18-FDG PET/CT of the Primary Tumor in Non-Small Cell

Lung Cancer Patients

SO FRONTIERS IN MEDICINE

LA English

DT Article

DE non-small cell lung cancer; F-18-FDG PET; CT; radiomics analysis; lymph

node staging; predict; primary tumor

ID CT-HISTOGRAM ANALYSIS; LYMPH-NODES; FDG-PET/CT; RADIOTHERAPY; DENSITY;

DISEASE; IMAGES

AB Purpose: We investigated whether a fluorine-18-fluorodeoxy glucose positron emission tomography/computed tomography (F-18-FDG PET/CT)-based radiomics model (RM) could predict the pathological mediastinal lymph node staging (pN staging) in patients with non-small cell lung cancer (NSCLC) undergoing surgery. Methods: A total of 716 patients with a clinicopathological diagnosis of NSCLC were included in this retrospective study. The prediction model was developed in a training cohort that consisted of 501 patients. Radiomics features were extracted from the F-18-FDG PET/CT of the primary tumor. Support vector machine and extremely randomized trees were used to build the RM. Internal validation was assessed. An independent testing cohort contained the remaining 215 patients. The performances of the RM and clinical node staging (cN staging) in predicting pN staging (pN0 vs. pN1 and N2) were compared for each cohort. The area under the curve (AUC) of the receiver operating characteristic curve was applied to assess the model's performance. Results: The AUC of the RM [0.81 (95% CI, 0.771-0.848); sensitivity: 0.794; specificity: 0.704] for the predictive performance of pN1 and N2 was significantly better than that of cN in the training cohort [0.685 (95% CI, 0.644-0.728); sensitivity: 0.804; specificity: 0.568], (P-value = 8.29e-07, as assessed by the Delong test). In the testing cohort, the AUC of the RM [0.766 (95% CI, 0.702-0.830); sensitivity: 0.688; specificity: 0.704] was also significantly higher than that of cN [0.685 (95% CI, 0.619-0.747); sensitivity: 0.799; specificity: 0.568], (P = 0.0371, Delong test). Conclusions: The RM based on F-18-FDG PET/CT has a potential for the pN staging in patients with NSCLC, suggesting that therapeutic planning could be tailored according to the predictions.

C1 [Zheng, Kai; Tang, Yongxiang; Fang, Zhihui; Hou, Jiale; Zhu, Zehua; Hu, Shuo] Cent South Univ, Xiangya Hosp, Dept Nucl Med, Changsha, Peoples R China.

[Zheng, Kai; Jiang, Chengzhi] Hunan Canc Hosp, Positron Emiss Tomog Computed Tomog PET CT Ctr, Changsha, Peoples R China.

[Zheng, Kai] Cent South Univ, Affiliated Canc Hosp, Xiangya Sch Med, Changsha, Peoples R China.

[Wang, Xinrong] Gen Elect GE Healthcare China, Shanghai, Peoples R China.

[Hu, Shuo] Cent South Univ, Xiangya Hosp, Natl Clin Res Ctr Geriatr Disorders, Changsha, Peoples R China.

[Hu, Shuo] Cent South Univ, Xiangya Hosp, Key Lab Biol Nanotechnol, Natl Hlth Commiss, Changsha, Peoples R China.

RP Hu, S (通讯作者)，Cent South Univ, Xiangya Hosp, Dept Nucl Med, Changsha, Peoples R China.; Hu, S (通讯作者)，Cent South Univ, Xiangya Hosp, Natl Clin Res Ctr Geriatr Disorders, Changsha, Peoples R China.; Hu, S (通讯作者)，Cent South Univ, Xiangya Hosp, Key Lab Biol Nanotechnol, Natl Hlth Commiss, Changsha, Peoples R China.

EM hushuo2018@163.com

FU National Natural Science Foundation of China [91859207, 81771873,

81471689]

FX This study was supported by the National Natural Science Foundation of

China (Nos. 91859207, 81771873, and 81471689).

CR Abramyuk A, 2012, LUNG CANCER, V78, P148, DOI 10.1016/j.lungcan.2012.08.001

Altorki NK, 2018, LANCET RESP MED, V6, P915, DOI 10.1016/S2213-2600(18)30411-9

Arshad MA, 2019, EUR J NUCL MED MOL I, V46, P455, DOI 10.1007/s00259-018-4139-4

Ball D, 2019, LANCET ONCOL, V20, P494, DOI 10.1016/S1470-2045(18)30896-9

Bray F, 2020, CA-CANCER J CLIN, V70, P313, DOI 10.3322/caac.21609

Campbell PJ, 2010, NATURE, V467, P1109, DOI 10.1038/nature09460

Chen WQ, 2016, CA-CANCER J CLIN, V66, P115, DOI 10.3322/caac.21338

Cho J, 2017, NUCL MED MOLEC IMAG, V51, P140, DOI 10.1007/s13139-016-0447-4

Choi EK, 2020, EUR RADIOL, V30, P442, DOI 10.1007/s00330-019-06342-1

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

Detterbeck FC, 2017, CHEST, V151, P193, DOI 10.1016/j.chest.2016.10.010

Dong XZ, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0157836

Farjah F, 2013, J THORAC ONCOL, V8, P1170, DOI 10.1097/JTO.0b013e3182992421

Flechsig P, 2017, MOL IMAGING BIOL, V19, P315, DOI 10.1007/s11307-016-0996-z

Flechsig P, 2014, J NUCL MED, V55, P559, DOI 10.2967/jnumed.113.128504

Gao X, 2015, EUR J RADIOL, V84, P312, DOI 10.1016/j.ejrad.2014.11.006

Giesel FL, 2017, J NUCL MED, V58, P282, DOI 10.2967/jnumed.116.179648

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Huang YQ, 2016, J CLIN ONCOL, V34, P2157, DOI 10.1200/JCO.2015.65.9128

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Kang F, 2016, J NUCL MED, V57, P672, DOI 10.2967/jnumed.115.167924

Kim DH, 2014, EUR J NUCL MED MOL I, V41, P2051, DOI 10.1007/s00259-014-2831-6

Kirienko M, 2018, EUR J NUCL MED MOL I, V45, P207, DOI 10.1007/s00259-017-3837-7

Kwon SY, 2011, NUCL MED MOLEC IMAG, V45, P185, DOI 10.1007/s13139-011-0085-9

Lee JW, 2016, EUR RADIOL, V26, P4515, DOI 10.1007/s00330-016-4292-8

Ouyang ML, 2018, CLIN NUCL MED, V43, P715, DOI 10.1097/RLU.0000000000002229

Pedregosa F., 2011, J MACH LEARN RES, V12, P2825

Phillips I, 2019, CLIN ONCOL-UK, V31, P681, DOI 10.1016/j.clon.2019.07.013

Rohren EM, 2004, RADIOLOGY, V231, P305, DOI 10.1148/radiol.2312021185

Yin GT, 2021, EUR RADIOL, V31, P3983, DOI 10.1007/s00330-020-07466-5

Yushkevich PA, 2017, IEEE PULSE, V8, P54, DOI 10.1109/MPUL.2017.2701493

Zhao CK, 2021, THYROID, V31, P470, DOI 10.1089/thy.2020.0305

NR 32

TC 1

Z9 1

U1 0

U2 6

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

EI 2296-858X

J9 FRONT MED-LAUSANNE

JI Front. Med.

PD JUN 18

PY 2021

VL 8

AR 673876

DI 10.3389/fmed.2021.673876

PG 9

WC Medicine, General & Internal

WE Science Citation Index Expanded (SCI-EXPANDED)

SC General & Internal Medicine

GA TC8TF

UT WOS:000668910500001

PM 34222284

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Sugai, Y

Kadoya, N

Tanaka, S

Tanabe, S

Umeda, M

Yamamoto, T

Takeda, K

Dobashi, S

Ohashi, H

Takeda, K

Jingu, K

AF Sugai, Yuto

Kadoya, Noriyuki

Tanaka, Shohei

Tanabe, Shunpei

Umeda, Mariko

Yamamoto, Takaya

Takeda, Kazuya

Dobashi, Suguru

Ohashi, Haruna

Takeda, Ken

Jingu, Keiichi

TI Impact of feature selection methods and subgroup factors on prognostic

analysis with CT-based radiomics in non-small cell lung cancer patients

SO RADIATION ONCOLOGY

LA English

DT Article

DE Radiomics; Prognosis prediction; Feature selection; Subgroup analysis;

Lung cancer

ID MACHINE LEARNING-METHODS; PREDICTING SURVIVAL; TUMOR PHENOTYPE;

SIGNATURE; NODE; TIME; ADENOCARCINOMA; SEGMENTATION; VARIABILITY;

METASTASIS

AB Background Radiomics is a new technology to noninvasively predict survival prognosis with quantitative features extracted from medical images. Most radiomics-based prognostic studies of non-small-cell lung cancer (NSCLC) patients have used mixed datasets of different subgroups. Therefore, we investigated the radiomics-based survival prediction of NSCLC patients by focusing on subgroups with identical characteristics. Methods A total of 304 NSCLC (Stages I-IV) patients treated with radiotherapy in our hospital were used. We extracted 107 radiomic features (i.e., 14 shape features, 18 first-order statistical features, and 75 texture features) from the gross tumor volume drawn on the free breathing planning computed tomography image. Three feature selection methods [i.e., test-retest and multiple segmentation (FS1), Pearson's correlation analysis (FS2), and a method that combined FS1 and FS2 (FS3)] were used to clarify how they affect survival prediction performance. Subgroup analysis for each histological subtype and each T stage applied the best selection method for the analysis of All data. We used a least absolute shrinkage and selection operator Cox regression model for all analyses and evaluated prognostic performance using the concordance-index (C-index) and the Kaplan-Meier method. For subgroup analysis, fivefold cross-validation was applied to ensure model reliability. Results In the analysis of All data, the C-index for the test dataset is 0.62 (FS1), 0.63 (FS2), and 0.62 (FS3). The subgroup analysis indicated that the prediction model based on specific histological subtypes and T stages had a higher C-index for the test dataset than that based on All data (All data, 0.64 vs. SCCall, 060; ADC(all), 0.69; T1, 0.68; T2, 0.65; T3, 0.66; T4, 0.70). In addition, the prediction models unified for each T stage in histological subtype showed a different trend in the C-index for the test dataset between ADC-related and SCC-related models (ADC(T1)-ADC(T4), 0.72-0.83; SCCT1-SCCT4, 0.58-0.71). Conclusions Our results showed that feature selection methods moderately affected the survival prediction performance. In addition, prediction models based on specific subgroups may improve the prediction performance. These results may prove useful for determining the optimal radiomics-based predication model.

C1 [Sugai, Yuto; Kadoya, Noriyuki; Tanaka, Shohei; Tanabe, Shunpei; Umeda, Mariko; Yamamoto, Takaya; Takeda, Kazuya; Jingu, Keiichi] Tohoku Univ, Grad Sch Med, Dept Radiat Oncol, Aoba Ku, 1-1 Seiryo Machi, Sendai, Miyagi 9808574, Japan.

[Dobashi, Suguru; Ohashi, Haruna; Takeda, Ken] Tohoku Univ, Fac Med, Sch Hlth Sci, Dept Radiol Technol, Sendai, Miyagi, Japan.

RP Kadoya, N (通讯作者)，Tohoku Univ, Grad Sch Med, Dept Radiat Oncol, Aoba Ku, 1-1 Seiryo Machi, Sendai, Miyagi 9808574, Japan.

EM kadoya.n@rad.med.tohoku.ac.jp

RI Takeda, Ken/L-1914-2019

OI Tanaka, Shohei/0000-0002-4257-5342

FU Japan Society for the Promotion of Science [19K08116]

FX This study was supported in part by the Japan Society for the Promotion

of Science Grant-in-Aid for Scientific Research (C) (19K08116).

CR Abel S, 2019, LUNG CANCER, V128, P127, DOI 10.1016/j.lungcan.2018.12.022

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Baessler B, 2020, EUR RADIOL, V30, P2334, DOI 10.1007/s00330-019-06495-z

Bortolotto C, 2021, EXPERT REV ANTICANC, V21, P257, DOI 10.1080/14737140.2021.1852935

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Chaddad A, 2017, ONCOTARGET, V8, P104393, DOI 10.18632/oncotarget.22251

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Erdim C, 2020, ACAD RADIOL, V27, P1422, DOI 10.1016/j.acra.2019.12.015

Ferlay J, 2015, INT J CANCER, V136, pE359, DOI 10.1002/ijc.29210

Fukui T, 2015, GEN THORAC CARDIOVAS, V63, P507, DOI 10.1007/s11748-015-0564-5

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Kadoya N, 2020, MED PHYS, V47, P2197, DOI 10.1002/mp.14104

Kakino R, 2020, MED PHYS, V47, P4634, DOI 10.1002/mp.14380

Lambin P, 2017, ADV DRUG DELIVER REV, V109, P131, DOI 10.1016/j.addr.2016.01.006

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lao JW, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-10649-8

Leger S, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-13448-3

Li HL, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.00057

Liang WH, 2015, J CLIN ONCOL, V33, P861, DOI 10.1200/JCO.2014.56.6661

Lin P, 2020, CANCER IMAGING, V20, DOI 10.1186/s40644-019-0283-8

Liu C, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.544339

Liu J, 2019, MED PHYS, V46, P3091, DOI 10.1002/mp.13551

Molina JR, 2008, MAYO CLIN PROC, V83, P584, DOI 10.4065/83.5.584

Mori M, 2020, RADIOTHER ONCOL, V153, P258, DOI 10.1016/j.radonc.2020.07.003

Morin O, 2018, INT J RADIAT ONCOL, V102, P1074, DOI 10.1016/j.ijrobp.2018.08.032

Oikonomou A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-22357-y

Ouyang ML, 2019, ANN NUCL MED, V33, P671, DOI 10.1007/s12149-019-01375-4

Rami-Porta R, 2015, TRANSL LUNG CANCER R, V4, P415, DOI 10.3978/j.issn.2218-6751.2015.07.11

Saeys Y, 2007, BIOINFORMATICS, V23, P2507, DOI 10.1093/bioinformatics/btm344

Soufi M, 2018, MED PHYS, V45, P5116, DOI 10.1002/mp.13202

Sun R, 2018, LANCET ONCOL, V19, P1180, DOI 10.1016/S1470-2045(18)30413-3

Sun WZ, 2018, RADIAT ONCOL, V13, DOI 10.1186/s13014-018-1140-9

Tanaka S, 2019, PHYS MEDICA, V58, P141, DOI 10.1016/j.ejmp.2019.02.009

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

van Timmeren JE, 2019, RADIOTHER ONCOL, V136, P78, DOI 10.1016/j.radonc.2019.03.032

Velazquez ER, 2013, SCI REP-UK, V3, DOI 10.1038/srep03529

Velazquez ER, 2012, RADIOTHER ONCOL, V105, P167, DOI 10.1016/j.radonc.2012.09.023

Wang LL, 2019, EUR RADIOL, V29, P2958, DOI 10.1007/s00330-018-5949-2

Wang X, 2020, PHYS MED BIOL, V65, DOI 10.1088/1361-6560/ab6e51

Wu WM, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00071

Yang J, 2020, RADIOTHER ONCOL, V150, P89, DOI 10.1016/j.radonc.2020.06.004

Yang LF, 2019, EUR RADIOL, V29, P2196, DOI 10.1007/s00330-018-5770-y

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

Zhao BS, 2009, RADIOLOGY, V252, P263, DOI 10.1148/radiol.2522081593

Zhao SJ, 2021, TRANSL LUNG CANCER R, V10, DOI 10.21037/tlcr-20-361

Zhou XZ, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.00604

Zhu XZ, 2018, EUR RADIOL, V28, P2772, DOI 10.1007/s00330-017-5221-1

Zwanenburg A, 2020, RADIOLOGY, V295, P328, DOI 10.1148/radiol.2020191145

NR 51

TC 4

Z9 4

U1 2

U2 5

PU BMC

PI LONDON

PA CAMPUS, 4 CRINAN ST, LONDON N1 9XW, ENGLAND

EI 1748-717X

J9 RADIAT ONCOL

JI Radiat. Oncol.

PD APR 30

PY 2021

VL 16

IS 1

AR 80

DI 10.1186/s13014-021-01810-9

PG 12

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA RV5XS

UT WOS:000645906000001

PM 33931085

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Yap, ML

Vinod, SK

Shon, IAH

Fowler, A

Lin, M

Gabriel, G

Holloway, LC

AF Yap, Mei L.

Vinod, S. K.

Shon, I. A. Ho

Fowler, A.

Lin, M.

Gabriel, G.

Holloway, L. C.

TI The Registration of Diagnostic versus Planning Fluorodeoxyglucose

Positron Emission Tomography/Computed Tomography in Radiotherapy

Planning for Non-small Cell Lung Cancer

SO CLINICAL ONCOLOGY

LA English

DT Article

DE Computer assisted; computer-assisted image analysis; conformal

radiotherapy; non-small cell lung cancer (NSCLC); positron emission

tomography; radiotherapy planning

ID GROSS TUMOR VOLUME; WHOLE-BODY PET; INTEGRATED PET/CT; CT; IMPACT;

ACCURACY; DEFINITION; LESIONS; SYSTEM; TARGET

AB Aims: Radiotherapy for non-small cell lung cancer (NSCLC) increasingly utilises fluorodeoxyglucose positron emission tomography/computed tomography (PET/CT) fusion. However, it is unknown whether a PET/CT scan conducted in the treatment position results in more accurate registration to the radiotherapy planning CT (rCT) than a diagnostic PET/CT scan. The aim of this study was to compare the accuracy of registration of the CT components of the planning PET/CT scan (pCT) and diagnostic PET/CT scan (dCT) scan with the rCT.

Materials and methods: Ten patients with stage I-III NSCLC underwent an rCT immediately followed by a planning PET/CT scan, both carried out with arms placed above the head and immobilisation in the treatment position. All previously underwent a diagnostic FDG PET/CT, which was carried out with the arms above the head, but without custom immobilisation. dCT and pCT were registered to the rCT using a rigid body mutual information algorithm. Four observers identified 12 anatomical points on each scan and differences in their absolute location were analysed.

Results: At the carina, the mean absolute error (MAE) for pCT-rCT compared with dCT-rCT was 4.37 versus 5.73 mm (P=0.028). However, there was no significant difference in the root mean squared error (RMSE) for that point. There were no significant differences in MAE or RMSE for all other anatomical points. The MAE for all points was 4.11 versus 4.15 mm (P=NS) and RMSE was 4.40 versus 4.48 mm for pCT-rCT compared with dCT-rCT (P=NS).

Conclusions: There is an average of 4 mm of misregistration when registering the CT components of PET/CT scans to the rCT for NSCLC. Using a rigid registration technique, the registration of a diagnostic PET/CT is as good as the registration of a planning PET/CT. (C) 2010 The Royal College of Radiologists. Published by Elsevier Ltd. All rights reserved.

C1 [Yap, Mei L.; Vinod, S. K.; Fowler, A.; Gabriel, G.; Holloway, L. C.] Liverpool Hosp, Dept Radiat Oncol, Liverpool, NSW, Australia.

[Vinod, S. K.; Shon, I. A. Ho; Lin, M.; Gabriel, G.] Univ New S Wales, Sydney, NSW, Australia.

[Shon, I. A. Ho; Lin, M.] Liverpool Hosp, Dept Nucl Med, Liverpool, NSW, Australia.

[Shon, I. A. Ho; Lin, M.] Liverpool Hosp, PET, Liverpool, NSW, Australia.

[Holloway, L. C.] Univ Sydney, Inst Med Phys, Sydney, NSW 2006, Australia.

[Holloway, L. C.] Univ Wollongong, Ctr Med Radiat Phys, Wollongong, NSW, Australia.

RP Vinod, SK (通讯作者)，Liverpool Hosp, Dept Radiat Oncol, Canc Therapy Ctr, Locked Bag 7103, Liverpool Bc, NSW 1871, Australia.

EM shalini.vinod@sswahs.nsw.gov.au

RI Yap, Meiling/ABG-6150-2021

OI Gabriel, Gabriel/0000-0003-0988-2137; Vinod,

Shalini/0000-0001-8075-6219; Holloway, Lois/0000-0003-4337-2165

CR Antoch G, 2003, RADIOLOGY, V229, P526, DOI 10.1148/radiol.2292021598

Ashamalla H, 2005, INT J RADIAT ONCOL, V63, P1016, DOI 10.1016/j.ijrobp.2005.04.021

Bradley J, 2004, INT J RADIAT ONCOL, V59, P78, DOI 10.1016/j.ijrobp.2003.10.044

Brianzoni E, 2005, EUR J NUCL MED MOL I, V32, P1392, DOI 10.1007/s00259-005-1845-5

Cohade C, 2003, EUR J NUCL MED MOL I, V30, P721, DOI 10.1007/s00259-002-1055-3

EVERETT SJ, 2009, 13 WORLD C LUNG CANC

Fox JL, 2005, INT J RADIAT ONCOL, V62, P70, DOI 10.1016/j.ijrobp.2004.09.020

Goerres GW, 2002, EUR J NUCL MED MOL I, V29, P351, DOI 10.1007/s00259-001-0710-4

Goerres GW, 2002, J NUCL MED, V43, P1469

Gondi V, 2007, INT J RADIAT ONCOL, V67, P187, DOI 10.1016/j.ijrobp.2006.09.033

Grgic A, 2009, INT J RADIAT ONCOL, V73, P103, DOI 10.1016/j.ijrobp.2008.03.063

Grills IS, 2007, INT J RADIAT ONCOL, V67, P709, DOI 10.1016/j.ijrobp.2006.09.046

Gupta NC, 1999, ANN SURG, V229, P286, DOI 10.1097/00000658-199902000-00018

Hany TF, 2002, RADIOLOGY, V225, P575, DOI 10.1148/radiol.2252011568

Ireland RH, 2007, INT J RADIAT ONCOL, V68, P952, DOI 10.1016/j.ijrobp.2007.02.017

Kalff V, 2001, J CLIN ONCOL, V19, P111, DOI 10.1200/JCO.2001.19.1.111

Lardinois D, 2003, NEW ENGL J MED, V348, P2500, DOI 10.1056/NEJMoa022136

LIN P, 2009, INCREMENTAL CLIN VAL

Mah K, 2002, INT J RADIAT ONCOL, V52, P339, DOI 10.1016/S0360-3016(01)01824-7

Pieterman RM, 2000, NEW ENGL J MED, V343, P254, DOI 10.1056/NEJM200007273430404

Shekhar R, 2005, J NUCL MED, V46, P1488

Slomka PJ, 2003, J NUCL MED, V44, P1156

SNOKE J, 2008, INT J RADIAT ONCOL, V70, P590

Underberg RWM, 2006, RADIAT ONCOL, V1, DOI 10.1186/1748-717X-1-8

Van Der Wel A, 2005, INT J RADIAT ONCOL, V61, P649, DOI 10.1016/j.ijrobp.2004.06.205

van Tinteren H, 2002, LANCET, V359, P1388, DOI 10.1016/S0140-6736(02)08352-6

Vlachaki M, 2009, AM J CLIN ONCOL-CANC, V32, P262, DOI 10.1097/COC.0b013e318184b33a

NR 27

TC 0

Z9 0

U1 0

U2 1

PU ELSEVIER SCIENCE LONDON

PI LONDON

PA 84 THEOBALDS RD, LONDON WC1X 8RR, ENGLAND

SN 0936-6555

EI 1433-2981

J9 CLIN ONCOL-UK

JI Clin. Oncol.

PD SEP

PY 2010

VL 22

IS 7

BP 554

EP 560

DI 10.1016/j.clon.2010.05.014

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA 652IO

UT WOS:000281997400007

PM 20605426

DA 2022-08-24

ER

PT J

AU Lee, SH

Kao, GD

Feigenberg, SJ

Dorsey, JF

Frick, MA

Jean-Baptiste, S

Uche, CZ

Cengel, KA

Levin, WP

Berman, AT

Aggarwal, C

Fan, Y

Xiao, Y

AF Lee, Sang Ho

Kao, Gary D.

Feigenberg, Steven J.

Dorsey, Jay F.

Frick, Melissa A.

Jean-Baptiste, Samuel

Uche, Chibueze Z.

Cengel, Keith A.

Levin, William P.

Berman, Abigail T.

Aggarwal, Charu

Fan, Yong

Xiao, Ying

TI Multiblock Discriminant Analysis of Integrative F-18-FDG-PET/CT

Radiomics for Predicting Circulating Tumor Cells in Early-Stage

Non-small Cell Lung Cancer Treated With Stereotactic Body Radiation

Therapy

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

ID HETEROGENEITY; FEATURES; SELECTION

AB Purpose: The main objective of the present study was to integrate F-18-FDG-PET/CT radiomics with multiblock discriminant analysis for predicting circulating tumor cells (CTCs) in early-stage non-small cell lung cancer (ES-NSCLC) treated with stereotactic body radiation therapy (SBRT).

Methods: Fifty-six patients with stage I NSCLC treated with SBRT underwent F-18-FDG-PET/CT imaging pre-SBRT and post-SBRT (median, 5 months; range, 3-10 months). CTCs were assessed via a telomerase-based assay before and within 3 months after SBRT and dichotomized at 5 and 1.3 CTCs/ mL. Pre-SBRT, post-SBRT, and delta PET/CT radiomics features (n Z 1548 x 3/1562 x 3) were extracted from gross tumor volume. Seven feature blocks were constructed including clinical parameters (n Z 12). Multiblock data integration was performed using block sparse partial least squares- discriminant analysis (sPLS-DA) referred to as Data Integration Analysis for Biomarker Discovery Using Latent Components (DIABLO) for identifying key signatures by maximizing common information between different feature blocks while discriminating CTC levels. Optimal input blocks were identified using a pairwise combination method. DIABLO performance for predicting pre-SBRT and post-SBRT CTCs was evaluated using combined AUC (area under the curve, averaged across different blocks) analysis with 20 x 5-fold cross-validation (CV) and compared with that of concatenation-based sPLS-DA that consisted of combining all features into 1 block. CV prediction scores between 1 class versus the other were compared using the Wilcoxon rank sum test.

Results: For predicting pre-SBRT CTCs, DIABLO achieved the best performance with combined pre-SBRT PET radiomics and clinical feature blocks, showing CVAUC of 0.875 (P = .009). For predicting post-SBRT CTCs, DIABLO achieved the best performance with combined post-SBRT CT and delta CT radiomics feature blocks, showing CV AUCs of 0.883 (P = .001). In contrast, all single-block sPLS-DA models could not attain CV AUCs higher than 0.7.

Conclusions: Multiblock integration with discriminant analysis of F-18-FDG-PET/CT radiomics has the potential for predicting pre-SBRT and post-SBRT CTCs. Radiomics and CTC analysis may complement and together help guide the subsequent management of patients with ES-NSCLC. (C) 2021 Elsevier Inc. All rights reserved.

C1 [Lee, Sang Ho; Kao, Gary D.; Feigenberg, Steven J.; Dorsey, Jay F.; Frick, Melissa A.; Jean-Baptiste, Samuel; Uche, Chibueze Z.; Cengel, Keith A.; Levin, William P.; Berman, Abigail T.; Xiao, Ying] Univ Penn, Dept Radiat Oncol, Philadelphia, PA 19104 USA.

[Aggarwal, Charu] Univ Penn, Div Hematol Oncol, Dept Med, Philadelphia, PA USA.

[Fan, Yong] Univ Penn, Dept Radiol, Philadelphia, PA 19104 USA.

RP Lee, SH (通讯作者)，Univ Penn, Dept Radiat Oncol, Philadelphia, PA 19104 USA.

EM SangHo.Lee@pennmedicine.upenn.edu

RI Lee, Sang Ho/B-9149-2017

OI Lee, Sang Ho/0000-0002-4634-4904

FU National Cancer Institute [R01CA201071, U24CA180803, U10CA180868]

FX This project was supported by grants R01CA201071 (to G.D.K.),

U24CA180803 (IROC), and U10CA180868 (NRG), all from the National Cancer

Institute.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

Bengio Y, 2004, J MACH LEARN RES, V5, P1089

Berman AT, 2019, TRANSL LUNG CANCER R, V8, P5, DOI 10.21037/tlcr.2018.12.12

Bradley JD, 2010, INT J RADIAT ONCOL, V77, P1146, DOI 10.1016/j.ijrobp.2009.06.017

Cao KAL, 2011, BMC BIOINFORMATICS, V12, DOI 10.1186/1471-2105-12-253

Chicklore S, 2013, EUR J NUCL MED MOL I, V40, P133, DOI 10.1007/s00259-012-2247-0

Chinniah C, 2019, CLIN LUNG CANCER, V20, P384, DOI 10.1016/j.cllc.2019.04.011

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Dissaux G, 2020, J NUCL MED, V61, P814, DOI 10.2967/jnumed.119.228106

Dorsey JF, 2015, CANCER-AM CANCER SOC, V121, P139, DOI 10.1002/cncr.28975

Fan JQ, 2008, J R STAT SOC B, V70, P849, DOI 10.1111/j.1467-9868.2008.00674.x

Fan JQ, 2018, ANN STAT, V46, P989, DOI 10.1214/17-AOS1575

Fiorelli A, 2015, ANN THORAC SURG, V99, P1899, DOI 10.1016/j.athoracsur.2014.11.049

Frick MA, 2020, CLIN CANCER RES, V26, P2372, DOI 10.1158/1078-0432.CCR-19-2158

Frick MA, 2018, INT J RADIAT ONCOL, V102, P536, DOI 10.1016/j.ijrobp.2018.06.041

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Ganeshan B, 2013, CANCER IMAGING, V13, P140, DOI 10.1102/1470-7330.2013.0015

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

HEPPNER GH, 1984, CANCER RES, V44, P2259

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Junttila MR, 2013, NATURE, V501, P346, DOI 10.1038/nature12626

Kim JH, 2009, COMPUT STAT DATA AN, V53, P3735, DOI 10.1016/j.csda.2009.04.009

Kononenko Igor, 2007, MACHINE LEARNING DAT

Lafata KJ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf5a5

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Le Cao KA, 2008, STAT APPL GENET MOL, V7, DOI 10.2202/1544-6115.1390

Lee SH, 2020, PHYS MED BIOL, V65, DOI 10.1088/1361-6560/ab8531

Lee SH, 2010, MED PHYS, V37, P3940, DOI 10.1118/1.3446799

Leijenaar RTH, 2015, SCI REP-UK, V5, DOI 10.1038/srep11075

Li HM, 2018, RADIOTHER ONCOL, V129, P218, DOI 10.1016/j.radonc.2018.06.025

Li Q, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0892-y

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

Lindsay CR, 2017, ANN ONCOL, V28, P1523, DOI 10.1093/annonc/mdx156

Liu ZY, 2019, THERANOSTICS, V9, P1303, DOI 10.7150/thno.30309

Lv WB, 2019, MOL IMAGING BIOL, V21, P954, DOI 10.1007/s11307-018-01304-3

Molinaro AM, 2005, BIOINFORMATICS, V21, P3301, DOI 10.1093/bioinformatics/bti499

Norgeot B, 2020, NAT MED, V26, P1320, DOI 10.1038/s41591-020-1041-y

O'Connor JPB, 2015, CLIN CANCER RES, V21, P249, DOI 10.1158/1078-0432.CCR-14-0990

Oikonomou A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-22357-y

Ou XJ, 2019, CONTRAST MEDIA MOL I, DOI 10.1155/2019/4507694

Pavic M, 2020, EJNMMI RES, V10, DOI 10.1186/s13550-020-00669-3

Rohart F, 2017, PLOS COMPUT BIOL, V13, DOI 10.1371/journal.pcbi.1005752

Sanduleanu S, 2018, RADIOTHER ONCOL, V127, P349, DOI 10.1016/j.radonc.2018.03.033

Schneider BJ, 2020, J CLIN ONCOL, V38, P753, DOI 10.1200/JCO.19.02748

Shah JL, 2017, SEMIN RADIAT ONCOL, V27, P218, DOI 10.1016/j.semradonc.2017.03.001

Singh A, 2019, BIOINFORMATICS, V35, P3055, DOI 10.1093/bioinformatics/bty1054

Stephans KL, 2018, INT J RADIAT ONCOL, V100, P462, DOI 10.1016/j.ijrobp.2017.10.037

Tanaka F, 2009, CLIN CANCER RES, V15, P6980, DOI 10.1158/1078-0432.CCR-09-1095

Tenenhaus A, 2014, BIOSTATISTICS, V15, P569, DOI 10.1093/biostatistics/kxu001

Thibault G, 2014, IEEE T BIO-MED ENG, V61, P630, DOI 10.1109/TBME.2013.2284600

Tibshirani R, 2011, J R STAT SOC B, V73, P273, DOI 10.1111/j.1467-9868.2011.00771.x

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Wang Y, 2012, EURASIP J ADV SIG PR, V40

Wei L, 2019, Q J NUCL MED MOL IM, V63, P323, DOI 10.23736/S1824-4785.19.03213-8

Welch ML, 2019, RADIOTHER ONCOL, V130, P2, DOI 10.1016/j.radonc.2018.10.027

Yoon HJ, 2015, MEDICINE, V94, DOI 10.1097/MD.0000000000001753

Yu W, 2018, INT J RADIAT ONCOL, V102, P1090, DOI 10.1016/j.ijrobp.2017.10.046

Zanfardino M, 2019, J TRANSL MED, V17, DOI 10.1186/s12967-019-2073-2

NR 59

TC 3

Z9 3

U1 1

U2 4

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD AUG 1

PY 2021

VL 110

IS 5

BP 1451

EP 1465

DI 10.1016/j.ijrobp.2021.02.030

EA JUL 2021

PG 15

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA TT3OH

UT WOS:000680259900026

PM 33662459

OA Bronze, Green Accepted

DA 2022-08-24

ER

PT J

AU Liang, B

Van, Y

Chen, XY

Yan, H

Yan, LL

Zhang, T

Zhou, ZM

Wang, H

Dai, JR

AF Liang, Bin

Van, Yuan

Chen, Xinyuan

Yan, Hui

Yan, Lingling

Zhang, Tao

Zhou, Zongmei

Wang, Lvhua

Dai, Jianrong

TI Prediction of Radiation Pneumonitis With Dose Distribution: A

Convolutional Neural Network (CNN) Based Model

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE convolutional neural network; dose distribution; pneumonitis prediction;

dosiomics; deep learning

ID LUNG-CANCER; RADIOTHERAPY; THERAPY; IMAGES

AB Radiation pneumonitis (RP) is one of the major side effects of thoracic radiotherapy. The aim of this study is to build a dose distribution based prediction model, and investigate the correlation of RP incidence and high-order features of dose distribution. A convolution 3D (C3D) neural network was used to construct the prediction model. The C3D network was pre-trained for action recognition. The dose distribution was used as input of the prediction model. With the C3D network, the convolution operation was performed in 3D space. The guided gradient-weighted class activation map (grad-CAM) was utilized to locate the regions of dose distribution which were strongly correlated with grade >= 2 and grade<2 RP cases, respectively. The features learned by the convolution filters were generated with gradient ascend to understand the deep network. The performance of the C3D prediction model was evaluated by comparing with three multivariate logistic regression (LR) prediction models, which used the dosimetric, normal tissue complication probability (NTCP) or dosiomics factors as input, respectively. All the prediction models were validated using 70 non-small cell lung cancer (NSCLC) patients treated with volumetric modulated arc therapy (VMAT). The area under curve (AUC) of C3D prediction model was 0.842. While the AUC of the three LR models were 0.676, 0.744 and 0.782, respectively. The guided grad-CAM indicated that the low-dose region of contralateral lung and high-dose region of ipsilateral lung were strongly correlated with the grade >= 2 and grade<2 RP cases, respectively. The features learned by shallow filters were simple and globally consistent, and of monotonous color. The features of deeper filters displayed more complicated pattern, which was hard or impossible to give strict mathematical definition. In conclusion, we built a C3D model for thoracic radiotherapy toxicity prediction. The results demonstrate its performance is superior over the classical LR models. In addition, CNN also offers a new perspective to further understand RP incidence.

C1 [Liang, Bin; Van, Yuan; Chen, Xinyuan; Yan, Hui; Yan, Lingling; Zhang, Tao; Zhou, Zongmei; Wang, Lvhua; Dai, Jianrong] Chinese Acad Med Sci & Peking Union Med Coll, Dept Radiat Oncol, Natl Canc Ctr, Natl Clin Res Ctr Canc,Canc Hosp, Beijing, Peoples R China.

RP Wang, H; Dai, JR (通讯作者)，Chinese Acad Med Sci & Peking Union Med Coll, Dept Radiat Oncol, Natl Canc Ctr, Natl Clin Res Ctr Canc,Canc Hosp, Beijing, Peoples R China.

EM wlhwq@yahoo.com; dai\_jianrong@cicams.ac.cn

FU National Natural Science Foundation of China [11475261, 81801799,

81502649]; National Key R&D Program of China [2016YFC0904600]

FX This work was supported by the National Natural Science Foundation of

China (11475261, 81801799, and 81502649) and the National Key R&D

Program of China (2016YFC0904600).

CR Abadi M., 2016, ARXIV 160304467

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Avanzo M, 2015, PHYS MEDICA, V31, P1, DOI 10.1016/j.ejmp.2014.10.006

Boonyawan K, 2018, INT J RADIAT ONCOL, V101, P919, DOI 10.1016/j.ijrobp.2018.04.012

Briere TM, 2016, INT J RADIAT ONCOL, V94, P377, DOI 10.1016/j.ijrobp.2015.10.002

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Tran D, 2015, IEEE I CONF COMP VIS, P4489, DOI 10.1109/ICCV.2015.510

Gabrys HS, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00035

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Ibragimov B, 2018, MED PHYS, V45, P4763, DOI 10.1002/mp.13122

KALLMAN P, 1992, INT J RADIAT BIOL, V62, P249, DOI 10.1080/09553009214552071

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

LeCun Y, 2015, NATURE, V521, P436, DOI 10.1038/nature14539

Li DY, 2017, PROC INT C TOOLS ART, P807, DOI 10.1109/ICTAI.2017.00127

Liang B, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00269

LYMAN JT, 1985, RADIAT RES, V104, pS13, DOI 10.2307/3576626

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Palma DA, 2013, INT J RADIAT ONCOL, V85, P444, DOI 10.1016/j.ijrobp.2012.04.043

Pinnix CC, 2015, INT J RADIAT ONCOL, V92, P175, DOI 10.1016/j.ijrobp.2015.02.010

R Development Core Team, 2009, R LANG ENV STAT COMP

Rossi L, 2018, RADIOTHER ONCOL, V129, P548, DOI 10.1016/j.radonc.2018.07.027

Selvaraju RR, 2016, GRAD CAM WHY DID YOU, DOI [10.1109/ICCV.2017.74, DOI 10.1109/ICCV.2017.74]

Soomro K., 2012, UCF101 DATASET 101 H

Tsougos I, 2005, PHYS MED BIOL, V50, P3535, DOI 10.1088/0031-9155/50/15/004

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

Vittinghoff E, 2007, AM J EPIDEMIOL, V165, P710, DOI 10.1093/aje/kwk052

Yorke ED, 2002, INT J RADIAT ONCOL, V54, P329, DOI 10.1016/S0360-3016(02)02929-2

Zhen X, 2017, PHYS MED BIOL, V62, P8246, DOI 10.1088/1361-6560/aa8d09

NR 30

TC 22

Z9 23

U1 0

U2 13

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD JAN 31

PY 2020

VL 9

AR 1500

DI 10.3389/fonc.2019.01500

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA KO6RZ

UT WOS:000515678300001

PM 32076596

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Yu, H

Lam, KO

Wu, HM

Green, M

Wang, WL

Jin, JY

Hu, C

Jolly, S

Wang, Y

Kong, FMS

AF Yu, Hao

Lam, Ka-On

Wu, Huanmei

Green, Michael

Wang, Weili

Jin, Jian-Yue

Hu, Chen

Jolly, Shruti

Wang, Yang

Kong, Feng-Ming Spring

TI Weighted-Support Vector Machine Learning Classifier of Circulating

Cytokine Biomarkers to Predict Radiation-Induced Lung Fibrosis in

Non-Small-Cell Lung Cancer Patients

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE Support Vector Machine; radiation-induced lung fibrosis; non-small-cell

lung cancer; cytokine; lung dosimetric factors

AB Background

Radiation-induced lung fibrosis (RILF) is an important late toxicity in patients with non-small-cell lung cancer (NSCLC) after radiotherapy (RT). Clinically significant RILF can impact quality of life and/or cause non-cancer related death. This study aimed to determine whether pre-treatment plasma cytokine levels have a significant effect on the risk of RILF and investigate the abilities of machine learning algorithms for risk prediction.

Methods

This is a secondary analysis of prospective studies from two academic cancer centers. The primary endpoint was grade >= 2 (RILF2), classified according to a system consistent with the consensus recommendation of an expert panel of the AAPM task for normal tissue toxicity. Eligible patients must have at least 6 months' follow-up after radiotherapy commencement. Baseline levels of 30 cytokines, dosimetric, and clinical characteristics were analyzed. Support vector machine (SVM) algorithm was applied for model development. Data from one center was used for model training and development; and data of another center was applied as an independent external validation.

Results

There were 57 and 37 eligible patients in training and validation datasets, with 14 and 16.2% RILF2, respectively. Of the 30 plasma cytokines evaluated, SVM identified baseline circulating CCL4 as the most significant cytokine associated with RILF2 risk in both datasets (P = 0.003 and 0.07, for training and test sets, respectively). An SVM classifier predictive of RILF2 was generated in Cohort 1 with CCL4, mean lung dose (MLD) and chemotherapy as key model features. This classifier was validated in Cohort 2 with accuracy of 0.757 and area under the curve (AUC) of 0.855.

Conclusions

Using machine learning, this study constructed and validated a weighted-SVM classifier incorporating circulating CCL4 levels with significant dosimetric and clinical parameters which predicts RILF2 risk with a reasonable accuracy. Further study with larger sample size is needed to validate the role of CCL4, and this SVM classifier in RILF2.

C1 [Yu, Hao; Wang, Yang] Shenzhen Polytech, Biomed Engn, Shenzhen, Peoples R China.

[Yu, Hao; Wu, Huanmei] Indiana Univ Purdue Univ Indianapolis IUPUI, BioHlth Informat, Sch Informat & Comp, Indianapolis, IN USA.

[Lam, Ka-On; Kong, Feng-Ming Spring] Univ Hong Kong, Li Ka Shing LKS Fac Med, Dept Clin Oncol, Hong Kong, Peoples R China.

[Lam, Ka-On; Kong, Feng-Ming Spring] Univ Hong Kong, Clin Oncol Ctr, Shenzhen Hosp, Shenzhen, Peoples R China.

[Green, Michael] Ann Arbor VA Hlth Care, Radiat Oncol, Ann Arbor, MI USA.

[Green, Michael; Jolly, Shruti] Univ Michigan, Radat Oncol, Ann Arbor, MI 48109 USA.

[Wang, Weili; Jin, Jian-Yue; Kong, Feng-Ming Spring] Case Western Reserve Univ, Univ Hosp, Cleveland Med Ctr, Seidman Canc Ctr, Cleveland, OH 44106 USA.

[Wang, Weili; Jin, Jian-Yue; Kong, Feng-Ming Spring] Case Western Reserve Univ, Case Comprehens Canc Ctr, Cleveland, OH 44106 USA.

[Hu, Chen] Johns Hopkins Univ, Sch Med, Sidney Kimmel Comprehens Canc Ctr, Baltimore, MD USA.

RP Kong, FMS (通讯作者)，Univ Hong Kong, Li Ka Shing LKS Fac Med, Dept Clin Oncol, Hong Kong, Peoples R China.; Kong, FMS (通讯作者)，Univ Hong Kong, Clin Oncol Ctr, Shenzhen Hosp, Shenzhen, Peoples R China.; Kong, FMS (通讯作者)，Case Western Reserve Univ, Univ Hosp, Cleveland Med Ctr, Seidman Canc Ctr, Cleveland, OH 44106 USA.; Kong, FMS (通讯作者)，Case Western Reserve Univ, Case Comprehens Canc Ctr, Cleveland, OH 44106 USA.

EM kong0001@hku.hk

RI Wang, Weili/A-5336-2013

OI Wang, Weili/0000-0002-1627-3025; Wu, Huanmei/0000-0003-0346-6044; Hu,

Chen/0000-0003-4672-1981

FU Shenzhen Fundamental Research Program; Shenzhen Science and Technology

Program [No.KQTD2018041 1185028798]

FX This project was supported in parts by Shenzhen Fundamental Research

Program (No. JCYJ2020109150427184), Shenzhen Science and Technology

Program (No.KQTD2018041 1185028798) and Shenzhen Fundamental Research

Program (No.JCYJ20180508153249223). The funders had no role in the

initiation or design of the study, collection of samples, analysis,

interpretation of data, writing of the paper, or the submission for

publication. The study and researchers are independent of the funders.

CR Ao XP, 2009, J HEMATOL ONCOL, V2, DOI 10.1186/1756-8722-2-6

Bender E, 2014, NATURE, V513, pS2, DOI 10.1038/513S2a

Bousabarah K, 2019, STRAHLENTHER ONKOL, V195, P830, DOI 10.1007/s00066-019-01452-7

Cai JR, 2017, BIOCHEM BIOPH RES CO, V491, P662, DOI 10.1016/j.bbrc.2017.07.147

Capelli A, 2005, EUR RESPIR J, V25, P701, DOI 10.1183/09031936.05.00082604

Carvalheiro T, 2018, INFLAMM RES, V67, P169, DOI 10.1007/s00011-017-1106-7

Chargari Cyrus, 2013, Presse Med, V42, pe342, DOI 10.1016/j.lpm.2013.06.012

Citrin DE, 2017, RADIAT RES, V188, P1, DOI 10.1667/RR14784.1

Ellsworth SG, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0183239

Emad A, 2007, TOXICOLOGY, V240, P60, DOI 10.1016/j.tox.2007.07.014

Groves AM, 2018, RADIAT RES, V190, P513, DOI 10.1667/RR15122.1

Hanania AN, 2019, CHEST, V156, P150, DOI 10.1016/j.chest.2019.03.033

Hart JP, 2005, INT J RADIAT ONCOL, V63, P1448, DOI 10.1016/j.ijrobp.2005.05.032

Hernando ML, 2001, INT J RADIAT ONCOL, V51, P650, DOI 10.1016/S0360-3016(01)01685-6

Ishida Y, 2007, AM J PATHOL, V170, P843, DOI 10.2353/ajpath.2007.051213

Kong FM, 2006, INT J RADIAT ONCOL, V65, P1075, DOI 10.1016/j.ijrobp.2006.01.051

Kong FM, 2021, INT J RADIAT ONCOL, V110, P172, DOI 10.1016/j.ijrobp.2018.11.028

Kong FM, 2017, TRANSL LUNG CANCER R, V6, P625, DOI 10.21037/tlcr.2017.09.13

Kong FM, 2015, SEMIN RADIAT ONCOL, V25, P100, DOI 10.1016/j.semradonc.2014.12.003

Luna JM, 2019, RADIOTHER ONCOL, V133, P106, DOI 10.1016/j.radonc.2019.01.003

Mazeron R, 2010, INT J RADIAT ONCOL, V77, P38, DOI 10.1016/j.ijrobp.2009.04.019

MCDONALD S, 1995, INT J RADIAT ONCOL, V31, P1187, DOI 10.1016/0360-3016(94)00429-O

Medhora M, 2012, RESPIROLOGY, V17, P66, DOI 10.1111/j.1440-1843.2011.02092.x

Oh YT, 2012, RADIOTHER ONCOL, V102, P343, DOI 10.1016/j.radonc.2012.02.003

R Core Team, 2019, R LANG ENV STAT COMP

Scholkopf B, 2000, NEURAL COMPUT, V12, P1207, DOI 10.1162/089976600300015565

Sime PJ, 2008, J INVEST MED, V56, P534, DOI 10.2310/JIM.0b013e31816464e9

Tighe RM, 2019, AM J PATHOL, V189, P1029, DOI 10.1016/j.ajpath.2019.01.017

Trott KR, 2004, INT J RADIAT ONCOL, V58, P463, DOI 10.1016/j.ijrobp.2003.09.045

Valdes G, 2016, PHYS MED BIOL, V61, P6105, DOI 10.1088/0031-9155/61/16/6105

Vapnik V, 1998, NATURE STAT LEARNING, V2nd

Wang SL, 2017, INT J RADIAT ONCOL, V98, P615, DOI 10.1016/j.ijrobp.2017.03.011

Ward PA, 1998, AM J RESP CRIT CARE, V157, pS123, DOI 10.1164/ajrccm.157.4.nhlbi-10

Yang X, 2007, INT J PATTERN RECOGN, V21, P961, DOI 10.1142/S0218001407005703

Yu H, 2019, CLIN CANCER RES, V25, P4343, DOI 10.1158/1078-0432.CCR-18-1084

Zhao J, 2016, INT J RADIAT ONCOL, V95, P1357, DOI 10.1016/j.ijrobp.2016.03.024

NR 36

TC 2

Z9 2

U1 1

U2 6

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD FEB 1

PY 2021

VL 10

AR 601979

DI 10.3389/fonc.2020.601979

PG 11

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA QH1EJ

UT WOS:000618018900001

PM 33598430

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Formenti, SC

Rudqvist, NP

Golden, E

Cooper, B

Wennerberg, E

Lhuillier, C

Vanpouille-Box, C

Friedman, K

de Andrade, LF

Wucherpfennig, KW

Heguy, A

Imai, N

Gnjatic, S

Emerson, RO

Zhou, XK

Zhang, T

Chachoua, A

Demaria, S

AF Formenti, Silvia C.

Rudqvist, Nils-Petter

Golden, Encouse

Cooper, Benjamin

Wennerberg, Erik

Lhuillier, Claire

Vanpouille-Box, Claire

Friedman, Kent

de Andrade, Lucas Ferrari

Wucherpfennig, Kai W.

Heguy, Adriana

Imai, Naoko

Gnjatic, Sacha

Emerson, Ryan O.

Zhou, Xi Kathy

Zhang, Tuo

Chachoua, Abraham

Demaria, Sandra

TI Radiotherapy induces responses of lung cancer to CTLA-4 blockade

SO NATURE MEDICINE

LA English

DT Article

ID NEURAL-NETWORKS; SOLID TUMORS; CELL; RADIATION; SEQ; SUPPRESSION;

REPERTOIRE; IPILIMUMAB; SURVIVAL; MUTATION

AB Focal radiation therapy enhances systemic responses to anti-CTLA-4 antibodies in preclinical studies and in some patients with melanoma(1-3), but its efficacy in inducing systemic responses (abscopal responses) against tumors unresponsive to CTLA-4 blockade remained uncertain. Radiation therapy promotes the activation of anti-tumor T cells, an effect dependent on type I interferon induction in the irradiated tumor(4-6). The latter is essential for achieving abscopal responses in murine cancers(6). The mechanisms underlying abscopal responses in patients treated with radiation therapy and CTLA-4 blockade remain unclear. Here we report that radiation therapy and CTLA-4 blockade induced systemic anti-tumor T cells in chemo-refractory metastatic non-small-cell lung cancer (NSCLC), where anti-CTLA-4 antibodies had failed to demonstrate significant efficacy alone or in combination with chemotherapy(7,8). Objective responses were observed in 18% of enrolled patients, and 31% had disease control. Increased serum interferon-beta after radiation and early dynamic changes of blood T cell clones were the strongest response predictors, confirming preclinical mechanistic data. Functional analysis in one responding patient showed the rapid in vivo expansion of CD8 T cells recognizing a neoantigen encoded in a gene upregulated by radiation, supporting the hypothesis that one explanation for the abscopal response is radiation-induced exposure of immunogenic mutations to the immune system.

C1 [Formenti, Silvia C.; Rudqvist, Nils-Petter; Golden, Encouse; Wennerberg, Erik; Lhuillier, Claire; Vanpouille-Box, Claire; Demaria, Sandra] Weill Cornell Med, Dept Radiat Oncol, New York, NY 10065 USA.

[Cooper, Benjamin] NYU, Sch Med, Dept Radiat Oncol, New York, NY USA.

[Friedman, Kent] NYU, Dept Radiol, Sch Med, 560 1St Ave, New York, NY 10016 USA.

[de Andrade, Lucas Ferrari; Wucherpfennig, Kai W.] Dana Farber Canc Inst, Dept Canc Immunol & Virol, Boston, MA 02115 USA.

[de Andrade, Lucas Ferrari; Wucherpfennig, Kai W.] Harvard Med Sch, Dept Microbiol & Immunol, Boston, MA USA.

[Heguy, Adriana] NYU, Sch Med, Dept Pathol, New York, NY USA.

[Heguy, Adriana] NYU Langone Hlth, Genome Technol Ctr, Div Adv Res Technol, New York, NY USA.

[Imai, Naoko; Gnjatic, Sacha] Icahn Sch Med Mt Sinai, Immunol, Hematol Oncol, Tisch Canc Inst, New York, NY 10029 USA.

[Emerson, Ryan O.] Adapt Biotechnol, Seattle, WA USA.

[Zhou, Xi Kathy] Weill Cornell Med, Div Biostat & Epidemiol, Dept Healthcare Policy & Res, New York, NY USA.

[Zhang, Tuo] Weill Cornell Med, Dept Microbiol & Immunol, New York, NY USA.

[Chachoua, Abraham] NYU, Sch Med, Dept Med, New York, NY USA.

[Demaria, Sandra] Weill Cornell Med, Dept Pathol & Lab Med, New York, NY USA.

[Golden, Encouse] Univ Calif San Francisco, Dept Radiat Oncol, San Francisco, CA USA.

RP Formenti, SC; Demaria, S (通讯作者)，Weill Cornell Med, Dept Radiat Oncol, New York, NY 10065 USA.; Demaria, S (通讯作者)，Weill Cornell Med, Dept Pathol & Lab Med, New York, NY USA.

EM formenti@med.cornell.edu; szd3005@med.cornell.edu

RI Vanpouille-Box, Claire/AAO-5355-2021; Demaria, Sandra/AAA-5816-2020;

Heguy, Adriana/GPP-3907-2022

OI Demaria, Sandra/0000-0003-4426-0499; Vanpouille-Box,

Claire/0000-0001-7213-0670; Cooper, Benjamin/0000-0002-7044-7989;

Formenti, Silvia/0000-0002-8227-8924; Gnjatic,

Sacha/0000-0001-5643-9520; Rudqvist, Nils/0000-0002-9720-3124;

Wennerberg, Erik/0000-0001-7689-5988

FU NCI [R01CA198533, R01CA201246]; Cancer Center support grant at the Laura

and Isaac Perlmutter Cancer Center, NYULH [P30CA016087]; DOD

[W81XWH-17-1-0029]; Cancer Center support grant [P30CA196521]; Friends

for Life Neuroblastoma Fellowship; National Cancer Institute (NCI) [R01

CA173750]; NATIONAL CANCER INSTITUTE [R01CA173750, R01CA198533,

R01CA201246, P30CA196521, P30CA016087] Funding Source: NIH RePORTER

FX We to acknowledge J. Goldberg for the initial design of the clinical

trial, K. Pilones for assistance with DNA preparation, L. Chriboga for

help with immunohistochemistry, D. Morrison for blood processing, and

the NYULH Genome Technology Center (GTC) technical personnel for

sequencing. We thank S. Chandraseckhar for data management, M.

Fenton-Kerimian for patient care, and G. Inghirami for providing the PDX

mice. We thank Bristol Meyer Squibb, New York, NY, USA, for providing

ipilimumab for this research study. We are indebted to G. Koretzky for

insightful discussion and review of the manuscript. The immunological

studies were funded by NCI grants no. R01CA198533 and no. R01CA201246

(to S.D.). The NYU Experimental Pathology Immunohistochemistry Core

Laboratory and the GTC are partially supported by the Cancer Center

support grant P30CA016087 at the Laura and Isaac Perlmutter Cancer

Center, NYULH. E.W. is supported by a DOD W81XWH-17-1-0029 post-doctoral

fellowship. S. G. acknowledges the Human Immune Monitoring Center at

Mount Sinai and Cancer Center support grant P30CA196521. L.F.A. was

funded by a Friends for Life Neuroblastoma Fellowship and K.W.W. was

supported by National Cancer Institute (NCI) grant no. R01 CA173750.

CR Andreatta M, 2016, BIOINFORMATICS, V32, P511, DOI 10.1093/bioinformatics/btv639

Burnette BC, 2011, CANCER RES, V71, P2488, DOI 10.1158/0008-5472.CAN-10-2820

Carlson CS, 2013, NAT COMMUN, V4, DOI 10.1038/ncomms3680

Collisson EA, 2014, NATURE, V511, P543, DOI 10.1038/nature13385

de Andrade LF, 2018, SCIENCE, V359, P1537, DOI 10.1126/science.aao0505

Demaria S, 2016, TRENDS CANCER, V2, P286, DOI 10.1016/j.trecan.2016.05.002

Deng LF, 2014, IMMUNITY, V41, P843, DOI 10.1016/j.immuni.2014.10.019

DeWitt WS, 2015, J VIROL, V89, P4517, DOI 10.1128/JVI.03474-14

Dobin A, 2013, BIOINFORMATICS, V29, P15, DOI 10.1093/bioinformatics/bts635

Formenti SC, 2017, ONCOIMMUNOLOGY, V6, DOI 10.1080/2162402X.2016.1274479

Formenti SC, 2009, LANCET ONCOL, V10, P718, DOI 10.1016/S1470-2045(09)70082-8

Gainor JF, 2016, CLIN CANCER RES, V22, P4585, DOI 10.1158/1078-0432.CCR-15-3101

Gasser S, 2005, NATURE, V436, P1186, DOI 10.1038/nature03884

Golden EB, 2015, LANCET ONCOL, V16, P795, DOI 10.1016/S1470-2045(15)00054-6

Golden EB, 2013, CANCER IMMUNOL RES, V1, P365, DOI 10.1158/2326-6066.CIR-13-0115

Harding SM, 2017, NATURE, V548, P466, DOI 10.1038/nature23470

Hellmann MD, 2018, NEW ENGL J MED, V378, P2093, DOI 10.1056/NEJMoa1801946

Hundal J, 2016, GENOME MED, V8, DOI 10.1186/s13073-016-0264-5

Ishwaran H, 2008, ANN APPL STAT, V2, P841, DOI 10.1214/08-AOAS169

Ishwaran H, 2007, ELECTRON J STAT, V1, P519, DOI 10.1214/07-EJS039

Jinushi M, 2006, P NATL ACAD SCI USA, V103, P9190, DOI 10.1073/pnas.0603503103

Koboldt DC, 2012, GENOME RES, V22, P568, DOI 10.1101/gr.129684.111

Koguchi Y, 2015, CANCER RES, V75, P5084, DOI 10.1158/0008-5472.CAN-15-2303

Konno H, 2018, ONCOGENE, V37, P2037, DOI 10.1038/s41388-017-0120-0

Kuo P, 2014, CLIN CANCER RES, V20, P5558, DOI 10.1158/1078-0432.CCR-14-1138

Li H., 2013, ARXIV PREPRINT ARXIV, P1

Lynch TJ, 2012, J CLIN ONCOL, V30, P2046, DOI 10.1200/JCO.2011.38.4032

McKenna A, 2010, GENOME RES, V20, P1297, DOI 10.1101/gr.107524.110

McLaren W, 2016, GENOME BIOL, V17, DOI 10.1186/s13059-016-0974-4

Monod MY, 2004, BIOINFORMATICS, V20, P379, DOI 10.1093/bioinformatics/bth945

Nielsen M, 2003, PROTEIN SCI, V12, P1007, DOI 10.1110/ps.0239403

Postow MA, 2012, NEW ENGL J MED, V366, P925, DOI 10.1056/NEJMoa1112824

Rizvi NA, 2015, SCIENCE, V348, P124, DOI 10.1126/science.aaa1348

Roberts A, 2011, GENOME BIOL, V12, DOI 10.1186/gb-2011-12-3-r22

Rudqvist NP, 2018, CANCER IMMUNOL RES, V6, P139, DOI 10.1158/2326-6066.CIR-17-0134

Ruocco MG, 2012, J CLIN INVEST, V122, P3718, DOI 10.1172/JCI61931

Schliep KP, 2011, BIOINFORMATICS, V27, P592, DOI 10.1093/bioinformatics/btq706

Sharma P, 2017, CELL, V168, P707, DOI 10.1016/j.cell.2017.01.017

Sherwood AM, 2013, CANCER IMMUNOL IMMUN, V62, P1453, DOI 10.1007/s00262-013-1446-2

Sidhom JW, 2018, CANCER IMMUNOL RES, V6, P151, DOI 10.1158/2326-6066.CIR-17-0114

Sim GC, 2014, J CLIN INVEST, V124, P99, DOI 10.1172/JCI46266

Snyder A, 2014, NEW ENGL J MED, V371, P2189, DOI 10.1056/NEJMoa1406498

Song KH, 2016, EUR J CELL BIOL, V95, P219, DOI 10.1016/j.ejcb.2016.04.002

Spigel DR, 2016, J CLIN ONCOL, V34, DOI 10.1200/JCO.2016.34.15\_suppl.9017

Szolek A, 2014, BIOINFORMATICS, V30, P3310, DOI 10.1093/bioinformatics/btu548

Tang DN, 2013, CANCER IMMUNOL RES, V1, P229, DOI 10.1158/2326-6066.CIR-13-0020

Tang F, 2017, STAT ANAL DATA MIN, V10, P363, DOI 10.1002/sam.11348

Trapnell C, 2010, NAT BIOTECHNOL, V28, P511, DOI 10.1038/nbt.1621

Twyman-Saint Victor C, 2015, NATURE, V520, P373, DOI 10.1038/nature14292

Van Allen EM, 2015, SCIENCE, V350, P207, DOI 10.1126/science.aad0095

Vanpouille-Box C, 2017, NAT COMMUN, V8, DOI 10.1038/ncomms15618

Wang WS, 2012, J TRANSL MED, V10, DOI 10.1186/1479-5876-10-146

Wolchok JD, 2009, CLIN CANCER RES, V15, P7412, DOI 10.1158/1078-0432.CCR-09-1624

Wu D, 2014, CLIN CANCER RES, V20, P4540, DOI 10.1158/1078-0432.CCR-13-3231

Yu GC, 2017, METHODS ECOL EVOL, V8, P28, DOI 10.1111/2041-210X.12628

ZATLOUKAL P, 2009, J CLIN ONCOL S, V27

NR 56

TC 378

Z9 388

U1 10

U2 57

PU NATURE PUBLISHING GROUP

PI NEW YORK

PA 75 VARICK ST, 9TH FLR, NEW YORK, NY 10013-1917 USA

SN 1078-8956

EI 1546-170X

J9 NAT MED

JI Nat. Med.

PD DEC

PY 2018

VL 24

IS 12

BP 1845

EP +

DI 10.1038/s41591-018-0232-2

PG 10

WC Biochemistry & Molecular Biology; Cell Biology; Medicine, Research &

Experimental

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Biochemistry & Molecular Biology; Cell Biology; Research & Experimental

Medicine

GA HD3DA

UT WOS:000452392200013

PM 30397353

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Zhang, FL

Wang, QS

Yang, AN

Lu, N

Jiang, HY

Chen, DD

Yu, YJ

Wang, YD

AF Zhang, Fuli

Wang, Qiusheng

Yang, Anning

Lu, Na

Jiang, Huayong

Chen, Diandian

Yu, Yanjun

Wang, Yadi

TI Geometric and Dosimetric Evaluation of the Automatic Delineation of

Organs at Risk (OARs) in Non-Small-Cell Lung Cancer Radiotherapy Based

on a Modified DenseNet Deep Learning Network

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE non-small-cell lung cancer; organs at risk; medical image segmentation;

deep learning; DenseNet; feature reuse

ID CLINICAL-EVALUATION; TARGET VOLUME; SEGMENTATION; VARIABILITY; ATLAS; CT

AB PurposeTo introduce an end-to-end automatic segmentation model for organs at risk (OARs) in thoracic CT images based on modified DenseNet, and reduce the workload of radiation oncologists. Materials and MethodsThe computed tomography (CT) images of 36 lung cancer patients were included in this study, of which 27 patients' images were randomly selected as the training set, 9 patients' as the testing set. The validation set was generated by cross validation and 6 patients' images were randomly selected from the training set during each epoch as the validation set. The autosegmentation task of the left and right lungs, spinal cord, heart, trachea and esophagus was implemented, and the whole training time was approximately 5 hours. Geometric evaluation metrics including the Dice similarity coefficient (DSC), 95% Hausdorff distance (HD95) and average surface distance (ASD), were used to assess the autosegmentation performance of OARs based on the proposed model and were compared with those based on U-Net as benchmarks. Then, two sets of treatment plans were optimized based on the manually contoured targets and OARs (Plan1), as well as the manually contours targets and the automatically contoured OARs (Plan2). Dosimetric parameters, including Dmax, Dmean and Vx, of OARs were obtained and compared. ResultsThe DSC, HD95 and ASD of the proposed model were better than those of U-Net. The differences in the DSC of the spinal cord and esophagus, differences in the HD95 of the spinal cord, heart, trachea and esophagus, as well as differences in the ASD of the spinal cord were statistically significant between the two models (P<0.05). The differences in the dose-volume parameters of the two sets of plans were not statistically significant (P>0.05). Moreover, compared with manual segmentation, autosegmentation significantly reduced the contouring time by nearly 40.7% (P<0.05). ConclusionsThe bilateral lungs, spinal cord, heart and trachea could be accurately delineated using the proposed model in this study; however, the automatic segmentation effect of the esophagus must still be further improved. The concept of feature map reuse provides a new idea for automatic medical image segmentation.

C1 [Zhang, Fuli; Lu, Na; Jiang, Huayong; Chen, Diandian; Yu, Yanjun; Wang, Yadi] Chinese Peoples Liberat Army PLA Gen Hosp, Radiat Oncol Dept, Med Ctr 7, Beijing, Peoples R China.

[Wang, Qiusheng; Yang, Anning] Beihang Univ, Sch Automat Sci & Elect Engn, Beijing, Peoples R China.

RP Zhang, FL (通讯作者)，Chinese Peoples Liberat Army PLA Gen Hosp, Radiat Oncol Dept, Med Ctr 7, Beijing, Peoples R China.

EM radiozfli@163.com

CR Brouwer CL, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-32

Conson M, 2014, RADIOTHER ONCOL, V112, P326, DOI 10.1016/j.radonc.2014.06.006

Dolz J, 2016, MED PHYS, V43, P2569, DOI 10.1118/1.4947484

Eaton BR, 2016, JNCI-J NATL CANCER I, V108, DOI 10.1093/jnci/djw034

Feng X, 2019, MED PHYS, V46, P2169, DOI 10.1002/mp.13466

Fu J, 2021, MED PHYS, V48, P2859, DOI 10.1002/mp.14800

He KM, 2016, PROC CVPR IEEE, P770, DOI 10.1109/CVPR.2016.90

He T, 2020, MED IMAGE ANAL, V61, DOI 10.1016/j.media.2020.101666

Huang G, 2017, PROC CVPR IEEE, P2261, DOI 10.1109/CVPR.2017.243

International Commission on Radiation Units and Measurements, 2010, 83 ICRU, V10, P34

Jameson MG, 2010, J MED IMAG RADIAT ON, V54, P401, DOI 10.1111/j.1754-9485.2010.02192.x

Ke LR, 2020, ORAL ONCOL, V110, DOI 10.1016/j.oraloncology.2020.104862

Kholiavchenko M, 2020, INT J COMPUT ASS RAD, V15, P425, DOI 10.1007/s11548-019-02115-9

Kingma D. P., 2015, P ICLR, DOI DOI 10.1145/1830483.1830503

Lin L, 2019, RADIOLOGY, V291, P677, DOI 10.1148/radiol.2019182012

Lustberg T, 2018, RADIOTHER ONCOL, V126, P312, DOI 10.1016/j.radonc.2017.11.012

Martin S, 2015, ACTA ONCOL, V54, P322, DOI 10.3109/0284186X.2014.970666

Men K, 2017, MED PHYS, V44, P6377, DOI 10.1002/mp.12602

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

Speight R, 2011, RADIOTHER ONCOL, V98, P277, DOI 10.1016/j.radonc.2010.12.007

Sung H, 2021, CA-CANCER J CLIN, V71, P209, DOI 10.3322/caac.21660

Tong N, 2019, MED PHYS, V46, P2669, DOI 10.1002/mp.13553

van Dam IE, 2010, RADIOTHER ONCOL, V96, P67, DOI 10.1016/j.radonc.2010.05.003

Vrtovec T, 2020, MED PHYS, V47, pE929, DOI 10.1002/mp.14320

Wang EH, 2015, J THORAC ONCOL, V10, P937, DOI 10.1097/JTO.0000000000000519

Wang Z, 2020, J APPL CLIN MED PHYS, V21, P272, DOI 10.1002/acm2.13097

Wong J, 2020, RADIOTHER ONCOL, V144, P152, DOI 10.1016/j.radonc.2019.10.019

Yang JZ, 2018, MED PHYS, V45, P4568, DOI 10.1002/mp.13141

Zhang T, 2020, MEDICINE, V99, DOI 10.1097/MD.0000000000021800

Zhu J, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.564737

Zhu JH, 2019, ACTA ONCOL, V58, P257, DOI 10.1080/0284186X.2018.1529421

NR 31

TC 0

Z9 0

U1 1

U2 1

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD MAR 15

PY 2022

VL 12

AR 861857

DI 10.3389/fonc.2022.861857

PG 8

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA 0F6ND

UT WOS:000777472900001

PM 35371991

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Tibdewal, A

Agarwal, JP

Srinivasan, S

Mummudi, N

Noronha, V

Prabhash, K

Patil, V

Purandare, N

Janu, A

Kannan, S

AF Tibdewal, Anil

Agarwal, Jai Prakash

Srinivasan, Shashank

Mummudi, Naveen

Noronha, Vanita

Prabhash, Kumar

Patil, Vijay

Purandare, Nilendu

Janu, Amit

Kannan, Sadhna

TI Standard maintenance therapy versus local consolidative radiation

therapy and standard maintenance therapy in 1-5 sites of oligometastatic

non-small cell lung cancer: a study protocol of phase III randomised

controlled trial

SO BMJ OPEN

LA English

DT Article

DE radiation oncology; chemotherapy; respiratory tract tumours

AB Introduction Two-phase II randomised studies have shown a significant benefit of local consolidation therapy in oligometastatic non-small cell lung cancer (NSCLC). This phase III randomised controlled trial (RCT) will evaluate the efficacy of local consolidation radiation therapy (RT) in oligometastases (OM) NSCLC after completion of initial systemic therapy. Methods and analysis This is a single-centre phase III RCT of OM NSCLC patients. One hundred and ninety patients will undergo 1:1 randomisation to either standard maintenance therapy (control arm) or local consolidation RT and standard maintenance therapy (experimental arm). Patients will be stratified into the number of OM sites (1-2 vs 3-5), nodal metastases (N0-N1 vs N2-N3) and presence or absence of brain metastases. Stereotactic body radiation therapy to all the oligometastatic sites and definitive RT to primary disease will be given in the experimental arm. The primary endpoint is overall survival and secondary endpoints include progression-free survival, local control of OM sites, new distant metastases free survival, objective response rate, toxicity and quality of life. Translation endpoint include circulating tumour cells and radiomics using texture analysis. Ethics and dissemination All patients will be provided with a written informed consent form which needs to be signed before randomisation. The study is approved by the institutional ethics committee-II (project number 3445) and registered with Clinical Trials Registry-India, dated 21 April 2020.

C1 [Tibdewal, Anil; Agarwal, Jai Prakash; Srinivasan, Shashank; Mummudi, Naveen] Tata Mem Hosp, Homi Bhabha Natl Inst, Dept Radiat Oncol, Mumbai, Maharashtra, India.

[Noronha, Vanita; Prabhash, Kumar; Patil, Vijay] Tata Mem Hosp, Homi Bhabha Natl Inst, Dept Med Oncol, Mumbai, Maharashtra, India.

[Purandare, Nilendu] Tata Mem Hosp, Homi Bhabha Natl Inst, Dept Nucl Med, Mumbai, Maharashtra, India.

[Janu, Amit] Tata Mem Hosp, Homi Bhabha Natl Inst, Dept Radiodiag, Mumbai, Maharashtra, India.

[Kannan, Sadhna] Tata Mem Hosp, Homi Bhabha Natl Inst, Clin Res Secretariat, Mumbai, Maharashtra, India.

RP Tibdewal, A (通讯作者)，Tata Mem Hosp, Homi Bhabha Natl Inst, Dept Radiat Oncol, Mumbai, Maharashtra, India.

EM aniltibdewal@gmail.com

RI Mummudi, Naveen/AAU-9305-2020

OI Mummudi, Naveen/0000-0002-6083-9225; Tibdewal, Anil/0000-0002-0374-0800

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Al-Halabi H, 2015, J THORAC ONCOL, V10, P1601, DOI 10.1097/JTO.0000000000000648

Alix-Panabieres C, 2016, CANCER DISCOV, V6, P479, DOI 10.1158/2159-8290.CD-15-1483

Arrieta O, 2019, LUNG CANCER, V130, P67, DOI 10.1016/j.lungcan.2019.02.006

Ashworth AB, 2014, CLIN LUNG CANCER, V15, P346, DOI 10.1016/j.cllc.2014.04.003

Collen C, 2014, ANN ONCOL, V25, P1954, DOI 10.1093/annonc/mdu370

Cox BW, 2012, INT J RADIAT ONCOL, V83, pE597, DOI 10.1016/j.ijrobp.2012.03.009

De Ruysscher D, 2018, J THORAC ONCOL, V13, P1958, DOI 10.1016/j.jtho.2018.07.098

Dingemans AMC, 2019, J THORAC ONCOL, V14, P2109, DOI 10.1016/j.jtho.2019.07.025

Dou TH, 2018, PLOS ONE, V13, DOI 10.1371/journal.pone.0206108

Elamin YY, 2019, CLIN LUNG CANCER, V20, P43, DOI 10.1016/j.cllc.2018.09.015

Gomez DR, 2019, J CLIN ONCOL, V37, DOI 10.1200/JCO.19.00201

Gomez DR, 2016, LANCET ONCOL, V17, P1672, DOI 10.1016/S1470-2045(16)30532-0

HELLMAN S, 1995, J CLIN ONCOL, V13, P8, DOI 10.1200/JCO.1995.13.1.8

Iyengar P, 2018, JAMA ONCOL, V4, DOI 10.1001/jamaoncol.2017.3501

Lievens Y, 2020, RADIOTHER ONCOL, V148, P157, DOI 10.1016/j.radonc.2020.04.003

Lindsay CR, 2017, ANN ONCOL, V28, P1523, DOI 10.1093/annonc/mdx156

Mak RH, 2011, ONCOLOGIST, V16, P886, DOI 10.1634/theoncologist.2011-0040

Mok TSK, 2019, LANCET, V393, P1819, DOI 10.1016/S0140-6736(18)32409-7

Palma DA, 2019, LANCET, V393, P2051, DOI 10.1016/S0140-6736(18)32487-5

Parikh RB, 2014, INT J RADIAT ONCOL, V89, P880, DOI 10.1016/j.ijrobp.2014.04.007

Patel SH, 2017, LUNG CANCER, V108, P109, DOI 10.1016/j.lungcan.2017.03.010

Patil VM, 2017, ESMO OPEN, V2, DOI 10.1136/esmoopen-2017-000168

Petty WJ, 2018, INT J RADIAT ONCOL, V102, P527, DOI 10.1016/j.ijrobp.2018.06.400

Reck M, 2016, NEW ENGL J MED, V375, P1823, DOI 10.1056/NEJMoa1606774

Rosell R, 2012, LANCET ONCOL, V13, P239, DOI 10.1016/S1470-2045(11)70393-X

Rusthoven KE, 2009, ACTA ONCOL, V48, P578, DOI 10.1080/02841860802662722

Solomon BJ, 2014, NEW ENGL J MED, V371, P2167, DOI [10.1056/NEJMoa1408440, 10.1056/NEJMx150034]

Soria JC, 2018, NEW ENGL J MED, V378, P113, DOI 10.1056/NEJMoa1713137

Sutera P, 2019, INT J RADIAT ONCOL, V103, P116, DOI 10.1016/j.ijrobp.2018.08.027

Van den Begin R, 2019, RADIOTHER ONCOL, V133, P113, DOI 10.1016/j.radonc.2019.01.001

Wang XS, 2020, J CLIN ONCOL, V38

Weichselbaum RR, 2011, NAT REV CLIN ONCOL, V8, P378, DOI 10.1038/nrclinonc.2011.44

Xu Q, 2013, CLIN TRANSL ONCOL, V15, P802, DOI 10.1007/s12094-013-1008-2

NR 34

TC 1

Z9 1

U1 0

U2 0

PU BMJ PUBLISHING GROUP

PI LONDON

PA BRITISH MED ASSOC HOUSE, TAVISTOCK SQUARE, LONDON WC1H 9JR, ENGLAND

SN 2044-6055

J9 BMJ OPEN

JI BMJ Open

PY 2021

VL 11

IS 3

AR e043628

DI 10.1136/bmjopen-2020-043628

PG 9

WC Medicine, General & Internal

WE Science Citation Index Expanded (SCI-EXPANDED)

SC General & Internal Medicine

GA RA0RN

UT WOS:000631126600021

PM 33727268

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Starkov, P

Aguilera, TA

Golden, DI

Shultz, DB

Trakul, N

Maxim, PG

Le, QT

Loo, BW

Diehn, M

Depeursinge, A

Rubin, DL

AF Starkov, Pierre

Aguilera, Todd A.

Golden, Daniel, I

Shultz, David B.

Trakul, Nicholas

Maxim, Peter G.

Quynh-Thu Le

Loo, Billy W.

Diehn, Maximillan

Depeursinge, Adrien

Rubin, Daniel L.

TI The use of texture-based radiomics CT analysis to predict outcomes in

early-stage non-small cell lung cancer treated with stereotactic

ablative radiotherapy

SO BRITISH JOURNAL OF RADIOLOGY

LA English

DT Article

ID BODY RADIATION-THERAPY; HETEROGENEITY; MRI; SURVIVAL; LOBECTOMY;

BIOMARKER; LESIONS

AB Objective: Stereotactic ablative radiotherapy (SABR) is being increasingly used as a non-invasive treatment for early-stage non-small cell lung cancer (NSCLC). A non-invasive method to estimate treatment outcomes in these patients would be valuable, especially since access to tissue specimens is often difficult in these cases.

Methods: We developed a method to predict survival following SABR in NSCLC patients using analysis of quantitative image features on pre-treatment CT images. We developed a Cox Lasso model based on two-dimensional Riesz wavelet quantitative texture features on CT scans with the goal of separating patients based on survival.

Results: The median log-rank p-value for 1000 cross-validations was 0.030. Our model was able to separate patients based upon predicted survival. When we added tumor size into the model, the p-value lost its significance, demonstrating that tumor size is not a key feature in the model but rather decreases significance likely due to the relatively small number of events in the dataset. Furthermore, running the model using Riesz features extracted either from the solid component of the tumor or from the ground glass opacity (GGO) component of the tumor maintained statistical significance. However, the p-value improved when combining features from the solid and the GGO components, demonstrating that there are important data that can be extracted from the entire tumor.

Conclusions: The model predicting patient survival following SABR in NSCLC may be useful in future studies by enabling prediction of survival-based outcomes using radiomics features in CT images.

Advances in knowledge: Quantitative image features from NSCLC nodules on CT images have been found to significantly separate patient populations based on overall survival (p = 0.04). In the long term, a non-invasive method to estimate treatment outcomes in patients undergoing SABR would be valuable, especially since access to tissue specimens is often difficult in these cases.

C1 [Starkov, Pierre] Ctr Suisse Elect & Microtech, Dept Signal Proc & Control Syst, Neuchatel, Switzerland.

[Aguilera, Todd A.] UT Southwestern Med Ctr, Dept Radiat Oncol, Dallas, TX 75390 USA.

[Golden, Daniel, I; Rubin, Daniel L.] Stanford Univ, Sch Med, Dept Biomed Data Sci Radiol & Med Biomed Informat, Stanford, CA 94305 USA.

[Shultz, David B.] Princess Margaret Canc Ctr, Dept Radiat Oncol, Toronto, ON, Canada.

[Trakul, Nicholas; Maxim, Peter G.; Quynh-Thu Le; Loo, Billy W.; Diehn, Maximillan] Stanford Canc Inst, Dept Radiat Oncol, Stanford, CA USA.

[Trakul, Nicholas; Maxim, Peter G.; Quynh-Thu Le; Loo, Billy W.; Diehn, Maximillan] Stanford Univ, Sch Med, Stanford, CA 94305 USA.

[Depeursinge, Adrien] Ecole Polytech Fed Lausanne, Biomed Imaging Grp, Dept Signal Proc & Control Syst, Lausanne, Switzerland.

[Depeursinge, Adrien] Univ Appl Sci Western Switzerland HES SO, Inst Informat Syst, Dept Signal Proc & Control Syst, Sierre, Switzerland.

RP Starkov, P (通讯作者)，Ctr Suisse Elect & Microtech, Dept Signal Proc & Control Syst, Neuchatel, Switzerland.; Aguilera, TA (通讯作者)，UT Southwestern Med Ctr, Dept Radiat Oncol, Dallas, TX 75390 USA.

EM pierrestarkov@gmail.com; Todd.Aguilera@UTSouthwestern.edu

RI Loo, Bill/AAD-6722-2021

OI Loo, Bill/0000-0002-2521-0544; Starkov, Pierre/0000-0002-4590-2783;

Shultz, David/0000-0001-8242-6555; Aguilera, Todd/0000-0002-3734-3758;

Le, Quynh Thu/0000-0002-3682-1439; Depeursinge,

Adrien/0000-0002-2362-0304

FU Swiss National Science Foundation [PZ00P2 154891]; National Cancer

Institute, National Institutes of Health [U01CA142555, 1U01CA190214,

1U01CA187947]; NATIONAL CANCER INSTITUTE [T32CA009695, U01CA190214,

U01CA187947] Funding Source: NIH RePORTER

FX This work was supported by the Swiss National Science Foundation (under

grant PZ00P2 154891) and grants from the National Cancer Institute,

National Institutes of Health, U01CA142555, 1U01CA190214, and

1U01CA187947.

CR Alic L, 2011, PHYS MED BIOL, V56, P1601, DOI 10.1088/0031-9155/56/6/006

Alic L, 2006, I S BIOMED IMAGING, P944

Asamura H, 2008, J THORAC ONCOL, V3, P46, DOI 10.1097/JTO.0b013e31815e8577

Asselin MC, 2012, EUR J CANCER, V48, P447, DOI 10.1016/j.ejca.2011.12.025

Baumann P, 2009, J CLIN ONCOL, V27, P3290, DOI 10.1200/JCO.2008.21.5681

Bland JM, 1998, BRIT MED J, V317, P1572, DOI 10.1136/bmj.317.7172.1572

Boffa DJ, 2012, ANN THORAC SURG, V94, P347, DOI 10.1016/j.athoracsur.2012.04.059

Chang JY, 2015, LANCET ONCOL, V16, P630, DOI 10.1016/S1470-2045(15)70168-3

Chen W, 2007, MAGN RESON MED, V58, P562, DOI 10.1002/mrm.21347

Davnall F, 2012, INSIGHTS IMAGING, V3, P573, DOI 10.1007/s13244-012-0196-6

Depeursinge A, 2014, IEEE T MED IMAGING, V33, P1669, DOI 10.1109/TMI.2014.2321347

Depeursinge A, 2011, LECT NOTES COMPUT SC, V6893, P231, DOI 10.1007/978-3-642-23626-6\_29

Fakiris AJ, 2009, INT J RADIAT ONCOL, V75, P677, DOI 10.1016/j.ijrobp.2008.11.042

Fritz A, 2010, AJCC CANC STAGING MA, V7th

Galban CJ, 2009, NAT MED, V15, P572, DOI 10.1038/nm.1919

Golden DI, 2013, J AM MED INFORM ASSN, V20, P1059, DOI 10.1136/amiajnl-2012-001460

Gould MK, 2003, ANN INTERN MED, V139, P879, DOI 10.7326/0003-4819-139-11-200311180-00013

HARRINGTON DP, 1982, BIOMETRIKA, V69, P553, DOI 10.1093/biomet/69.3.553

Johansen R, 2009, J MAGN RESON IMAGING, V29, P1300, DOI 10.1002/jmri.21778

Licht PB, 2013, ANN THORAC SURG, V96, P943, DOI 10.1016/j.athoracsur.2013.04.011

Mattonen SA, 2014, MED IMAGING 2014 BIO, P9038

Palma D, 2010, J CLIN ONCOL, V28, P5153, DOI 10.1200/JCO.2010.30.0731

Shibamoto Y, 2012, CANCER-AM CANCER SOC, V118, P2078, DOI 10.1002/cncr.26470

Shultz DB, 2014, CLIN LUNG CANCER, V15, P294, DOI 10.1016/j.cllc.2013.12.011

Tibshirani R, 1997, STAT MED, V16, P385, DOI 10.1002/(SICI)1097-0258(19970228)16:4<385::AID-SIM380>3.0.CO;2-3

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Unser M, 2010, IEEE T IMAGE PROCESS, V19, P636, DOI 10.1109/TIP.2009.2038832

Yang XY, 2011, J BIOMED BIOTECHNOL, DOI 10.1155/2011/732848

NR 28

TC 25

Z9 25

U1 1

U2 12

PU BRITISH INST RADIOLOGY

PI LONDON

PA 36 PORTLAND PLACE, LONDON W1N 4AT, ENGLAND

SN 0007-1285

EI 1748-880X

J9 BRIT J RADIOL

JI Br. J. Radiol.

PY 2019

VL 92

IS 1094

AR 20180228

DI 10.1259/bjr.20180228

PG 7

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA HI7CW

UT WOS:000456614000006

PM 30457885

OA Green Published

DA 2022-08-24

ER

PT J

AU Carvalho, S

Leijenaar, RTH

Troost, EGC

van Timmeren, JE

Oberije, C

van Elmpt, W

de Geus-Oei, LF

Bussink, J

Lambin, P

AF Carvalho, Sara

Leijenaar, Ralph T. H.

Troost, Esther G. C.

van Timmeren, Janna E.

Oberije, Cary

van Elmpt, Wouter

de Geus-Oei, Lioe-Fee

Bussink, Johan

Lambin, Philippe

TI F-18-fluorodeoxyglucose positron-emission tomography (FDG-PET)-Radiomics

of metastatic lymph nodes and primary tumor in non-small cell lung

cancer (NSCLC) - A prospective externally validated study

SO PLOS ONE

LA English

DT Article

ID STANDARDIZED UPTAKE VALUE; FDG-PET RADIOMICS; F-18-FDG PET; TEXTURE

ANALYSIS; CT TEXTURE; SURVIVAL; FEATURES; HETEROGENEITY; INFORMATION;

QUANTIFICATION

AB Background

Lymph node stage prior to treatment is strongly related to disease progression and poor prognosis in non-small cell lung cancer (NSCLC). However, few studies have investigated metabolic imaging features derived from pre-radiotherapy F-18-fluorodeoxyglucose (FDG) positron-emission tomography (PET) of metastatic hilar/mediastinal lymph nodes (LNs). We hypothesized that these would provide complementary prognostic information to FDG-PET descriptors to only the primary tumor (tumor).

Methods

Two independent cohorts of 262 and 50 node-positive NSCLC patients were used for model development and validation. Image features (i.e. Radiomics) including shape and size, first order statistics, texture, and intensity-volume histograms (IVH) (http://www.radiomics.io/) were evaluated by univariable Cox regression on the development cohort. Prognostic modeling was conducted with a 10-fold cross-validated least absolute shrinkage and selection operator (LASSO), automatically selecting amongst FDG-PET-Radiomics descriptors from (1) tumor, (2) LNs or (3) both structures. Performance was assessed with the concordance-index. Development data are publicly available at www.cancerdata.org and Dryad (doi:10.5061/dryad.752153b).

Results

Common SUV descriptors (maximum, peak, and mean) were significantly related to overall survival when extracted from LNs, as were LN volume and tumor load (summed tumor and LNs' volumes), though this was not true for either SUV metrics or tumor's volume. Feature selection exclusively from imaging information based on FDG-PET-Radiomics, exhibited performances of (1) 0.53-external 0.54, when derived from the tumor, (2) 0.62-external 0.56 from LNs, and (3) 0.62-external 0.59 from both structures, including at least one feature from each sub-category, except IVH.

Conclusion

Combining imaging information based on FDG-PET-Radiomics features from tumors and LNs is desirable to achieve a higher prognostic discriminative power for NSCLC.

C1 [Carvalho, Sara; Leijenaar, Ralph T. H.; Troost, Esther G. C.; van Timmeren, Janna E.; Oberije, Cary; van Elmpt, Wouter; Lambin, Philippe] Maastricht Univ, Med Ctr, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol,MAASTRO, Maastricht, Netherlands.

[Troost, Esther G. C.] Helmholtz Zentrum Dresden Rossendorf, OncoRay, Inst Radiooncol, Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Med Fac, Dept Radiotherapy & Radiat Oncol, Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Univ Hosp Carl Gustav Carus, Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Helmholtz Zentrum Dresden Rossendorf, Med Fac, Natl Ctr Radiat Res Oncol,OncoRay, Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Univ Hosp Carl Gustav Carus, Helmholtz Zentrum Dresden Rossendorf, Dresden, Germany.

[de Geus-Oei, Lioe-Fee] Radboud UMC, Dept Radiol & Nucl Med, Nijmegen, Netherlands.

[de Geus-Oei, Lioe-Fee] Leiden Univ, Med Ctr, Dept Radiol, Leiden, Netherlands.

[de Geus-Oei, Lioe-Fee] Univ Twente, MIRA Inst, Biomed Photon Imaging Grp, Enschede, Netherlands.

[Bussink, Johan] Radboud Univ Nijmegen, Med Ctr, Dept Radiat Oncol, Nijmegen, Netherlands.

RP Lambin, P (通讯作者)，Maastricht Univ, Med Ctr, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol,MAASTRO, Maastricht, Netherlands.

EM sarajbc@gmail.com

RI van Timmeren, Janita/AAL-4456-2020; Oberije, Cary/ABA-6178-2020;

Bussink, Jan/N-3584-2014; de Geus-Oei, L.F./B-2716-2014

OI van Timmeren, Janita/0000-0002-8166-6853; Oberije,

Cary/0000-0003-0749-5117; de Geus-Oei, L.F./0000-0003-1817-2743;

Bussink, Johan/0000-0002-5751-4796; Lambin, Philippe/0000-0001-7961-0191

FU ERC advanced grant (ERC-ADG) [694812]; QuIC-ConCePT project; EFPI A

companies; Innovative Medicine Initiative Joint Undertaking (IMI JU)

[115151]; Dutch technology Foundation STW [10696 DuCAT, P14-19 Radiomics

STRaTegy]; Technology Programme of the Ministry of Economic Affairs; EU

7th framework program [257144, 601826]; SME Phase 2 (EU) [673780 RAIL];

EUROSTARS (SeDI); EUROSTARS (CloudAtlas); EUROSTARS (DART); European

Program H (BD2Decide) [PHC30-689715]; European Program H (ImmunoSABR)

[733008]; Interreg V-A Euregio Meuse-Rhine ("Euradiomics");

Kankeronderzoekfonds Limburg from the Health Foundation Limburg; Alpe

d'HuZes-KWF (DESIGN); Zuyderland-MAASTRO grant; Dutch Cancer Society

FX Authors acknowledge financial support from ERC advanced grant

(ERC-ADG-2015, no 694812 - Hypoximmuno) and the QuIC-ConCePT project,

which is partly funded by EFPI A companies and the Innovative Medicine

Initiative Joint Undertaking (IMI JU) under Grant Agreement No. 115151.

This research is also supported by the Dutch technology Foundation STW

(grant no 10696 DuCAT & no P14-19 Radiomics STRaTegy), which is the

applied science division of NWO, and the Technology Programme of the

Ministry of Economic Affairs. Authors also acknowledge financial support

from the EU 7th framework program (ARTFORCE - no 257144, REQUITE - no

601826), SME Phase 2 (EU proposal 673780 RAIL), EUROSTARS (SeDI,

CloudAtlas, DART), the European Program H2020-2015-17 (BD2Decide -

PHC30-689715 and ImmunoSABR - no 733008), Interreg V-A Euregio

Meuse-Rhine ("Euradiomics"), Kankeronderzoekfonds Limburg from the

Health Foundation Limburg, Alpe d'HuZes-KWF (DESIGN), the

Zuyderland-MAASTRO grant and the Dutch Cancer Society.; Authors

acknowledge financial support from ERC advanced grant (ERC-ADG-2015, no

694812-Hypoximmuno) and the QuIC-ConCePT project, which is partly funded

by EFPI A companies and the Innovative Medicine Initiative Joint

Undertaking (IMI JU) under Grant Agreement No. 115151. This research is

also supported by the Dutch technology Foundation STW (grant no 10696

DuCAT & no P14-19 Radiomics STRaTegy), which is the applied science

division of NWO, and the Technology Programme of the Ministry of

Economic Affairs. Authors also acknowledge financial support from the EU

7th framework program (ART-FORCE no 257144, REQUITE no 601826), SME

Phase 2 (EU proposal 673780 -RAIL), EUROSTARS (SeDI, CloudAtlas, DART),

the European Program H2020-2015-17 (BD2Decide-PHC30-689715 and

ImmunoSABR no 733008), Interreg V-A Euregio Meuse-Rhine ("Euradiomics"),

Kankeronderzoekfonds Limburg from the Health Foundation Limburg, Alpe

d'HuZes-KWF (DESIGN), the Zuyderland-MAASTRO grant and the Dutch Cancer

Society. The authors report no conflicts of interest.

CR [Anonymous], 2015, LANG ENV STAT COMP

Boellaard R, 2008, EUR J NUCL MED MOL I, V35, P2320, DOI 10.1007/s00259-008-0874-2

Burnham KP, 2004, SOCIOL METHOD RES, V33, P261, DOI 10.1177/0049124104268644

Carvalho S, 2013, ACTA ONCOL, V52, P1398, DOI 10.3109/0284186X.2013.812795

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

de Groot PM, 2015, CLIN CHEST MED, V36, P179, DOI 10.1016/j.ccm.2015.02.004

De Ruysscher D, 2005, INT J RADIAT ONCOL, V62, P988, DOI 10.1016/j.ijrobp.2004.12.019

Deasy JO, 2003, MED PHYS, V30, P979, DOI 10.1118/1.1568978

Dehing-Oberije C, 2008, INT J RADIAT ONCOL, V70, P1039, DOI 10.1016/j.ijrobp.2007.07.2323

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Desseroit MC, 2017, J NUCL MED, V58, P406, DOI 10.2967/jnumed.116.180919

Desseroit MC, 2016, EUR J NUCL MED MOL I, V43, P1477, DOI 10.1007/s00259-016-3325-5

Duan XY, 2013, BMC CANCER, V13, DOI 10.1186/1471-2407-13-546

Giron J, 2016, J THORAC ONCOL, V11, pE77, DOI 10.1016/j.jtho.2016.01.026

Grootjans W, 2015, NAT REV CLIN ONCOL, V12, P395, DOI 10.1038/nrclinonc.2015.75

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Hatt M, 2015, J NUCL MED, V56, P38, DOI 10.2967/jnumed.114.144055

Hellwig D, 2007, J NUCL MED, V48, P1761, DOI 10.2967/jnumed.107.044362

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lambin P, 2015, ACTA ONCOL, V54, P1289, DOI 10.3109/0284186X.2015.1062136

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lambin P, 2010, RADIOTHER ONCOL, V96, P145, DOI 10.1016/j.radonc.2010.07.001

Lee AY, 2014, NUCL MED MOLEC IMAG, V48, P41, DOI 10.1007/s13139-013-0244-2

Leijenaar RTH, 2015, SCI REP-UK, V5, DOI 10.1038/srep11075

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Li HS, 2015, MED PHYS, V42, P4727, DOI 10.1118/1.4926755

Markovina S, REGIONAL LYMPH NODE

Mirsadraee S, 2012, WORLD J RADIOL, V4, P128, DOI 10.4329/wjr.v4.i4.128

Nguyen NC, 2011, ACTA ONCOL, V50, P670, DOI 10.3109/0284186X.2010.550933

Oberije C, 2014, RADIOTHER ONCOL, V112, P37, DOI 10.1016/j.radonc.2014.04.012

Paesmans M, 2015, EUR RESPIR J, V46, P1751, DOI 10.1183/13993003.00099-2015

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Peeters ST, 2016, RADIOTHER ONCOL, V120, P273, DOI 10.1016/j.radonc.2016.05.023

Pettersen EO, 2015, J ENZYM INHIB MED CH, V30, P689, DOI 10.3109/14756366.2014.966704

Prabhu RS, 2015, HEAD NECK-J SCI SPEC, V37, P777, DOI 10.1002/hed.23662

Rao SX, 2014, UNITED EUR GASTROENT, V2, P530, DOI 10.1177/2050640614552463

Royston P, 2013, BMC MED RES METHODOL, V13, DOI 10.1186/1471-2288-13-33

Schuurbiers OCJ, 2014, J THORAC ONCOL, V9, P1485, DOI 10.1097/JTO.0000000000000286

Fortuny MS, 2016, BMC PULM MED, V16, DOI 10.1186/s12890-016-0338-6

Shen GH, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0173104

Taylor MD, 2009, J THORAC CARDIOV SUR, V137, P43, DOI 10.1016/j.jtcvs.2008.10.014

Teran MD, 2014, J THORAC DIS, V6, P230, DOI 10.3978/j.issn.2072-1439.2013.12.18

Tibshirani R, 1997, STAT MED, V16, P385, DOI 10.1002/(SICI)1097-0258(19970228)16:4<385::AID-SIM380>3.0.CO;2-3

Toll DB, 2008, J CLIN EPIDEMIOL, V61, P1085, DOI 10.1016/j.jclinepi.2008.04.008

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

Wang YH, 2015, BMC PULM MED, V15, DOI 10.1186/s12890-015-0014-2

Zegers CML, 2014, CLIN CANCER RES, V20, P6389, DOI 10.1158/1078-0432.CCR-14-1524

Zhang HW, 2013, RADIOLOGY, V269, P801, DOI 10.1148/radiol.13130110

NR 50

TC 35

Z9 36

U1 1

U2 7

PU PUBLIC LIBRARY SCIENCE

PI SAN FRANCISCO

PA 1160 BATTERY STREET, STE 100, SAN FRANCISCO, CA 94111 USA

SN 1932-6203

J9 PLOS ONE

JI PLoS One

PD MAR 1

PY 2018

VL 13

IS 3

AR e0192859

DI 10.1371/journal.pone.0192859

PG 16

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA FX8RR

UT WOS:000426363200015

PM 29494598

OA gold, Green Published, Green Submitted

DA 2022-08-24

ER

PT J

AU Grootjans, W

Usmanij, EA

Oyen, WJG

van der Heijden, EHFM

Visser, EP

Visvikis, D

Hatt, M

Bussink, J

de Geus-Oei, LF

AF Grootjans, Willem

Usmanij, Edwin A.

Oyen, Wim J. G.

van der Heijden, Erik H. F. M.

Visser, Eric P.

Visvikis, Dimitris

Hatt, Mathieu

Bussink, Johan

de Geus-Oei, Lioe-Fee

TI Performance of automatic image segmentation algorithms for calculating

total lesion glycolysis for early response monitoring in non-small cell

lung cancer patients during concomitant chemoradiotherapy

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Early response monitoring; Non-small cell lung cancer; Concomitant

chemoradiochemotherapy; F-18-FDG PET/CT; Total lesion glycolysis;

Automatic image segmentation

ID TARGET VOLUME DELINEATION; RADIOTHERAPY FDG-PET; F-18-FDG PET;

PROGNOSTIC VALUE; DOSE-ESCALATION; SURVIVAL; FAILURE; IMPACT; NSCLC;

AREAS

AB Background and purpose: This study evaluated the use of total lesion glycolysis (TLG) determined by different automatic segmentation algorithms, for early response monitoring in non-small cell lung cancer (NSCLC) patients during concomitant chemoradiotherapy.

Materials and methods: Twenty-seven patients with locally advanced NSCLC treated with concomitant chemoradiotherapy underwent F-18-fluorodeoxyglucose (FDG) PET/CT imaging before and in the second week of treatment. Segmentation of the primary tumours and lymph nodes was performed using fixed threshold segmentation at (i) 40% SUVmax (T40), (ii) 50% SUVmax (T50), (iii) relative-threshold-level (RTL), (iv) signal-to-background ratio (SBR), and (v) fuzzy locally adaptive Bayesian (FLAB) segmentation. Association of primary tumour TLG (TLGT), lymph node TLG (TLGLN), summed TLG (TLG(S) = TLG(T) + TLG(LN)), and relative TLG decrease (Delta TLG) with overall -survival (OS) and progression-free survival (PFS) was determined using univariate Cox regression models.

Results: Pretreatment TLG(T) was predictive for PFS and OS, irrespective of the segmentation method used. Inclusion of TLG(LN) improved disease and early response assessment, with pretreatment TLG(S) more strongly associated with PFS and OS than TLG(T) for all segmentation algorithms. This was also the case for Delta TLG(S), which was significantly associated with PFS and OS, with the exception of RTL and T40.

Conclusions: Delta TLG(S) was significantly associated with PFS and OS, except for RTL and T40. Inclusion of TLG(LN) improves early treatment response monitoring during concomitant chemoradiotherapy with FDG-PET. (C) 2016 Elsevier Ireland Ltd. All rights reserved.

C1 [Grootjans, Willem; Usmanij, Edwin A.; Oyen, Wim J. G.; Visser, Eric P.; de Geus-Oei, Lioe-Fee] Radboud Univ Nijmegen, Med Ctr, Dept Radiol & Nucl Med, Nijmegen, Netherlands.

[Grootjans, Willem; de Geus-Oei, Lioe-Fee] Leiden Univ, Med Ctr, Dept Radiol, POB 9600, NL-2300 RC Leiden, Netherlands.

[Oyen, Wim J. G.] Inst Canc Res, London, England.

[Oyen, Wim J. G.] Royal Marsden NHS Fdn Trust, London, England.

[van der Heijden, Erik H. F. M.] Radboud Univ Nijmegen, Med Ctr, Dept Pulm Med, Nijmegen, Netherlands.

[Visvikis, Dimitris; Hatt, Mathieu] INSERM, UMR 1101, Lab Traitement Informat Med LaTIM, Brest, France.

[Bussink, Johan] Radboud Univ Nijmegen, Med Ctr, Dept Radiat Oncol, Nijmegen, Netherlands.

[de Geus-Oei, Lioe-Fee] Univ Twente, MIRA Inst, Biomed Photon Imaging Grp, Enschede, Netherlands.

RP Grootjans, W (通讯作者)，Leiden Univ, Med Ctr, Dept Radiol, POB 9600, NL-2300 RC Leiden, Netherlands.

EM W.Grootjans@lumc.nl

RI Oyen, Wim J.G./D-4178-2009; Visvikis, Dimitris/AAM-7868-2021; Visvikis,

Dimitris/AAM-7865-2021; de Geus-Oei, L.F./B-2716-2014; Visser,

Eric/L-4719-2015; Oyen, Wim J.G./AAD-3373-2020; Hatt,

Mathieu/M-8917-2017; Bussink, Jan/N-3584-2014; van der Heijden, Erik

H.F.M/D-3774-2009

OI Oyen, Wim J.G./0000-0001-8235-7078; de Geus-Oei,

L.F./0000-0003-1817-2743; Visser, Eric/0000-0003-3672-5882; Oyen, Wim

J.G./0000-0001-8235-7078; Hatt, Mathieu/0000-0002-8938-8667; van der

Heijden, Erik H.F.M/0000-0003-3596-518X; Usmanij,

Edwin/0000-0002-4427-2759; Grootjans, Willem/0000-0003-4851-7167;

VISVIKIS, Dimitris/0000-0003-0831-3637; Bussink,

Johan/0000-0002-5751-4796

FU Siemens Healthcare, The Hague, The Netherlands

FX Willem Grootjans is the recipient of an educational grant from Siemens

Healthcare, The Hague, The Netherlands.

CR Aerts HJWL, 2012, LUNG CANCER, V75, P73, DOI 10.1016/j.lungcan.2011.06.003

Arens AIJ, 2014, EUR J NUCL MED MOL I, V41, P915, DOI 10.1007/s00259-013-2651-0

Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

Bentzen SM, 2005, LANCET ONCOL, V6, P112, DOI 10.1016/S1470-2045(05)01737-7

Boellaard R, EARL PROCEDURE ASSES

Calais J, 2015, J NUCL MED, V56, P196, DOI 10.2967/jnumed.114.144253

Chirindel A, 2015, RADIOTHER ONCOL, V115, P335, DOI 10.1016/j.radonc.2015.05.019

Daisne JF, 2003, RADIOTHER ONCOL, V69, P247, DOI 10.1016/S0167-8140(03)00270-6

de Geus-Oei LF, 2008, CANCER IMAGING, V8, P70, DOI 10.1102/1470-7330.2008.0010

De Ruysscher D, 2012, LUNG CANCER, V75, P141, DOI 10.1016/j.lungcan.2011.07.018

Even AJG, 2015, RADIOTHER ONCOL, V116, P281, DOI 10.1016/j.radonc.2015.07.013

Gao A, 2015, INT J CLIN EXP MED, V8, P7561

Grootjans W, 2015, NAT REV CLIN ONCOL, V12, P395, DOI 10.1038/nrclinonc.2015.75

Hatt M, 2009, IEEE T MED IMAGING, V28, P881, DOI 10.1109/TMI.2008.2012036

Hyun SH, 2014, EUR J NUCL MED MOL I, V41, P50, DOI 10.1007/s00259-013-2530-8

Im HJ, 2015, EUR J NUCL MED MOL I, V42, P241, DOI 10.1007/s00259-014-2903-7

Ingerid Skjei Jr K, 2016, PHYS MED BIOL, V61, P2243

Kepka L, 2015, RADIOTHER ONCOL, V115, P151, DOI 10.1016/j.radonc.2015.04.001

Knudtsen IS, 2014, RADIOTHER ONCOL, V113, P210, DOI 10.1016/j.radonc.2014.09.012

Konert T, 2015, RADIOTHER ONCOL, V116, P27, DOI 10.1016/j.radonc.2015.03.014

Lee JA, 2010, RADIOTHER ONCOL, V96, P302, DOI 10.1016/j.radonc.2010.07.003

Nygard L, 2016, RADIOTHER ONCOL, V118, P460, DOI 10.1016/j.radonc.2016.01.009

Usmanij EA, 2013, J NUCL MED, V54, P1528, DOI 10.2967/jnumed.112.116921

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

van Dalen JA, 2007, NUCL MED COMMUN, V28, P485, DOI 10.1097/MNM.0b013e328155d154

van Diessen JNA, 2016, RADIOTHER ONCOL, V118, P447, DOI 10.1016/j.radonc.2016.02.008

van Elmpt W, 2012, RADIOTHER ONCOL, V104, P67, DOI 10.1016/j.radonc.2012.03.005

Visser EP, 2010, J NUCL MED, V51, P173, DOI 10.2967/jnumed.109.068411

Yossi S, 2015, CLIN NUCL MED, V40, pE215, DOI 10.1097/RLU.0000000000000615

Zaidi H, 2010, EUR J NUCL MED MOL I, V37, P2165, DOI 10.1007/s00259-010-1423-3

NR 30

TC 14

Z9 15

U1 1

U2 3

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD JUN

PY 2016

VL 119

IS 3

BP 473

EP 479

DI 10.1016/j.radonc.2016.04.039

PG 13

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA DR7JH

UT WOS:000380075400016

PM 27178141

DA 2022-08-24

ER

PT J

AU Qiu, QT

Xing, LG

Wang, Y

Feng, AL

Wen, Q

AF Qiu, Qingtao

Xing, Ligang

Wang, Yu

Feng, Alei

Wen, Qiang

TI Development and Validation of a Radiomics Nomogram Using Computed

Tomography for Differentiating Immune Checkpoint Inhibitor-Related

Pneumonitis From Radiation Pneumonitis for Patients With Non-Small Cell

Lung Cancer

SO FRONTIERS IN IMMUNOLOGY

LA English

DT Article

DE radiomics nomogram; immune checkpoint inhibitor-related pneumonitis;

radiation pneumonitis; NSCLC; differential diagnosis

ID DEATH 1; RADIOTHERAPY; BLOCKADE; FEATURES; INJURY

AB BackgroundThe combination of immunotherapy and chemoradiotherapy has become the standard therapeutic strategy for patients with unresected locally advance-stage non-small cell lung cancer (NSCLC) and induced treatment-related adverse effects, particularly immune checkpoint inhibitor-related pneumonitis (CIP) and radiation pneumonitis (RP). The aim of this study is to differentiate between CIP and RP by pretreatment CT radiomics and clinical or radiological parameters. MethodsA total of 126 advance-stage NSCLC patients with pneumonitis were enrolled in this retrospective study and divided into the training dataset (n =88) and the validation dataset (n = 38). A total of 837 radiomics features were extracted from regions of interest based on the lung parenchyma window of CT images. A radiomics signature was constructed on the basis of the predictive features by the least absolute shrinkage and selection operator. A logistic regression was applied to develop a radiomics nomogram. Receiver operating characteristics curve and area under the curve (AUC) were applied to evaluate the performance of pneumonitis etiology identification. ResultsThere was no significant difference between the training and the validation datasets for any clinicopathological parameters in this study. The radiomics signature, named Rad-score, consisting of 11 selected radiomics features, has potential ability to differentiate between CIP and RP with the empirical and alpha-binormal-based AUCs of 0.891 and 0.896. These results were verified in the validation dataset with AUC = 0.901 and 0.874, respectively. The clinical and radiological parameters of bilateral changes (p < 0.001) and sharp border (p = 0.001) were associated with the identification of CIP and RP. The nomogram model showed good performance on discrimination in the training dataset (AUC = 0.953 and 0.950) and in the validation dataset (AUC = 0.947 and 0.936). ConclusionsCT-based radiomics features have potential values for differentiating between patients with CIP and patients with RP. The addition of bilateral changes and sharp border produced superior model performance on classifying, which could be a useful method to improve related clinical decision-making.

C1 [Qiu, Qingtao] Shandong First Med Univ & Shandong Acad Med Sci, Shandong Canc Hosp & Inst, Dept Radiat Phys & Technol, Jinan, Peoples R China.

[Xing, Ligang] Shandong First Med Univ & Shandong Acad Med Sci, Shandong Canc Hosp & Inst, Dept Radiat Oncol, Jinan, Peoples R China.

[Wang, Yu; Feng, Alei; Wen, Qiang] Shandong First Med Univ, Shandong Prov Hosp, Dept Radiat Oncol, Jinan, Peoples R China.

RP Wen, Q (通讯作者)，Shandong First Med Univ, Shandong Prov Hosp, Dept Radiat Oncol, Jinan, Peoples R China.

EM wq890425@126.com

FU National Natural Science Foundation of China [82001902]; Shandong

Provincial Natural Science Foundation [ZR2020QH198, ZR2020QH200];

Radiation Oncology Translational Medicine Foundation for Scientific

Research of Bethune [flzh202123]; Special Tumor Foundation for

Scientific Research of Saifu [fszl202106]

FX Funding This study was supported by the National Natural Science

Foundation of China (grant number 82001902), Shandong Provincial Natural

Science Foundation (grant numbers ZR2020QH198 and ZR2020QH200),

Radiation Oncology Translational Medicine Foundation for Scientific

Research of Bethune (grant number flzh202123), and the Special Tumor

Foundation for Scientific Research of Saifu (grant number fszl202106).

The funding sources had no role in the study design, data collection,

analysis of interpretation, or writing of this manuscript.

CR Andruska Neal, 2018, BMJ Case Rep, V2018, DOI 10.1136/bcr-2018-225937

Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Arpin D, 2005, J CLIN ONCOL, V23, P8748, DOI 10.1200/JCO.2005.01.7145

Azzam EI, 2012, CANCER LETT, V327, P48, DOI 10.1016/j.canlet.2011.12.012

Barabino E, 2022, CANCERS, V14, DOI 10.3390/cancers14020350

Bledsoe TJ, 2017, CLIN CHEST MED, V38, P201, DOI 10.1016/j.ccm.2016.12.004

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Brahmer JR, 2018, J CLIN ONCOL, V36, P1714, DOI 10.1200/JCO.2017.77.6385

Brodersen K H, 2010, Proceedings of the 2010 20th International Conference on Pattern Recognition (ICPR 2010), P4263, DOI 10.1109/ICPR.2010.1036

Cameron BD, 2018, RADIAT RES, V190, P99, DOI 10.1667/RR15059.1

Chen X, 2020, INT J RADIAT ONCOL, V108, pS163

Chen XG, 2021, ONCOLOGIST, V26, pE1822, DOI 10.1002/onco.13900

Cheng J, 2022, MED PHYS, V49, P1547, DOI 10.1002/mp.15451

Colen RR, 2018, INVEST NEW DRUG, V36, P601, DOI 10.1007/s10637-017-0524-2

Cong P, 2021, TRANSL CANCER RES, V10, P4375, DOI 10.21037/tcr-21-702

Du F, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.596013

Ettinger DS, 2021, J NATL COMPR CANC NE, V19, P254, DOI 10.6004/jnccn.2021.0013

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Johnson DB, 2019, CLIN CANCER RES, V25, P1452, DOI 10.1158/1078-0432.CCR-18-3858

Kawahara D, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-021-95643-x

Khunger M, 2017, CHEST, V152, P271, DOI 10.1016/j.chest.2017.04.177

Ko EC, 2018, CLIN CANCER RES, V24, P5792, DOI 10.1158/1078-0432.CCR-17-3620

Kong FM, 2006, INT J RADIAT ONCOL, V65, P1075, DOI 10.1016/j.ijrobp.2006.01.051

Li MQ, 2019, BBA-REV CANCER, V1871, P323, DOI 10.1016/j.bbcan.2019.02.004

Lin XQ, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.698832

Liu LJ, 2020, AGING-US, V12, P1186, DOI 10.18632/aging.102676

Liu XL, 2021, BIOMEDICINES, V9, DOI 10.3390/biomedicines9091181

Matsukane R, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-020-79397-6

Michot JM, 2016, EUR J CANCER, V54, P139, DOI 10.1016/j.ejca.2015.11.016

Naidoo J, 2015, ANN ONCOL, V26, P2375, DOI 10.1093/annonc/mdv383

Naidoo J, 2017, J CLIN ONCOL, V35, P709, DOI 10.1200/JCO.2016.68.2005

Nishino M, 2016, JAMA ONCOL, V2, P1607, DOI 10.1001/jamaoncol.2016.2453

Refaee T, 2020, RESPIRATION, V99, P99, DOI 10.1159/000505429

Saito A, 2018, INT J MOL SCI, V19, DOI 10.3390/ijms19082460

Schoenfeld JD, 2019, J IMMUNOTHER CANCER, V7, DOI 10.1186/s40425-019-0583-3

Tabatabaei Mohsen, 2021, Iran J Med Sci, V46, P420, DOI 10.30476/ijms.2021.88036.1858

Voong KR, 2019, CLIN LUNG CANCER, V20, pE470, DOI 10.1016/j.cllc.2019.02.018

Wen Q, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.620246

Yang LF, 2019, EUR RADIOL, V29, P2196, DOI 10.1007/s00330-018-5770-y

Yang N, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-021-97497-9

Zhang ZF, 2021, FRONT IMMUNOL, V12, DOI 10.3389/fimmu.2021.774807

NR 42

TC 0

Z9 0

U1 2

U2 2

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 1664-3224

J9 FRONT IMMUNOL

JI Front. Immunol.

PD APR 26

PY 2022

VL 13

AR 870842

DI 10.3389/fimmu.2022.870842

PG 11

WC Immunology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Immunology

GA 1F4OF

UT WOS:000795147300001

PM 35558076

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Hirose, T

Arimura, H

Ninomiya, K

Yoshitake, T

Fukunaga, J

Shioyama, Y

AF Hirose, Taka-aki

Arimura, Hidetaka

Ninomiya, Kenta

Yoshitake, Tadamasa

Fukunaga, Jun-ichi

Shioyama, Yoshiyuki

TI Radiomic prediction of radiation pneumonitis on pretreatment planning

computed tomography images prior to lung cancer stereotactic body

radiation therapy

SO SCIENTIFIC REPORTS

LA English

DT Article

ID FEATURES; CHEMORADIATION; RADIOTHERAPY; TEXTURE

AB This study developed a radiomics-based predictive model for radiation-induced pneumonitis (RP) after lung cancer stereotactic body radiation therapy (SBRT) on pretreatment planning computed tomography (CT) images. For the RP prediction models, 275 non-small-cell lung cancer patients consisted of 245 training (22 with grade >= 2 RP) and 30 test cases (8 with grade >= 2 RP) were selected. A total of 486 radiomic features were calculated to quantify the RP texture patterns reflecting radiation-induced tissue reaction within lung volumes irradiated with more than x Gy, which were defined as LVx. Ten subsets consisting of all 22 RP cases and 22 or 23 randomly selected non-RP cases were created from the imbalanced dataset of 245 training patients. For each subset, signatures were constructed, and predictive models were built using the least absolute shrinkage and selection operator logistic regression. An ensemble averaging model was built by averaging the RP probabilities of the 10 models. The best model areas under the receiver operating characteristic curves (AUCs) calculated on the training and test cohort for LV5 were 0.871 and 0.756, respectively. The radiomic features calculated on pretreatment planning CT images could be predictive imaging biomarkers for RP after lung cancer SBRT.

C1 [Hirose, Taka-aki; Fukunaga, Jun-ichi] Kyushu Univ Hosp, Dept Med Technol, Div Radiol, Higashi Ku, 3-1-1 Maidashi, Fukuoka 8128582, Japan.

[Arimura, Hidetaka] Kyushu Univ, Fac Med Sci, Higashi Ku, 3-1-1 Maidashi, Fukuoka 8128582, Japan.

[Ninomiya, Kenta] Kyushu Univ, Dept Hlth Sci, Grad Sch Med Sci, Higashi Ku, 3-1-1 Maidashi, Fukuoka 8128582, Japan.

[Yoshitake, Tadamasa; Shioyama, Yoshiyuki] Kyushu Univ, Dept Clin Radiol, Grad Sch Med Sci, Higashi Ku, 3-1-1 Maidashi, Fukuoka 8128582, Japan.

RP Hirose, T (通讯作者)，Kyushu Univ Hosp, Dept Med Technol, Div Radiol, Higashi Ku, 3-1-1 Maidashi, Fukuoka 8128582, Japan.; Arimura, H (通讯作者)，Kyushu Univ, Fac Med Sci, Higashi Ku, 3-1-1 Maidashi, Fukuoka 8128582, Japan.

EM t-hirose@med.kyushu-u.ac.jp; arimurah@med.kyushu-u.ac.jp

OI Hirose, Taka-aki/0000-0003-2410-8254

FU JSPS KAKENHI [19K16803, 20K08113]

FX This work was supported by JSPS KAKENHI Grant Number 19K16803 and

20K08113. The authors are grateful to all members of Arimura Laboratory

(http://web.shs.kyushu-u.ac.jp/~arimura), whose comments contributed

significantly to this study. We would also like to thank Editage

(www.editage.com) for English language editing.

CR Akbani R, 2004, LECT NOTES COMPUT SC, V3201, P39, DOI 10.1007/978-3-540-30115-8\_7

AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

Blondel P, 2009, APPL ACOUST, V70, P1288, DOI 10.1016/j.apacoust.2008.07.015

Cancer Therapy Evaluation Program, 2009, COMMON TERMINOLOGY C

Cui SN, 2019, MED PHYS, V46, P2497, DOI 10.1002/mp.13497

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Fay M, 2005, INT J RADIAT ONCOL, V61, P1355, DOI 10.1016/j.ijrobp.2004.08.025

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Graham MV, 1999, INT J RADIAT ONCOL, V45, P323, DOI 10.1016/S0360-3016(99)00183-2

Hara R, 2004, CHEST, V125, P340, DOI 10.1378/chest.125.1.340

Jain AK, 2000, IEEE T PATTERN ANAL, V22, P4, DOI 10.1109/34.824819

Luna JM, 2019, RADIOTHER ONCOL, V133, P106, DOI 10.1016/j.radonc.2019.01.003

MALLAT SG, 1989, IEEE T PATTERN ANAL, V11, P674, DOI 10.1109/34.192463

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Moran A, 2017, CLIN LUNG CANCER, V18, pE425, DOI 10.1016/j.cllc.2017.05.014

Nagata Y, 2005, INT J RADIAT ONCOL, V63, P1427, DOI 10.1016/j.ijrobp.2005.05.034

Onishi H, 2011, INT J RADIAT ONCOL, V81, P1352, DOI 10.1016/j.ijrobp.2009.07.1751

Palma DA, 2013, INT J RADIAT ONCOL, V85, P444, DOI 10.1016/j.ijrobp.2012.04.043

Peduz P, 1996, LOGIST REGRES ANAL, V49, P1373, DOI DOI 10.1016/S0895-4356(96)00236-3

Schiller TW, 2010, NEUROCOMPUTING, V73, P1861, DOI 10.1016/j.neucom.2009.09.023

Soufi M, 2018, MED PHYS, V45, P5116, DOI 10.1002/mp.13202

Thibault G, 2013, INT J PATTERN RECOGN, V27, DOI 10.1142/S0218001413570024

Tibshirani R, 1996, J ROY STAT SOC B MET, V58, P267, DOI 10.1111/j.2517-6161.1996.tb02080.x

Tibshirani RJ, 2013, ELECTRON J STAT, V7, P1456, DOI 10.1214/13-EJS815

Timmerman R, 2003, CHEST, V124, P1946, DOI 10.1378/chest.124.5.1946

Traverso A, 2018, INT J RADIAT ONCOL, V102, P1143, DOI 10.1016/j.ijrobp.2018.05.053

Tsujino K, 2003, INT J RADIAT ONCOL, V55, P110, DOI 10.1016/S0360-3016(02)03807-5

Vallieres, 2015, RADIOMICS MATLAB PRO

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

VANDERPLOEG T, 2016, BMC RES NOTES, V9, P1, DOI DOI 10.1186/s13104-015-1837-x

Yamashita H, 2014, WORLD J RADIOL, V6, P708, DOI 10.4329/wjr.v6.i9.708

Yamashita H, 2010, RADIAT ONCOL, V5, DOI 10.1186/1748-717X-5-32

NR 32

TC 8

Z9 8

U1 2

U2 9

PU NATURE RESEARCH

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD DEC 24

PY 2020

VL 10

IS 1

AR 20424

DI 10.1038/s41598-020-77552-7

PG 9

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA PB4FP

UT WOS:000596278900009

PM 33235324

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Nemoto, T

Futakami, N

Yagi, M

Kumabe, A

Takeda, A

Kunieda, E

Shigematsu, N

AF Nemoto, Takafumi

Futakami, Natsumi

Yagi, Masamichi

Kumabe, Atsuhiro

Takeda, Atsuya

Kunieda, Etsuo

Shigematsu, Naoyuki

TI Efficacy evaluation of 2D, 3D U-Net semantic segmentation and

atlas-based segmentation of normal lungs excluding the trachea and main

bronchi

SO JOURNAL OF RADIATION RESEARCH

LA English

DT Article; Proceedings Paper

CT 7th Japan-Taiwan Radiation Oncology Symposium

CY MAY 11, 2019

CL JAPAN

DE semantic segmentation; U-Net; lung cancer; trachea; main bronchi

ID HEAD; RADIOTHERAPY; DELINEATION; TARGET

AB This study aimed to examine the efficacy of semantic segmentation implemented by deep learning and to confirm whether this method is more effective than a commercially dominant auto-segmentation tool with regards to delineating normal lung excluding the trachea and main bronchi. A total of 232 non-small-cell lung cancer cases were examined. The computed tomography (CT) images of these cases were converted from Digital Imaging and Communications in Medicine (DICOM) Radiation Therapy (RT) formats to arrays of 32 x 128 x 128 voxels and input into both 2D and 3D U-Net, which are deep learning networks for semantic segmentation. The number of training, validation and test sets were 160, 40 and 32, respectively. Dice similarity coefficients (DSCs) of the test set were evaluated employing Smart Segmentation(?) Knowledge Based Contouring (Smart segmentation is an atlas-based segmentation tool), as well as the 2D and 3D U-Net. The mean DSCs of the test set were 0.964 [95% confidence interval (CI), 0.960-0.968], 0.990 (95% CI, 0.989-0.992) and 0.990 (95% CI, 0.989-0.991) with Smart segmentation, 2D and 3D U-Net, respectively. Compared with Smart segmentation, both U-Nets presented significantly higher DSCs by the Wilcoxon signed-rank test (P < 0.01). There was no difference in mean DSC between the 2D and 3D U-Net systems. The newly-devised 2D and 3D U-Net approaches were found to be more effective than a commercial auto-segmentation tool. Even the relatively shallow 2D U-Net which does not require high-performance computational resources was effective enough for the lung segmentation. Semantic segmentation using deep learning was useful in radiation treatment planning for lung cancers.

C1 [Nemoto, Takafumi] Saiseikai Yokohamashi Tobu Hosp, Div Radiat Oncol, Tsurumi Ku, Shimosueyoshi 3-6-1, Kanagawa, Kanagawa 2308765, Japan.

[Futakami, Natsumi; Kunieda, Etsuo] Tokai Univ, Sch Med, Dept Radiat Oncol, Shimokasuya 143, Isehara, Kanagawa 2591143, Japan.

[Nemoto, Takafumi; Kumabe, Atsuhiro; Shigematsu, Naoyuki] Keio Univ, Dept Radiol, Sch Med, Shinjyuku Ku, Shinanomachi 35, Tokyo 1608582, Japan.

[Yagi, Masamichi] Fujitsu Ltd, Syst Platform Solut Unit, Platform Tech Engn Div, HPC&AI Business Dept, World Trade Ctr Bldg,4-1,Hamamatsucho 2 Chome, Tokyo 1056125, Japan.

[Takeda, Atsuya] Ofuna Chuo Hosp, Radiat Oncol Ctr, Kamakura, Kanagawa 2470056, Japan.

RP Nemoto, T (通讯作者)，Saiseikai Yokohamashi Tobu Hosp, Div Radiat Oncol, Tsurumi Ku, Shimosueyoshi 3-6-1, Kanagawa, Kanagawa 2308765, Japan.; Nemoto, T (通讯作者)，Keio Univ, Dept Radiol, Sch Med, Shinjyuku Ku, Shinanomachi 35, Tokyo 1608582, Japan.

EM takatohoku@gmail.com

OI Nemoto, Takafumi/0000-0002-5370-0970

CR Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Daisne JF, 2013, RADIAT ONCOL, V8, DOI 10.1186/1748-717X-8-154

Dong X, 2019, MED PHYS, V46, P2157, DOI 10.1002/mp.13458

Foundation for Promotion of Cancer Research, 2018, CANC STAT JAP

Hong TS, 2012, RADIOTHER ONCOL, V103, P92, DOI 10.1016/j.radonc.2012.02.010

International Agency for Research on Cancer, GLOB 2018

Kanda Y, 2013, BONE MARROW TRANSPL, V48, P452, DOI 10.1038/bmt.2012.244

Kong FM, ATLASES ORGANS RISK

Li XA, 2009, INT J RADIAT ONCOL, V73, P944, DOI 10.1016/j.ijrobp.2008.10.034

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Network NCC, NCCN CLIN PRACT GUID

Park J, 2019, J DIGIT IMAGING

Phillip I, 2016, ARXIV161107004

Raudaschl PF, 2017, MED PHYS, V44, P2020, DOI 10.1002/mp.12197

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

van der Veen J, 2019, RADIOTHER ONCOL, V138, P68, DOI 10.1016/j.radonc.2019.05.010

Yamamoto T, 2016, RADIOTHER ONCOL, V118, P227, DOI 10.1016/j.radonc.2015.11.006

Yang JZ, 2018, MED PHYS, V45, P4568, DOI 10.1002/mp.13141

Young AV, 2011, INT J RADIAT ONCOL, V79, P943, DOI 10.1016/j.ijrobp.2010.04.063

Zhou XR, 2017, MED PHYS, V44, P5221, DOI 10.1002/mp.12480

NR 21

TC 18

Z9 20

U1 2

U2 5

PU OXFORD UNIV PRESS

PI OXFORD

PA GREAT CLARENDON ST, OXFORD OX2 6DP, ENGLAND

SN 0449-3060

EI 1349-9157

J9 J RADIAT RES

JI J. Radiat. Res.

PD MAR

PY 2020

VL 61

IS 2

BP 257

EP 264

DI 10.1093/jrr/rrz086

PG 8

WC Biology; Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED); Conference Proceedings Citation Index - Science (CPCI-S)

SC Life Sciences & Biomedicine - Other Topics; Oncology; Radiology, Nuclear

Medicine & Medical Imaging

GA LS5UB

UT WOS:000536447800012

PM 32043528

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Prasanna, P

Tiwari, P

Madabhushi, A

AF Prasanna, Prateek

Tiwari, Pallavi

Madabhushi, Anant

TI Co-occurrence of Local Anisotropic Gradient Orientations (CoLlAGe): A

new radiomics descriptor

SO SCIENTIFIC REPORTS

LA English

DT Article

ID MOLECULAR SUBTYPES; BREAST-CANCER; RECURRENCE; IMAGES

AB In this paper, we introduce a new radiomic descriptor, Co-occurrence of Local Anisotropic Gradient Orientations (CoLlAGe) for capturing subtle differences between benign and pathologic phenotypes which may be visually indistinguishable on routine anatomic imaging. CoLlAGe seeks to capture and exploit local anisotropic differences in voxel-level gradient orientations to distinguish similar appearing phenotypes. CoLlAGe involves assigning every image voxel an entropy value associated with the co-occurrence matrix of gradient orientations computed around every voxel. The hypothesis behind CoLlAGe is that benign and pathologic phenotypes even though they may appear similar on anatomic imaging, will differ in their local entropy patterns, in turn reflecting subtle local differences in tissue microarchitecture. We demonstrate CoLlAGe's utility in three clinically challenging classification problems: distinguishing (1) radiation necrosis, a benign yet confounding effect of radiation treatment, from recurrent tumors on T1-w MRI in 42 brain tumor patients, (2) different molecular sub-types of breast cancer on DCE-MRI in 65 studies and (3) non-small cell lung cancer (adenocarcinomas) from benign fungal infection (granulomas) on 120 non-contrast CT studies. For each of these classification problems, CoLlAGE in conjunction with a random forest classifier outperformed state of the art radiomic descriptors (Haralick, Gabor, Histogram of Gradient Orientations).

C1 [Prasanna, Prateek; Tiwari, Pallavi; Madabhushi, Anant] Case Western Reserve Univ, Dept Biomed Engn, Cleveland, OH 44120 USA.

RP Prasanna, P (通讯作者)，Case Western Reserve Univ, Dept Biomed Engn, Cleveland, OH 44120 USA.

EM prateek.prasanna@gmail.com

RI Prasanna, Prateek/Y-5136-2019; Madabhushi, Anant/AAG-2908-2019

OI Madabhushi, Anant/0000-0002-5741-0399; Prasanna,

Prateek/0000-0002-3068-3573

FU National Cancer Institute of the National Institutes of Health

[R01CA136535-01, R01CA140772-01, R21CA167811-01, R21CA179327-01];

National Institute of Diabetes and Digestive and Kidney Diseases

[R21CA195152-01, R01DK098503-02]; DOD Prostate Cancer Synergistic Idea

Development Award [PC120857]; DOD Lung Cancer Idea Development New

Investigator Award [LC130463]; Ohio Third Frontier Technology

development Grant; CTSC Coulter Annual Pilot Grant; Case Comprehensive

Cancer Center Pilot Grant; VelaSano Grant from the Cleveland Clinic;

Wallace H. Coulter Foundation Program in the Department of Biomedical

Engineering at Case Western Reserve University; NATIONAL CANCER

INSTITUTE [R01CA136535, R21CA195152, R21CA167811, R01CA202752,

R21CA179327, R01CA140772] Funding Source: NIH RePORTER; NATIONAL

INSTITUTE OF DIABETES AND DIGESTIVE AND KIDNEY DISEASES [R01DK098503]

Funding Source: NIH RePORTER

FX Research reported in this publication was supported by the National

Cancer Institute of the National Institutes of Health under award

numbers R01CA136535-01, R01CA140772-01, R21CA167811-01, R21CA179327-01;

R21CA195152-01 the National Institute of Diabetes and Digestive and

Kidney Diseases under award number R01DK098503-02, the DOD Prostate

Cancer Synergistic Idea Development Award (PC120857); the DOD Lung

Cancer Idea Development New Investigator Award (LC130463); the Ohio

Third Frontier Technology development Grant, the CTSC Coulter Annual

Pilot Grant, the Case Comprehensive Cancer Center Pilot Grant, VelaSano

Grant from the Cleveland Clinic, and the Wallace H. Coulter Foundation

Program in the Department of Biomedical Engineering at Case Western

Reserve University. The content is solely the responsibility of the

authors and does not necessarily represent the official views of the

National Institutes of Health.

CR Agner SC, 2014, RADIOLOGY, V272, P91, DOI 10.1148/radiol.14121031

Agner SC, 2011, J DIGIT IMAGING, V24, P446, DOI 10.1007/s10278-010-9298-1

BREIMAN L, 2001, MACH LEARN, V0045

Dalal N, 2005, PROC CVPR IEEE, P886, DOI 10.1109/cvpr.2005.177

Dennie C, 2016, QUANT IMAG MED SURG, V6, P6, DOI 10.3978/j.issn.2223-4292.2016.02.01

FOGEL I, 1989, BIOL CYBERN, V61, P103

Foster JG, 2014, FUTURE ONCOL, V10, P2659, DOI 10.2217/fon.14.201

Ganeshan B., 2016, EUROPEAN RADIOLOGY, V22, P796

Gatenby RA, 2013, RADIOLOGY, V269, P8, DOI 10.1148/radiol.13122697

Georgiadis P, 2009, MAGN RESON IMAGING, V27, P120, DOI 10.1016/j.mri.2008.05.017

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Ito S, 2010, LECT NOTES COMPUT SC, V6315, P701

JAIN AK, 1990, 1990 IEEE INTERNATIONAL CONFERENCE ON SYSTEMS, MAN, AND CYBERNETICS, P14, DOI 10.1109/ICSMC.1990.142050

Kovalev VA, 2001, IEEE T MED IMAGING, V20, P424, DOI 10.1109/42.925295

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Larroza A, 2015, J MAGN RESON IMAGING, V42, P1362, DOI 10.1002/jmri.24913

Lee G, 2013, LECT NOTES COMPUT SC, V8151, P396, DOI 10.1007/978-3-642-40760-4\_50

Lotjonen JMP, 2010, NEUROIMAGE, V49, P2352, DOI 10.1016/j.neuroimage.2009.10.026

Madabhushi A, 2006, MED PHYS, V33, P3426, DOI 10.1118/1.2335487

Pang YW, 2012, IEEE T SYST MAN CY B, V42, P458, DOI 10.1109/TSMCB.2011.2167750

Prasanna P, 2017, EUR RADIOL, V27, P4188, DOI 10.1007/s00330-016-4637-3

Prasanna P, 2014, LECT NOTES COMPUT SC, V8675, P73, DOI 10.1007/978-3-319-10443-0\_10

Prasanna P, 2013, INT CONF PER COMP, P176, DOI 10.4108/icst.pervasivehealth.2013.252093

Schrading S, 2008, RADIOLOGY, V246, P58, DOI 10.1148/radiol.2461062173

Tiwari P., 2014, SPIE

Uematsu T, 2009, RADIOLOGY, V250, P638, DOI 10.1148/radiol.2503081054

Verma N, 2013, NEURO-ONCOLOGY, V15, P515, DOI 10.1093/neuonc/nos307

Watanabe T, 2009, LECT NOTES COMPUT SC, V5414, P37

Wilcoxon F., 1964, SOME RAPID APPROXIMA

NR 30

TC 77

Z9 78

U1 0

U2 22

PU NATURE PORTFOLIO

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD NOV 22

PY 2016

VL 6

AR 37241

DI 10.1038/srep37241

PG 14

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA EC6DL

UT WOS:000388226600001

PM 27872484

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Krafft, SP

Rao, A

Stingo, F

Briere, TM

Court, LE

Liao, ZX

Martel, MK

AF Krafft, Shane P.

Rao, Arvind

Stingo, Francesco

Briere, Tina Marie

Court, Laurence E.

Liao, Zhongxing

Martel, Mary K.

TI The utility of quantitative CT radiomics features for improved

prediction of radiation pneumonitis

SO MEDICAL PHYSICS

LA English

DT Article

DE computed tomography; lung; NTCP; radiation pneumonitis; radiomics

ID INTERSTITIAL LUNG-DISEASES; VOLUME REDUCTION SURGERY; RISK-FACTORS;

HEART IRRADIATION; SELECTION; CANCER; LASSO; TEXTURE; MODELS; IMAGES

AB Purpose Methods The purpose of this study was to explore gains in predictive model performance for radiation pneumonitis (RP) using pretreatment CT radiomics features extracted from the normal lung volume. A total of 192 patients treated for nonsmall cell lung cancer with definitive radiotherapy were considered in the current study. In addition to clinical and dosimetric data, CT radiomics features were extracted from the total lung volume defined using the treatment planning scan. A total of 6851 features (15 clinical, 298 total lung and heart dosimetric, and 6538 image features) were gathered and considered candidate predictors for modeling of RP grade >= 3. Models were built with the least absolute shrinkage and selection operator (LASSO) logistic regression and applied to the set of candidate predictors with 50 iterations of tenfold nested cross-validation. Results Conclusions In the current cohort, 30 of 192 patients (15.6%) presented with RP grade >= 3. Average cross-validated AUC (CV-AUC) using only the clinical and dosimetric parameters was 0.51. CV-AUC was 0.68 when total lung CT radiomics features were added. Analysis with the entire set of available predictors revealed seven different image features selected in at least 40% of the model fits. We have successfully incorporated CT radiomics features into a framework for building predictive RP models via LASSO logistic regression. Addition of normal lung image features produced superior model performance relative to traditional dosimetric and clinical predictors of RP, suggesting that pretreatment CT radiomics features should be considered in the context of RP prediction.

C1 [Krafft, Shane P.; Briere, Tina Marie; Court, Laurence E.; Martel, Mary K.] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Houston, TX 77030 USA.

[Krafft, Shane P.] Univ Texas Grad Sch Biomed Sci Houston, Houston, TX 77030 USA.

[Rao, Arvind] Univ Texas MD Anderson Canc Ctr, Dept Bioinformat & Computat Biol, Houston, TX 77030 USA.

[Stingo, Francesco] Univ Texas MD Anderson Canc Ctr, Dept Biostat, Houston, TX 77030 USA.

[Liao, Zhongxing] Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Houston, TX 77030 USA.

RP Krafft, SP (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Houston, TX 77030 USA.; Krafft, SP (通讯作者)，Univ Texas Grad Sch Biomed Sci Houston, Houston, TX 77030 USA.

EM SPKrafft@mdanderson.org

RI Stingo, Francesco/N-6514-2019

OI Stingo, Francesco/0000-0001-9150-8552; Court,

Laurence/0000-0002-3241-6145; Krafft, Shane/0000-0002-4582-8587

FU Rosalie B. Hite Fellowship in Cancer Research

FX Shane P. Krafft is a recipient of the Rosalie B. Hite Fellowship in

Cancer Research. Portions of the work were presented at the 57th Annual

Meeting of the American Association of Physicists in Medicine (AAPM),

July 2015, Anaheim, CA.

CR BENJAMINI Y, 1995, J R STAT SOC B, V57, P289, DOI 10.1111/j.2517-6161.1995.tb02031.x

Castillo R, 2015, RADIOLOGY, V275, P822, DOI 10.1148/radiol.14140457

Cella L, 2015, ACTA ONCOL, V54, P1796, DOI 10.3109/0284186X.2015.1016624

Chabat F, 2003, RADIOLOGY, V228, P871, DOI 10.1148/radiol.2283020505

Coxson HO, 2003, THORAX, V58, P510, DOI 10.1136/thorax.58.6.510

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Friedman J, 2010, J STAT SOFTW, V33, P1, DOI 10.18637/jss.v033.i01

Gierada DS, 2000, CHEST, V117, P991, DOI 10.1378/chest.117.4.991

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Hoffman EA, 2003, ACAD RADIOL, V10, P1104, DOI 10.1016/S1076-6332(03)00330-1

Hope AJ, 2006, INT J RADIAT ONCOL, V65, P112, DOI 10.1016/j.ijrobp.2005.11.046

Hothorn T, 2005, J COMPUT GRAPH STAT, V14, P675, DOI 10.1198/106186005X59630

Huang EX, 2011, ACTA ONCOL, V50, P51, DOI 10.3109/0284186X.2010.521192

Hunter LA, 2013, MED PHYS, V40, DOI 10.1118/1.4829514

Jackson A, 2010, INT J RADIAT ONCOL, V76, pS155, DOI 10.1016/j.ijrobp.2009.08.074

Jin HK, 2009, RADIOTHER ONCOL, V91, P427, DOI 10.1016/j.radonc.2008.09.009

Kimura T, 1010, BRIT J RADIOL, V85, P135

Kocak Z, 2005, INT J RADIAT ONCOL, V62, P635, DOI 10.1016/j.ijrobp.2004.12.023

Kong FM, 2015, SEMIN RADIAT ONCOL, V25, P100, DOI 10.1016/j.semradonc.2014.12.003

Krafft S, SEE SUPPLEMENTAL MAT, P1000

Kuhn M, 2008, J STAT SOFTW, V28, P1, DOI 10.18637/jss.v028.i05

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Liao ZXX, 2010, INT J RADIAT ONCOL, V76, P775, DOI 10.1016/j.ijrobp.2009.02.032

Ma JL, 2010, INT J RADIAT ONCOL, V76, P116, DOI 10.1016/j.ijrobp.2009.01.025

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Makimoto T, 1999, JPN J CLIN ONCOL, V29, P192, DOI 10.1093/jjco/29.4.192

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Roberts S, 2014, COMPUT STAT DATA AN, V70, P198, DOI 10.1016/j.csda.2013.09.008

Sanuki N, 2012, J RADIAT RES, V53, P110, DOI 10.1269/jrr.110142

Takeda A, 2012, CHEST, V141, P858, DOI 10.1378/chest.11-1193

Tibshirani R, 1996, J ROY STAT SOC B MET, V58, P267, DOI 10.1111/j.2517-6161.1996.tb02080.x

Tucker SL, 2008, INT J RADIAT ONCOL, V72, P568, DOI 10.1016/j.ijrobp.2008.04.053

Tucker SL, 2014, ACTA ONCOL, V53, P590, DOI 10.3109/0284186X.2013.831185

Tucker SL, 2010, INT J RADIAT ONCOL, V77, P691, DOI 10.1016/j.ijrobp.2009.05.055

van Luijk P, 2007, INT J RADIAT ONCOL, V69, P552, DOI 10.1016/j.ijrobp.2007.05.065

Vinogradskiy Y, 2012, INT J RADIAT ONCOL, V82, P1650, DOI 10.1016/j.ijrobp.2011.02.009

Vinogradskiy Y, 2012, INT J RADIAT ONCOL, V82, P1549, DOI 10.1016/j.ijrobp.2011.05.007

Vogelius IR, 2012, ACTA ONCOL, V51, P975, DOI 10.3109/0284186X.2012.718093

Wu TT, 2009, BIOINFORMATICS, V25, P714, DOI 10.1093/bioinformatics/btp041

Xu CJ, 2012, INT J RADIAT ONCOL, V84, pE123, DOI 10.1016/j.ijrobp.2012.02.022

Xu Y, 2006, ACAD RADIOL, V13, P969, DOI 10.1016/j.acra.2006.04.017

Zou H, 2005, J R STAT SOC B, V67, P301, DOI 10.1111/j.1467-9868.2005.00503.x

Zou H, 2006, J AM STAT ASSOC, V101, P1418, DOI 10.1198/016214506000000735

NR 44

TC 36

Z9 41

U1 5

U2 20

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD NOV

PY 2018

VL 45

IS 11

BP 5317

EP 5324

DI 10.1002/mp.13150

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA HA1QQ

UT WOS:000449995900061

PM 30133809

DA 2022-08-24

ER

PT J

AU Londono, GAJ

Vicente, AMG

Bosque, JJ

Amo-Salas, M

Perez-Beteta, J

Honguero-Martinez, AF

Perez-Garcia, VM

Castrejon, AMS

AF Jimenez Londono, German Andres

Garcia Vicente, Ana Maria

Bosque, Jesus J.

Amo-Salas, Mariano

Perez-Beteta, Julian

Francisco Honguero-Martinez, Antonio

Perez-Garcia, Victor M.

Soriano Castrejon, Angel Maria

TI SUVmax to tumor perimeter distance: a robust radiomics prognostic

biomarker in resectable non-small cell lung cancer patients

SO EUROPEAN RADIOLOGY

LA English

DT Article

DE Non-small cell lung cancer; Prognosis; [F-18]FDG PET; CT; Radiomics;

Geometric variables

ID POSITRON-EMISSION-TOMOGRAPHY; STAGE-I; F-18-FDG PET/CT; POSTRECURRENCE

SURVIVAL; VOLUMETRIC PARAMETERS; PREDICTS SURVIVAL; EARLY RECURRENCE;

FDG PET/CT; NSCLC; RADIOTHERAPY

AB Objective The purpose of this study was to evaluate the prognostic value of novel geometric variables obtained from pre-treatment [F-18]FDG PET/CT with respect to classical ones in patients with non-small cell lung cancer (NSCLC). Methods Retrospective study including stage I-III NSCLC patients with baseline [F-18]FDG PET/CT. Clinical, histopathologic, and metabolic parameters were obtained. After tumor segmentation, SUV and volume-based variables, global texture, sphericity, and two novel parameters, normalized SUVpeak to centroid distance (nSCD) and normalized SUVmax to perimeter distance (nSPD), were obtained. Early recurrence (ER) and short-term mortality (STM) were used as end points. Univariate logistic regression and multivariate logistic regression with respect to ER and STM were performed. Results A cohort of 173 patients was selected. ER was detected in 49/104 of patients with recurrent disease. Additionally, 100 patients died and 53 had STM. Age, pathologic lymphovascular invasion, lymph nodal infiltration, TNM stage, nSCD, and nSPD were associated with ER, although only age (aOR = 1.06, p = 0.002), pathologic lymphovascular invasion (aOR = 3.40, p = 0.022), and nSPD (aOR = 0.02, p = 0.018) were significant independent predictors of ER in multivariate analysis. Age, lymph nodal infiltration, TNM stage, nSCD, and nSPD were predictors of STM. Age (aOR = 1.05, p = 0.006), lymph nodal infiltration (aOR = 2.72, p = 0.005), and nSPD (aOR = 0.03, p = 0.022) were significantly associated with STM in multivariate analysis. Coefficient of variation (COV) and SUVmean/SUVmax ratio did not show significant predictive value with respect to ER or STM. Conclusion The geometric variables, nSCD and nSPD, are robust biomarkers of the poorest outcome prediction of patients with NSCLC with respect to classical PET variables.

C1 [Jimenez Londono, German Andres; Garcia Vicente, Ana Maria; Soriano Castrejon, Angel Maria] Hosp Gen Univ Ciudad Real, Dept Nucl Med, Ciudad Real, Spain.

[Bosque, Jesus J.; Perez-Beteta, Julian; Perez-Garcia, Victor M.] Univ Castilla La Mancha, Dept Math, Math Oncol Lab MOLAB, Ciudad Real, Spain.

[Amo-Salas, Mariano] Univ Castilla La Mancha, Dept Math, Ciudad Real, Spain.

[Francisco Honguero-Martinez, Antonio] Hosp Gen Univ Albacete, Dept Surg, Albacete, Spain.

RP Londono, GAJ (通讯作者)，Hosp Gen Univ Ciudad Real, Dept Nucl Med, Ciudad Real, Spain.

EM gjimenez91@yahoo.com

RI Amo-Salas, Mariano/R-9586-2019; Perez-Beteta, Julian/Q-6404-2017

OI Amo-Salas, Mariano/0000-0002-0956-2531; Perez-Beteta,

Julian/0000-0003-0317-6215

CR Agarwal M, 2010, EUR J NUCL MED MOL I, V37, P691, DOI 10.1007/s00259-009-1291-x

Ahn HK, 2019, CLIN RADIOL, V74, P467, DOI 10.1016/j.crad.2019.02.008

Anwar H, 2018, ANN NUCL MED, V32, P687, DOI 10.1007/s12149-018-1301-9

Apostolova I, 2016, EUR J NUCL MED MOL I, V43, P2360, DOI 10.1007/s00259-016-3452-z

Apostolova I, 2014, BMC CANCER, V14, DOI 10.1186/1471-2407-14-896

Avila Martinez RJ., 2018, INVASION PLEURA VISC

Barta JA, 2019, ANN GLOB HEALTH, V85, DOI 10.5334/aogh.2419

Battafarano RJ, 2002, J THORAC CARDIOV SUR, V123, P280, DOI 10.1067/mtc.2002.119338

Bauml J, 2013, CLIN LUNG CANCER, V14, P581, DOI 10.1016/j.cllc.2013.05.002

Berghmans T, 2008, J THORAC ONCOL, V3, P6, DOI 10.1097/JTO.0b013e31815e6d6b

Bundschuh RA, 2014, J NUCL MED, V55, P891, DOI 10.2967/jnumed.113.127340

Cho BC, 2019, ANTICANCER RES, V39, P1403, DOI 10.21873/anticanres.13255

Choi Pil Jo, 2013, Korean J Thorac Cardiovasc Surg, V46, P449, DOI 10.5090/kjtcs.2013.46.6.449

Coroller TP, 2017, J THORAC ONCOL, V12, P467, DOI 10.1016/j.jtho.2016.11.2226

Detterbeck FC, 2017, CHEST, V151, P193, DOI 10.1016/j.chest.2016.10.010

Domachevsky L, 2015, EUR RADIOL, V25, P3361, DOI 10.1007/s00330-015-3754-8

Dong M, 2017, J MED IMAG RADIAT ON, V61, P652, DOI 10.1111/1754-9485.12599

Ettinger DS, 2017, J NATL COMPR CANC NE, V15, P504, DOI 10.6004/jnccn.2017.0050

Finkle JH, 2017, EUR J NUCL MED MOL I, V44, P1275, DOI 10.1007/s00259-017-3659-7

Goldstraw P, 2007, J THORAC ONCOL, V2, P706, DOI 10.1097/JTO.0b013e31812f3c1a

Grabinska K, 2015, WORLD J GASTROENTERO, V21, P5901, DOI 10.3748/wjg.v21.i19.5901

Guerra JLL, 2013, ANN ONCOL, V24, P67, DOI 10.1093/annonc/mds274

Han S, 2018, ANN NUCL MED, V32, P602, DOI 10.1007/s12149-018-1281-9

Hoang JK, 2008, J CLIN ONCOL, V26, P1459, DOI 10.1200/JCO.2007.14.3628

Hung JJ, 2010, THORAX, V65, P241, DOI 10.1136/thx.2008.110825

Hyun SH, 2014, EUR J NUCL MED MOL I, V41, P50, DOI 10.1007/s00259-013-2530-8

Hyun SH, 2013, ANN SURG, V257, P364, DOI 10.1097/SLA.0b013e318262a6ec

Im HJ, 2015, EUR J NUCL MED MOL I, V42, P241, DOI 10.1007/s00259-014-2903-7

Londono GAJ, 2020, CLIN NUCL MED, V45, pE477, DOI 10.1097/RLU.0000000000003166

Jimenez-Sanchez J, 2021, P NATL ACAD SCI USA, V118, DOI 10.1073/pnas.2018110118

Kiankhooy A, 2014, ANN THORAC SURG, V98, P1175, DOI 10.1016/j.athoracsur.2014.05.061

Kim K, 2012, NUCL MED COMMUN, V33, P613, DOI 10.1097/MNM.0b013e328351d4f5

Kirienko M, 2018, EUR J NUCL MED MOL I, V45, P207, DOI 10.1007/s00259-017-3837-7

Kirienko M, 2017, FRONT BIOSCI-LANDMRK, V22, P1713

Kurtipek E, 2015, CLIN NUCL MED, V40, P459, DOI 10.1097/RLU.0000000000000740

Liao SR, 2012, EUR J NUCL MED MOL I, V39, P27, DOI 10.1007/s00259-011-1934-6

Lin Y, 2012, ANTICANCER RES, V32, P5087

Liu J, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0146195

Luo JZ, 2017, ONCOTARGET, V8, P7050, DOI 10.18632/oncotarget.12540

Majem M, 2019, CLIN TRANSL ONCOL, V21, P3, DOI 10.1007/s12094-018-1978-1

Melloni G, 2013, EJSO-EUR J SURG ONC, V39, P1254, DOI 10.1016/j.ejso.2013.07.092

Mizuno T, 2018, J THORAC DIS, V10, P1788, DOI 10.21037/jtd.2018.01.148

Na FF, 2014, J THORAC ONCOL, V9, P834, DOI 10.1097/JTO.0000000000000185

Paesmans M, 2010, J THORAC ONCOL, V5, P612, DOI 10.1097/JTO.0b013e3181d0a4f5

Park SY, 2015, J NUCL MED, V56, P45, DOI 10.2967/jnumed.114.147561

Perez-Beteta J, 2018, RADIOLOGY, V288, P218, DOI 10.1148/radiol.2018171051

Postmus PE, 2017, ANN ONCOL, V28, P1, DOI 10.1093/annonc/mdx222

Siegel RL., 2020, CA-CANCER J CLIN, V70, P7, DOI [DOI 10.3322/caac.21551, 10.3322/caac.21590]

Sugimura H, 2007, ANN THORAC SURG, V83, P409, DOI 10.1016/j.athoracsur.2006.08.046

Galan MJT, 2019, REV ESP MED NUCL IMA, V38, P290, DOI 10.1016/j.remn.2019.02.004

Travis WD, 2015, J THORAC ONCOL, V10, P1243, DOI 10.1097/JTO.0000000000000630

Vesselle H, 2007, CLIN CANCER RES, V13, P3255, DOI 10.1158/1078-0432.CCR-06-1128

Walters S, 2013, THORAX, V68, P551, DOI 10.1136/thoraxjnl-2012-202297

Wei SH, 2011, J THORAC ONCOL, V6, P310, DOI 10.1097/JTO.0b013e3181ff9b45

Yoo IR, 2014, BIO-MED MATER ENG, V24, P3091, DOI 10.3233/BME-141131

Yoshino I, 2001, Ann Thorac Cardiovasc Surg, V7, P204

NR 56

TC 1

Z9 1

U1 6

U2 6

PU SPRINGER

PI NEW YORK

PA ONE NEW YORK PLAZA, SUITE 4600, NEW YORK, NY, UNITED STATES

SN 0938-7994

EI 1432-1084

J9 EUR RADIOL

JI Eur. Radiol.

PD JUN

PY 2022

VL 32

IS 6

BP 3889

EP 3902

DI 10.1007/s00330-021-08523-3

EA FEB 2022

PG 14

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 1J9ZO

UT WOS:000752749000005

PM 35133484

DA 2022-08-24

ER

PT J

AU Franceschini, D

Cozzi, L

De Rose, F

Navarria, P

Fogliata, A

Franzese, C

Pezzulla, D

Tomatis, S

Reggiori, G

Scorsetti, M

AF Franceschini, Davide

Cozzi, Luca

De Rose, Fiorenza

Navarria, Pierina

Fogliata, Antonella

Franzese, Ciro

Pezzulla, Donato

Tomatis, Stefano

Reggiori, Giacomo

Scorsetti, Marta

TI A radiomic approach to predicting nodal relapse and disease-specific

survival in patients treated with stereotactic body radiation therapy

for early-stage non-small cell lung cancer.

SO STRAHLENTHERAPIE UND ONKOLOGIE

LA English

DT Article

DE Lung cancer; Stereotactic Body Radiation therapy; Radiomics; Survival

ID SIGNATURE; IMAGES

AB Purpose To describe the possibility of building a classifier for patients at risk of lymph node relapse and a predictive model for disease-specific survival in patients with early stage non-small cell lung cancer. Methods A cohort of 102 patients who received stereotactic body radiation treatment was retrospectively investigated. A set of 45 textural features was computed for the tumor volumes on the treatment planning CT images. Patients were split into two independent cohorts (70 patients, 68.9%, for training; and 32 patients, 31.4%, for validation). Three different models were built in the study. A stepwise backward linear discriminant analysis was applied to identify patients at risk of lymph node progression. The performance of the model was assessed by means of standard metrics derived from the confusion matrix. Furthermore, all textural features were correlated to survival data to build two separate predictive models for progression-free survival (PFS) and disease-specific survival (DS-OS). These models were built from the features/predictors found significant in univariate analysis and elastic net regularization by means of a multivarate Cox regression with backward selection. Low- and high-risk groups were identified by maximizing the separation by means of the Youden method. Results In the total cohort (77, 75.5%, males; and 25, 24.5%, females; median age 76.6 years), 15 patients presented nodal progression at the time of analysis; 19 patients (18.6%) died because of disease-specific causes, 25 (24.5%) died from other reasons, 28 (27.5%) were alive without disease, and 30 (29.4%) with either local or distant progression. The specificity, sensitivity, and accuracy of the classifier resulted 83.1 & x202f;+/- 24.5, 87.4 & x202f;+/- 1.2, and 85.4 & x202f;+/- 12.5 in the validation group (coherent with the findings in the training). The area under the curve for the classifier resulted in 0.84 & x202f;+/- 0.04 and 0.73 & x202f;+/- 0.05 for training and validation, respectively. The mean time for DS-OS and PFS for the low- and high-risk subgroups of patients (in the validation groups) were 88.2 & x202f;month & x202f;+/- 9.0 & x202f;month vs. 84.1 & x202f;month & x202f;+/- 7.8 & x202f;month (low risk) and 52.7 & x202f;month & x202f;+/- 5.9 & x202f;month vs. 44.6 & x202f;month & x202f;+/- 9.2 & x202f;month (high risk), respectively. Conclusion Radiomics analysis based on planning CT images allowed a classifier and predictive models capable of identifying patients at risk of nodal relapse and high-risk of bad prognosis to be built. The radiomics signatures identified were mostly related to tumor heterogeneity.

C1 [Franceschini, Davide; Cozzi, Luca; De Rose, Fiorenza; Navarria, Pierina; Fogliata, Antonella; Franzese, Ciro; Pezzulla, Donato; Tomatis, Stefano; Reggiori, Giacomo; Scorsetti, Marta] Humanitas Univ, Dept Biomed Sci, Milan, Italy.

[Cozzi, Luca; Scorsetti, Marta] Humanitas Clin & Res Ctr, Radiotherapy & Radiosurg, Milan, Italy.

RP Cozzi, L (通讯作者)，Humanitas Univ, Dept Biomed Sci, Milan, Italy.; Cozzi, L (通讯作者)，Humanitas Clin & Res Ctr, Radiotherapy & Radiosurg, Milan, Italy.

EM luca.cozzi@humanitas.it

RI Pezzulla, Donato/AAQ-3754-2020; Tomatis, Stefano/AAA-6002-2021;

Franceschini, Davide/AAB-3871-2019; De Rose, Fiorenza/AAC-6414-2022;

Franzese, Ciro/AAJ-7311-2020; Pezzulla, Donato/AFT-2862-2022

OI Franceschini, Davide/0000-0003-1142-2439; De Rose,

Fiorenza/0000-0001-7994-495X; Franzese, Ciro/0000-0001-6893-6284;

Pezzulla, Donato/0000-0001-6676-1169; Cozzi, Luca/0000-0001-7862-898X;

Tomatis, Stefano/0000-0002-4791-0373; Navarria,

Pierina/0000-0002-6913-1442; reggiori, giacomo/0000-0003-3336-5690;

Scorsetti, Marta/0000-0003-0320-559X

CR Abel S, 2019, LUNG CANCER MANAG, V8, DOI 10.2217/lmt-2018-0013

Aberle DR, 2011, NEW ENGL J MED, V365, P395, DOI 10.1056/NEJMoa1102873

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

[Anonymous], R COR TEAM LANG ENV

Bogowicz M, 2017, INT J RADIAT ONCOL, V99, P921, DOI 10.1016/j.ijrobp.2017.06.002

Buizza G, 2018, PHYS MEDICA, V54, P21, DOI 10.1016/j.ejmp.2018.09.003

Chi A, 2010, RADIOTHER ONCOL, V94, P1, DOI 10.1016/j.radonc.2009.12.008

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

Cozzi L, 2019, STRAHLENTHER ONKOL, V195, P805, DOI 10.1007/s00066-019-01483-0

de Jong EEC, 2018, LUNG CANCER, V124, P6, DOI 10.1016/j.lungcan.2018.07.023

Foster CC, 2019, LUNG CANCER, V130, P162, DOI 10.1016/j.lungcan.2019.02.023

Howlader N, 2014, SEER CANC STAT REV 1

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Kirienko M, 2018, EUR J NUCL MED MOL I, V45, P1649, DOI 10.1007/s00259-018-3987-2

Kirienko M, 2018, EUR J NUCL MED MOL I, V45, P207, DOI 10.1007/s00259-017-3837-7

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Larue RTHM, 2017, RADIOTHER ONCOL, V125, P147, DOI 10.1016/j.radonc.2017.07.023

Nioche C, 2018, CANCER RES, V78, P4786, DOI 10.1158/0008-5472.CAN-18-0125

Padda SK, 2014, SEMIN ONCOL, V41, P40, DOI 10.1053/j.seminoncol.2013.12.011

Ramella S, 2018, PLOS ONE, V13, DOI 10.1371/journal.pone.0207455

Robinson CG, 2013, J THORAC ONCOL, V8, P192, DOI 10.1097/JTO.0b013e31827ce361

Siegel RL, 2021, CA-CANCER J CLIN, V71, P7, DOI 10.3322/caac.21654

Sollini M, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00426-y

Starkov P, 2019, BRIT J RADIOL, V92, DOI 10.1259/bjr.20180228

Thawani R, 2018, LUNG CANCER, V115, P34, DOI 10.1016/j.lungcan.2017.10.015

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Timmerman RD, 2018, JAMA ONCOL, V4, P1263, DOI 10.1001/jamaoncol.2018.1251

van Timmeren JE, 2019, PLOS ONE, V14, DOI 10.1371/journal.pone.0217536

van Timmeren JE, 2019, RADIOTHER ONCOL, V136, P78, DOI 10.1016/j.radonc.2019.03.032

Videtic GMM, 2015, INT J RADIAT ONCOL, V93, P757, DOI 10.1016/j.ijrobp.2015.07.2260

YOUDEN WJ, 1950, BIOMETRICS, V6, P172, DOI 10.1002/1097-0142(1950)3:1<32::AID-CNCR2820030106>3.0.CO;2-3

Yu W, 2018, INT J RADIAT ONCOL, V102, P1090, DOI 10.1016/j.ijrobp.2017.10.046

NR 34

TC 6

Z9 6

U1 2

U2 7

PU SPRINGER HEIDELBERG

PI HEIDELBERG

PA TIERGARTENSTRASSE 17, D-69121 HEIDELBERG, GERMANY

SN 0179-7158

EI 1439-099X

J9 STRAHLENTHER ONKOL

JI Strahlenther. Onkol.

PD OCT

PY 2020

VL 196

IS 10

SI SI

BP 922

EP 931

DI 10.1007/s00066-019-01542-6

EA NOV 2019

PG 10

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA NP3UY

UT WOS:000496407800001

PM 31722061

DA 2022-08-24

ER

PT J

AU Niraula, D

Jamaluddin, J

Matuszak, MM

Ten Haken, RK

El Naqa, I

AF Niraula, Dipesh

Jamaluddin, Jamalina

Matuszak, Martha M.

Ten Haken, Randall K.

El Naqa, Issam

TI Quantum deep reinforcement learning for clinical decision support in

oncology: application to adaptive radiotherapy

SO SCIENTIFIC REPORTS

LA English

DT Article

ID INDUCIBLE PROTEIN-10; UNCERTAINTY

AB Subtle differences in a patient's genetics and physiology may alter radiotherapy (RT) treatment responses, motivating the need for a more personalized treatment plan. Accordingly, we have developed a novel quantum deep reinforcement learning (qDRL) framework for clinical decision support that can estimate an individual patient's dose response mid-treatment and recommend an optimal dose adjustment. Our framework considers patients' specific information including biological, physical, genetic, clinical, and dosimetric factors. Recognizing that physicians must make decisions amidst uncertainty in RT treatment outcomes, we employed indeterministic quantum states to represent human decision making in a real-life scenario. We paired quantum decision states with a model-based deep q-learning algorithm to optimize the clinical decision-making process in RT. We trained our proposed qDRL framework on an institutional dataset of 67 stage III non-small cell lung cancer (NSCLC) patients treated on prospective adaptive protocols and independently validated our framework in an external multi-institutional dataset of 174 NSCLC patients. For a comprehensive evaluation, we compared three frameworks: DRL, qDRL trained in a Qiskit quantum computing simulator, and qDRL trained in an IBM quantum computer. Two metrics were considered to evaluate our framework: (1) similarity score, defined as the root mean square error between retrospective clinical decisions and the AI recommendations, and (2) self-evaluation scheme that compares retrospective clinical decisions and AI recommendations based on the improvement in the observed clinical outcomes. Our analysis shows that our framework, which takes into consideration individual patient dose response in its decision-making, can potentially improve clinical RT decision-making by at least about 10% compared to unaided clinical practice. Further validation of our novel quantitative approach in a prospective study will provide a necessary framework for improving the standard of care in personalized RT.

C1 [Niraula, Dipesh; El Naqa, Issam] H Lee Moffitt Canc Ctr & Res Inst, Dept Machine Learning, Tampa, FL 33612 USA.

[Jamaluddin, Jamalina; Matuszak, Martha M.] Univ Michigan, Dept Nucl Engn & Radiol Sci, Ann Arbor, MI 48109 USA.

[Matuszak, Martha M.; Ten Haken, Randall K.] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

RP Niraula, D (通讯作者)，H Lee Moffitt Canc Ctr & Res Inst, Dept Machine Learning, Tampa, FL 33612 USA.

EM Dipesh.Niraula@moffitt.org

RI Niraula, Dipesh/AAE-6536-2020

OI Niraula, Dipesh/0000-0002-2245-8536; Jamaluddin,

Jamalina/0000-0002-6534-8388

FU National Institute of Health (NIH) [R01-CA233487]

FX \This work was partly supported by grants from National Institute of

Health (NIH) grant R01-CA233487.

CR Abbas A., 2020, LEARN QUANTUM COMPUT

Alzubaidi L, 2021, J BIG DATA-GER, V8, DOI 10.1186/s40537-021-00444-8

ANGIOLILLO AL, 1995, J EXP MED, V182, P155, DOI 10.1084/jem.182.1.155

Borghesi A., 2020, IMPROVING DEEP LEARN

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Bryant AK, 2017, CANCER EPIDEM BIOMAR, V26, P963, DOI 10.1158/1055-9965.EPI-16-1023

Busemeyer J. R., 2012, QUANTUM MODELS COGNI, DOI 10.1017/CBO9780511997716

De Finetti B., 1968, INT ENCY SOCIAL SCI, V12, P496

Dong DY, 2008, IEEE T SYST MAN CY B, V38, P1207, DOI 10.1109/TSMCB.2008.925743

Dong DY, 2012, IEEE-ASME T MECH, V17, P86, DOI 10.1109/TMECH.2010.2090896

Dufour JH, 2002, J IMMUNOL, V168, P3195, DOI 10.4049/jimmunol.168.7.3195

El Naga I, 2021, NAT REV CLIN ONCOL, V18, P605, DOI 10.1038/s41571-021-00541-w

El Naqa I., 2018, GUIDE OUTCOME MODELI, DOI [10.1201/9780429452659, DOI 10.1201/9780429452659]

El Naqa I, 2018, JCO CLIN CANCER INFO, V2, DOI 10.1200/CCI.18.00002

Gilliam A., 2020, OPTIMIZING QUANTUM S

Grover LK, 2001, AM J PHYS, V69, P769, DOI 10.1119/1.1359518

Gulrajani I, 2017, P 31 INT C NEUR INF, P5767, DOI DOI 10.5555/3295222.3295327

Hildebrandt MAT, 2010, PLOS ONE, V5, DOI 10.1371/journal.pone.0012402

IBM Q team, 2020, IBM Q 16 MELB BACK S

Khrennikov A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-34531-3

LeCun Y, 2015, NATURE, V521, P436, DOI 10.1038/nature14539

Li JA, 2020, NAT HUM BEHAV, V4, P294, DOI 10.1038/s41562-019-0804-2

LICHTENSTEIN S, 1971, J EXP PSYCHOL, V89, P46, DOI 10.1037/h0031207

Luo Y, 2018, MED PHYS, V45, P3980, DOI 10.1002/mp.13029

LUSTER AD, 1985, NATURE, V315, P672, DOI 10.1038/315672a0

Mnih V, 2015, NATURE, V518, P529, DOI 10.1038/nature14236

Morgan Howard E, 2020, Cancers Head Neck, V5, P1, DOI 10.1186/s41199-019-0046-z

Netherton TJ, 2021, ONCOLOGY-BASEL, V99, P124, DOI 10.1159/000512172

Nielsen Michael A., 2002, QUANTUM COMPUTATION, P558, DOI [10.1017/cbo9780511976667, 10.1017/CBO9780511976667]

Pothos EM, 2009, P ROY SOC B-BIOL SCI, V276, P2171, DOI 10.1098/rspb.2009.0121

Rodrigues G., 2015, PRACT RADIAT ONCOL, V5, P3, DOI [10.1016/j.prro.2015.02.012/attachment/62dd00cb-5dc0-4627-943a-235110d60303/mmc1.pdf, DOI 10.1016/J.PRRO.2015.02.012/ATTACHMENT/62DD00CB-5DC0-4627-943A-235110D60303/MMC1.PDF]

Savage LJ., 1954, FDN STAT

SHAFIR E, 1992, COGNITIVE PSYCHOL, V24, P449, DOI 10.1016/0010-0285(92)90015-T

Silver D, 2017, NATURE, V550, P354, DOI 10.1038/nature24270

Sonke JJ, 2010, SEMIN RADIAT ONCOL, V20, P94, DOI 10.1016/j.semradonc.2009.11.003

Sutton RS, 2018, ADAPT COMPUT MACH LE, P1

Tseng HH, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00266

Tseng HH, 2017, MED PHYS, V44, P6690, DOI 10.1002/mp.12625

TVERSKY A, 1974, SCIENCE, V185, P1124, DOI 10.1126/science.185.4157.1124

Vallieres M. C., 2018, THESIS MCGILL U LIB

van Hasselt H, 2016, AAAI CONF ARTIF INTE, P2094

Watkins C. J. C. H., 1989, THESIS

Yukalov VI, 2016, PHILOS T R SOC A, V374, DOI 10.1098/rsta.2015.0100

NR 43

TC 1

Z9 1

U1 1

U2 1

PU NATURE PORTFOLIO

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD DEC 7

PY 2021

VL 11

IS 1

AR 23545

DI 10.1038/s41598-021-02910-y

PG 13

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA XV3EL

UT WOS:000734829300011

PM 34876609

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Carles, M

Fechter, T

Radicioni, G

Schimek-Jasch, T

Adebahr, S

Zamboglou, C

Nicolay, NH

Marti-Bonmati, L

Nestle, U

Grosu, AL

Baltas, D

Mix, M

Gkika, E

AF Carles, Montserrat

Fechter, Tobias

Radicioni, Gianluca

Schimek-Jasch, Tanja

Adebahr, Sonja

Zamboglou, Constantinos

Nicolay, Nils H.

Marti-Bonmati, Luis

Nestle, Ursula

Grosu, Anca L.

Baltas, Dimos

Mix, Michael

Gkika, Eleni

TI FDG-PET Radiomics for Response Monitoring in Non-Small-Cell Lung Cancer

Treated with Radiation Therapy

SO CANCERS

LA English

DT Article

DE lung cancer; PET radiomics; FDG monitoring and retrospectively gated 4D

PET; CT

AB Simple Summary

In this study, we strive to identify clinically relevant image feature (IF) changes during chemoradiation in patients with non-small-cell lung cancer (NSCLC) to be able to predict tumor responses in an early stage of treatment. All patients underwent static (3D) and respiratory-gated 4D PET/CT scans before treatment and a 3D scan during or after treatment. Our proposed method rejects IF changes due to intrinsic variability such as noise, resolution and movement through breathing. The IF variability observed across 4D PET is employed as a patient individualized normalization factor to emphasize statistically relevant IF changes during treatment.

The aim of this study is to identify clinically relevant image feature (IF) changes during chemoradiation and evaluate their efficacy in predicting treatment response. Patients with non-small-cell lung cancer (NSCLC) were enrolled in two prospective trials (STRIPE, PET-Plan). We evaluated 48 patients who underwent static (3D) and retrospectively-respiratory-gated 4D PET/CT scans before treatment and a 3D scan during or after treatment. Our proposed method rejects IF changes due to intrinsic variability. The IF variability observed across 4D PET is employed as a patient individualized normalization factor to emphasize statistically relevant IF changes during treatment. Predictions of overall survival (OS), local recurrence (LR) and distant metastasis (DM) were evaluated. From 135 IFs, only 17 satisfied the required criteria of being normally distributed across 4D PET and robust between 3D and 4D images. Changes during treatment in the area-under-the-curve of the cumulative standard-uptake-value histogram (delta<INF>AUC<INF>CSH</INF></INF>) within primary tumor discriminated (AUC = 0.87, Specificity = 0.78) patients with and without LR. The resulted prognostic model was validated with a different segmentation method (AUC = 0.83) and in a different patient cohort (AUC = 0.63). The quantification of tumor FDG heterogeneity by delta<INF>AUC<INF>CSH</INF></INF> during chemoradiation correlated with the incidence of local recurrence and might be recommended for monitoring treatment response in patients with NSCLC.

C1 [Carles, Montserrat; Fechter, Tobias; Baltas, Dimos] Univ Med Ctr Freiburg, Div Med Phys, Dept Radiat Oncol, Fac Med, D-79106 Freiburg, Germany.

[Carles, Montserrat; Fechter, Tobias; Adebahr, Sonja; Zamboglou, Constantinos; Nicolay, Nils H.; Nestle, Ursula; Grosu, Anca L.; Baltas, Dimos; Gkika, Eleni] German Canc Res Ctr, Partner Site Freiburg German Canc Res Ctr DKFZ, German Canc Consortium DKTK, D-69120 Heidelberg, Germany.

[Carles, Montserrat; Marti-Bonmati, Luis] La Fe Hlth Res Inst, Biomed Imaging Res Grp GIBI230 PREBI & Imaging Fe, Distributed Network Biomed Imaging ReDIB Unique S, Valencia 46026, Spain.

[Radicioni, Gianluca; Schimek-Jasch, Tanja; Adebahr, Sonja; Zamboglou, Constantinos; Nicolay, Nils H.; Nestle, Ursula; Grosu, Anca L.; Gkika, Eleni] Univ Med Ctr Freiburg, Dept Radiat Oncol, Fac Med, D-79106 Freiburg, Germany.

[Nestle, Ursula] GmbH Moenchengladbach, Dept Radiat Oncol, Kliniken Maria Hilf, D-41063 Moechengladbach, Germany.

[Mix, Michael] Univ Med Ctr Freiburg, Dept Nucl Med, Fac Med, D-79106 Freiburg, Germany.

RP Carles, M (通讯作者)，Univ Med Ctr Freiburg, Div Med Phys, Dept Radiat Oncol, Fac Med, D-79106 Freiburg, Germany.; Carles, M (通讯作者)，German Canc Res Ctr, Partner Site Freiburg German Canc Res Ctr DKFZ, German Canc Consortium DKTK, D-69120 Heidelberg, Germany.; Carles, M (通讯作者)，La Fe Hlth Res Inst, Biomed Imaging Res Grp GIBI230 PREBI & Imaging Fe, Distributed Network Biomed Imaging ReDIB Unique S, Valencia 46026, Spain.

EM montserrat.carles@uniklinik-freiburg.de;

tobias.fechter@uniklinik-freiburg.de;

gianluca.radiccioni@uniklinik-freiburg.de;

tanja.schimek-jasch@uniklinik-freiburg.de;

Sonia.adebahr@uniklinik-freiburg.de;

constantinos.zamboglou@uniklinik-freiburg.de;

nils.nicolay@uniklinik-freiburg.de; marti\_lui@gva.es;

ursula.nestle@mariahilf.de; anca.grosu@uniklinik-freiburg.de;

dimos.baltas@uniklinik-freiburg.de; michael.mix@uniklinik-freiburg.de;

eleni.gkika@uniklinik-freiburg.de

RI Nestle, Ursula/ABG-2339-2021; Marti-Bonmati, Luis/A-1147-2015

OI Fechter, Tobias/0000-0001-6271-9385; Marti-Bonmati,

Luis/0000-0002-8234-010X; Carles, Montserrat/0000-0003-2401-8240; Mix,

Michael/0000-0002-9106-2519; Nicolay, Nils Henrik/0000-0003-2550-1410

FU Era PerMed; Conselleria de Sanitat Universal i Salut Publica from the

Comunitat Valenciana; German consortium of translational cancer research

(DKTK); German Cancer Aid grant [108237, 108472]

FX Montserrat Carles was partially funded in 2019 and 2020 by Era PerMed

and funded from July 2020 on by the Conselleria de Sanitat Universal i

Salut Publica from the Comunitat Valenciana. Sonja Adebahr is funded by

a German consortium of translational cancer research (DKTK). The PET

Plan trial was supported by the German Cancer Aid grant NR 108237. The

STRIPE trial was supported from the German Cancer Aid grant NR Nr

108472. The funding sources had no involvement in the writing of the

manuscript or in the decision to submit the article for publication.

CR Avanzo M, 2017, PHYS MEDICA, V38, P122, DOI 10.1016/j.ejmp.2017.05.071

Benjamini Y, 2001, BEHAV BRAIN RES, V125, P279, DOI 10.1016/S0166-4328(01)00297-2

Bese NS, 2007, INT J RADIAT ONCOL, V68, P654, DOI 10.1016/j.ijrobp.2007.03.010

Bowen SR, 2012, CLIN TRANSL MED, V1, DOI 10.1186/2001-1326-1-18

Carles M, 2018, PHYS MED BIOL, V63, DOI 10.1088/1361-6560/aab180

Carles M, 2017, PHYS MED BIOL, V62, P652, DOI 10.1088/1361-6560/62/2/652

Carles M., 2019, NUKLEARMED-NUCL MED, V58, pP76

Carles M, 2015, PHYS MED BIOL, V60, P9227, DOI 10.1088/0031-9155/60/24/9227

Dong XZ, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0157836

Eberhardt WEE, 2015, J CLIN ONCOL, V33, P4194, DOI 10.1200/JCO.2015.62.6812

European Inst Biomed Imaging Res, 2019, INSIGHTS IMAGING, V10, DOI 10.1186/s13244-019-0684-z

Even AJG, 2015, RADIOTHER ONCOL, V116, P281, DOI 10.1016/j.radonc.2015.07.013

Giavarina D, 2015, BIOCHEM MEDICA, V25, P141, DOI 10.11613/BM.2015.015

Gkika E, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.01161

Grootjans W, 2016, J NUCL MED, V57, P1692, DOI 10.2967/jnumed.116.173112

Kang SR, 2014, NUCL MED MOLEC IMAG, V48, P16, DOI 10.1007/s13139-013-0231-7

Kong FM, 2017, JAMA ONCOL, V3, P1358, DOI 10.1001/jamaoncol.2017.0982

Kong FM, 2019, RADIOTHER ONCOL, V132, P241, DOI 10.1016/j.radonc.2018.10.006

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Leijenaar RTH, 2015, SCI REP-UK, V5, DOI 10.1038/srep11075

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

MacManus M, 2009, RADIOTHER ONCOL, V91, P85, DOI 10.1016/j.radonc.2008.11.008

McMillan MT, 2017, INT J RADIAT ONCOL, V98, P1142, DOI 10.1016/j.ijrobp.2017.04.004

Nestle U, 2020, RADIOTHER ONCOL, V148, P82, DOI 10.1016/j.radonc.2020.03.018

Nestle U, 2020, LANCET ONCOL, V21, P581, DOI 10.1016/S1470-2045(20)30013-9

Nestle U, 2018, RADIOTHER ONCOL, V127, P1, DOI 10.1016/j.radonc.2018.02.023

Nestle U, 2006, RADIOTHER ONCOL, V81, P209, DOI 10.1016/j.radonc.2006.09.011

Nyflot MJ, 2015, J MED IMAGING, V2, DOI 10.1117/1.JMI.2.4.041002

Orlhac F, 2014, J NUCL MED, V55, P414, DOI 10.2967/jnumed.113.129858

Postmus PE, 2017, ANN ONCOL, V28, P1, DOI 10.1093/annonc/mdx222

Reuze S, 2018, INT J RADIAT ONCOL, V102, P1117, DOI 10.1016/j.ijrobp.2018.05.022

Scrivener M, 2016, TRANSL CANCER RES, V5, P398, DOI 10.21037/tcr.2016.06.18

Shi LT, 2018, TECHNOL CANCER RES T, V17, DOI 10.1177/1533033818782788

Sollini M, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00426-y

Stroobants Sigrid G, 2003, Clin Lung Cancer, V4, P242, DOI 10.3816/CLC.2003.n.005

Thawani R, 2018, LUNG CANCER, V115, P34, DOI 10.1016/j.lungcan.2017.10.015

Thorwarth D, 2010, RADIOTHER ONCOL, V96, P317, DOI 10.1016/j.radonc.2010.07.012

Townsend DW, 2008, SEMIN NUCL MED, V38, P152, DOI 10.1053/j.semnuclmed.2008.01.003

UyBico SJ, 2010, RADIOGRAPHICS, V30, P1163, DOI 10.1148/rg.305095166

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

van Baardwijk A, 2007, EUR J CANCER, V43, P1392, DOI 10.1016/j.ejca.2007.03.027

van Elmpt W, 2012, J NUCL MED, V53, P1514, DOI 10.2967/jnumed.111.102566

Zwanenburg A, 2019, EUR J NUCL MED MOL I, V46, P2638, DOI 10.1007/s00259-019-04391-8

NR 44

TC 6

Z9 6

U1 1

U2 5

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2072-6694

J9 CANCERS

JI Cancers

PD FEB

PY 2021

VL 13

IS 4

AR 814

DI 10.3390/cancers13040814

PG 14

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA QO8BL

UT WOS:000623363200001

PM 33672052

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Baek, S

He, YS

Allen, BG

Buatti, JM

Smith, BJ

Tong, L

Sun, ZY

Wu, J

Diehn, M

Loo, BW

Plichta, KA

Seyedin, SN

Gannon, M

Cabel, KR

Kim, Y

Wu, XD

AF Baek, Stephen

He, Yusen

Allen, Bryan G.

Buatti, John M.

Smith, Brian J.

Tong, Ling

Sun, Zhiyu

Wu, Jia

Diehn, Maximilian

Loo, Billy W.

Plichta, Kristin A.

Seyedin, Steven N.

Gannon, Maggie

Cabel, Katherine R.

Kim, Yusung

Wu, Xiaodong

TI Deep segmentation networks predict survival of non-small cell lung

cancer

SO SCIENTIFIC REPORTS

LA English

DT Article

ID POSITRON-EMISSION-TOMOGRAPHY; TOTAL LESION GLYCOLYSIS; PROGNOSTIC VALUE;

FDG PET/CT

AB Non-small-cell lung cancer (NSCLC) represents approximately 80-85% of lung cancer diagnoses and is the leading cause of cancer-related death worldwide. Recent studies indicate that image-based radiomics features from positron emission tomography/computed tomography (PET/CT) images have predictive power for NSCLC outcomes. To this end, easily calculated functional features such as the maximum and the mean of standard uptake value (SUV) and total lesion glycolysis (TLG) are most commonly used for NSCLC prognostication, but their prognostic value remains controversial. Meanwhile, convolutional neural networks (CNN) are rapidly emerging as a new method for cancer image analysis, with significantly enhanced predictive power compared to hand-crafted radiomics features. Here we show that CNNs trained to perform the tumor segmentation task, with no other information than physician contours, identify a rich set of survival-related image features with remarkable prognostic value. In a retrospective study on pre-treatment PET-CT images of 96 NSCLC patients before stereotactic-body radiotherapy (SBRT), we found that the CNN segmentation algorithm (U-Net) trained for tumor segmentation in PET and CT images, contained features having strong correlation with 2- and 5-year overall and disease-specific survivals. The U-Net algorithm has not seen any other clinical information (e.g. survival, age, smoking history, etc.) than the images and the corresponding tumor contours provided by physicians. In addition, we observed the same trend by validating the U-Net features against an extramural data set provided by Stanford Cancer Institute. Furthermore, through visualization of the U-Net, we also found convincing evidence that the regions of metastasis and recurrence appear to match with the regions where the U-Net features identified patterns that predicted higher likelihoods of death. We anticipate our findings will be a starting point for more sophisticated non-intrusive patient specific cancer prognosis determination. For example, the deep learned PET/CT features can not only predict survival but also visualize high-risk regions within or adjacent to the primary tumor and hence potentially impact therapeutic outcomes by optimal selection of therapeutic strategy or first-line therapy adjustment.

C1 [Baek, Stephen; He, Yusen; Sun, Zhiyu] Univ Iowa, Dept Ind & Syst Engn, Iowa City, IA 52242 USA.

[Baek, Stephen; Allen, Bryan G.; Buatti, John M.; Plichta, Kristin A.; Seyedin, Steven N.; Gannon, Maggie; Cabel, Katherine R.; Kim, Yusung; Wu, Xiaodong] Univ Iowa, Dept Radiat Oncol, Iowa City, IA 52242 USA.

[Baek, Stephen; Wu, Xiaodong] Univ Iowa, Dept Elect & Comp Engn, Iowa City, IA 52242 USA.

[Tong, Ling] Univ Iowa, Dept Business Analyt, Iowa City, IA 52242 USA.

[Smith, Brian J.] Univ Iowa, Dept Biostat, Iowa City, IA 52242 USA.

[Wu, Jia; Diehn, Maximilian; Loo, Billy W.] Stanford Univ, Stanford Canc Inst, Palo Alto, CA 94304 USA.

RP Kim, Y; Wu, XD (通讯作者)，Univ Iowa, Dept Radiat Oncol, Iowa City, IA 52242 USA.; Wu, XD (通讯作者)，Univ Iowa, Dept Elect & Comp Engn, Iowa City, IA 52242 USA.

EM yusung-kim@uiowa.edu; xiaodong-wu@uiowa.edu

RI sun, zhiyu/AAX-9797-2020; HE, YUSEN/AAB-1880-2019; Baek,

Stephen/A-6316-2016

OI Baek, Stephen/0000-0002-4758-4539; Baek, Stephen/0000-0001-5225-7965;

Buatti, John/0000-0001-8499-3721; Allen, Bryan/0000-0002-4893-7105; He,

Yusen/0000-0001-7093-8596; Wu, Jia/0000-0001-8392-8338; Diehn,

Maximilian/0000-0003-2032-0581

FU National Cancer Institute (NCI) of the National Institutes of Health

(NIH) [1R21CA209874, U01CA140206, P30CA086862]; NATIONAL CANCER

INSTITUTE [P30CA086862, R21CA209874] Funding Source: NIH RePORTER

FX The authors want to express their gratitude to Dr. Ruijiang Li at

Stanford University for his assistance in coordinating the collaboration

with Stanford University and for providing the extramural dataset. They

also thank Dr. Sanjay Aneja at Yale University for providing insight and

expertise that greatly assisted the research. Research reported in this

publication was supported by the National Cancer Institute (NCI) of the

National Institutes of Health (NIH) under award number 1R21CA209874 and

partially by U01CA140206 and P30CA086862.

CR Agarwal M, 2010, EUR J NUCL MED MOL I, V37, P691, DOI 10.1007/s00259-009-1291-x

American Cancer Society, NON SMALL CELL LUNG

[Anonymous], 2015, ICML WORKSH DEEP LEA

Berghmans T, 2008, J THORAC ONCOL, V3, P6, DOI 10.1097/JTO.0b013e31815e6d6b

Bollineni VR, 2012, INT J RADIAT ONCOL, V83, pE551, DOI 10.1016/j.ijrobp.2012.01.012

Burdick MJ, 2010, INT J RADIAT ONCOL, V78, P1033, DOI 10.1016/j.ijrobp.2009.09.081

Chen HHW, 2012, RADIOLOGY, V264, P559, DOI 10.1148/radiol.12111148

Chicklore S, 2013, EUR J NUCL MED MOL I, V40, P133, DOI 10.1007/s00259-012-2247-0

Diamant A, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-39206-1

DOOMS M, 2018, PLOS ONE, V13, DOI DOI 10.1371/JOURNAL.PONE.0192859

Fried DV, 2016, RADIOLOGY, V278, P214, DOI 10.1148/radiol.2015142920

Geirhos R., 2018, 7 INT C LEARN REPR I

Hosny A, 2018, PLOS MED, V15, DOI 10.1371/journal.pmed.1002711

Jiawen Yao, 2016, Medical Image Computing and Computer-Assisted Intervention - MICCAI 2016. 19th International Conference. Proceedings: LNCS 9901, P649, DOI 10.1007/978-3-319-46723-8\_75

Kubilius J, 2016, PLOS COMPUT BIOL, V12, DOI 10.1371/journal.pcbi.1004896

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Mehta G, 2014, CLIN RADIOL, V69, P268, DOI 10.1016/j.crad.2013.10.010

Oikonomou A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-22357-y

Paesmans M, 2010, J THORAC ONCOL, V5, P612, DOI 10.1097/JTO.0b013e3181d0a4f5

Park HS, 2009, EXPERT SYST APPL, V36, P3336, DOI 10.1016/j.eswa.2008.01.039

Paul R, 2016, TOMOGRAPHY, V2, P388, DOI 10.18383/j.tom.2016.00211

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

ROUSSEEUW PJ, 1987, J COMPUT APPL MATH, V20, P53, DOI 10.1016/0377-0427(87)90125-7

Selvaraju RR, 2017, IEEE I CONF COMP VIS, P618, DOI 10.1109/ICCV.2017.74

Siegel RL, 2017, CA-CANCER J CLIN, V67, P7, DOI 10.3322/caac.21387

Tibshirani R, 1996, J ROY STAT SOC B MET, V58, P267, DOI 10.1111/j.2517-6161.1996.tb02080.x

Uthoff J., 2019, MED PHYS

WHO, 2020, ADOLESCENT MENTAL HL

Woodard GA, 2016, CANCER TREAT RES, V170, P47, DOI 10.1007/978-3-319-40389-2\_3

Wu XD, 2018, I S BIOMED IMAGING, P514, DOI 10.1109/ISBI.2018.8363628

Zaizen Y, 2012, EUR J RADIOL, V81, P4179, DOI 10.1016/j.ejrad.2012.07.009

Zhang YC, 2017, SCI REP-UK, V7, DOI 10.1038/srep46349

Zhong ZS, 2019, MED PHYS, V46, P619, DOI 10.1002/mp.13331

NR 33

TC 33

Z9 33

U1 2

U2 12

PU NATURE RESEARCH

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD NOV 21

PY 2019

VL 9

AR 17286

DI 10.1038/s41598-019-53461-2

PG 10

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA JP1RE

UT WOS:000498048500021

PM 31754135

OA Green Published, Green Submitted, gold

DA 2022-08-24

ER

PT J

AU Elsayad, K

Kriz, J

Reinartz, G

Scobioala, S

Ernst, I

Haverkamp, U

Eich, HT

AF Elsayad, Khaled

Kriz, Jan

Reinartz, Gabriele

Scobioala, Sergiu

Ernst, Iris

Haverkamp, Uwe

Eich, Hans Theodor

TI Cone-beam CT-guided radiotherapy in the management of lung cancer

Diagnostic and therapeutic value

SO STRAHLENTHERAPIE UND ONKOLOGIE

LA English

DT Article

DE Lung neoplasms; Intensity-modulated radiation therapy; Radiotherapy

planning; computer-assisted; Radiotherapy, image-guided;

Chemoradiotherapy

ID INTENSITY-MODULATED RADIOTHERAPY; TUMOR VOLUME CHANGES; ADAPTIVE

RADIOTHERAPY; MEGAVOLTAGE CT; CONCURRENT; REGRESSION

AB Background Recent studies have demonstrated an increase in the necessity of adaptive planning over the course of lung cancer radiation therapy (RT) treatment. In this study, we evaluated intrathoracic changes detected by cone-beam CT (CBCT) in lung cancer patients during RT.

Methods and materials A total of 71 lung cancer patients treated with fractionated CBCT-guided RT were evaluated. Intrathoracic changes and plan adaptation priority (AP) scores were compared between small cell lung cancer (SCLC, n = 13) and non-small cell lung cancer (NSCLC, n = 58) patients.

Results The median cumulative radiation dose administered was 54 Gy (range 30-72 Gy) and the median fraction dose was 1.8 Gy (range 1.8-3.0 Gy). All patients were subjected to a CBCT scan at least weekly (range 1-5/week). We observed intrathoracic changes in 83 % of the patients over the course of RT [58 % (41/71) regression, 17 % (12/71) progression, 20 % (14/71) atelectasis, 25 % (18/71) pleural effusion, 13 % (9/71) infiltrative changes, and 10 % (7/71) anatomical shift]. Nearly half, 45 % (32/71), of the patients had one intrathoracic soft tissue change, 22.5 % (16/71) had two, and three or more changes were observed in 15.5 % (11/71) of the patients. Plan modifications were performed in 60 % (43/71) of the patients. Visual volume reduction did correlate with the number of CBCT scans acquired (r = 0.313, p = 0.046) and with the timing of chemotherapy administration (r = 0.385, p = 0.013).

Conclusion Weekly CBCT monitoring provides an adaptation advantage in patients with lung cancer. In this study, the monitoring allowed for plan adaptations due to tumor volume changes and to other anatomical changes.

C1 [Elsayad, Khaled; Kriz, Jan; Reinartz, Gabriele; Scobioala, Sergiu; Ernst, Iris; Haverkamp, Uwe; Eich, Hans Theodor] Univ Hosp Muenster, Dept Radiat Oncol, Albert Schweitzer Campus 1,Bldg A1, D-48149 Munster, Germany.

RP Eich, HT (通讯作者)，Univ Hosp Muenster, Dept Radiat Oncol, Albert Schweitzer Campus 1,Bldg A1, D-48149 Munster, Germany.

EM Hans.eich@ukmuenster.de

RI Elsayad, Khaled/AAS-1604-2020

OI elsayad, khaled/0000-0001-9303-7336

CR Bosmans G, 2006, INT J RADIAT ONCOL, V66, P748, DOI 10.1016/j.ijrobp.2006.05.022

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Bral S, 2009, RADIOTHER ONCOL, V91, P438, DOI 10.1016/j.radonc.2009.03.015

Brink C, 2014, INT J RADIAT ONCOL, V89, P916, DOI 10.1016/j.ijrobp.2014.03.038

Chan MKH, 2015, STRAHLENTHER ONKOL, V191, P161, DOI 10.1007/s00066-014-0747-5

Chi A, 2014, FRONT ONCOL, V4, DOI 10.3389/fonc.2014.00156

Elsayad K, 2014, IMAGE GUIDED RADIOTH

Fox J, 2009, INT J RADIAT ONCOL, V74, P341, DOI 10.1016/j.ijrobp.2008.07.063

Guckenberger M, 2012, STRAHLENTHER ONKOL, V188, P894, DOI 10.1007/s00066-012-0161-9

Guckenberger M, 2011, INT J RADIAT ONCOL, V81, pE275, DOI 10.1016/j.ijrobp.2011.01.067

Guckenberger M, 2011, INT J RADIAT ONCOL, V79, P901, DOI 10.1016/j.ijrobp.2010.04.050

Haasbeek CJA, 2007, INT J RADIAT ONCOL, V67, P1370, DOI 10.1016/j.ijrobp.2006.11.018

Houston KA, 2014, LUNG CANCER, V86, P22, DOI 10.1016/j.lungcan.2014.08.001

Knap MM, 2010, ACTA ONCOL, V49, P1077, DOI 10.3109/0284186X.2010.498434

Koo TR, 2014, RADIAT ONCOL, V9, DOI 10.1186/s13014-014-0283-6

Kriz J, 2015, STRAHLENTHER ONKOL, V191, P717, DOI 10.1007/s00066-015-0839-x

Kupelian PA, 2006, INT J RADIAT ONCOL, V64, P328, DOI 10.1016/j.ijrobp.2005.08.039

Kupelian PA, 2005, INT J RADIAT ONCOL, V63, P1024, DOI 10.1016/j.ijrobp.2005.04.046

Kwint M, 2014, RADIOTHER ONCOL, V113, P392, DOI 10.1016/j.radonc.2014.10.009

Li RJ, 2013, INT J RADIAT ONCOL, V87, P917, DOI 10.1016/j.ijrobp.2013.08.015

Moller DS, 2014, RADIOTHER ONCOL, V110, P517, DOI 10.1016/j.radonc.2013.10.013

Pallotta S, 2015, STRAHLENTHER ONKOL, V191, P726, DOI 10.1007/s00066-015-0861-z

Rodrigues G, 2015, PRACT RADIAT ONCOL, V5, P141, DOI 10.1016/j.prro.2015.02.012

Schimek-Jasch T, 2015, STRAHLENTHER ONKOL, V191, P525, DOI 10.1007/s00066-015-0812-8

Semrau S, 2014, STRAHLENTHER ONKOL, V190, P1125, DOI 10.1007/s00066-014-0710-5

Siker ML, 2006, INT J RADIAT ONCOL, V66, P135, DOI 10.1016/j.ijrobp.2006.03.064

Sonke JJ, 2010, SEMIN RADIAT ONCOL, V20, P94, DOI 10.1016/j.semradonc.2009.11.003

Tvilum M, 2015, ACTA ONCOL, V54, P1430, DOI 10.3109/0284186X.2015.1062544

Vaaler AK, 1997, CHEST, V111, P115, DOI 10.1378/chest.111.1.115

van Zijtvetd M, 2007, RADIOTHER ONCOL, V85, P195, DOI 10.1016/j.radonc.2007.08.010

Woodford C, 2007, INT J RADIAT ONCOL, V69, P1316, DOI 10.1016/j.ijrobp.2007.07.2369

World Health Organization, 2020, TOP 10 CAUS DEATH

Zhang PP, 2014, INT J RADIAT ONCOL, V88, P446, DOI 10.1016/j.ijrobp.2013.10.038

NR 33

TC 25

Z9 26

U1 1

U2 3

PU SPRINGER HEIDELBERG

PI HEIDELBERG

PA TIERGARTENSTRASSE 17, D-69121 HEIDELBERG, GERMANY

SN 0179-7158

EI 1439-099X

J9 STRAHLENTHER ONKOL

JI Strahlenther. Onkol.

PD FEB

PY 2016

VL 192

IS 2

BP 83

EP 91

DI 10.1007/s00066-015-0927-y

PG 9

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA DF4LL

UT WOS:000371319700002

PM 26630946

DA 2022-08-24

ER

PT J

AU Ger, RB

Cardenas, CE

Anderson, BM

Yang, JZ

Mackin, DS

Zhang, LF

Court, LE

AF Ger, Rachel B.

Cardenas, Carlos E.

Anderson, Brian M.

Yang, Jinzhong

Mackin, Dennis S.

Zhang, Lifei

Court, Laurence E.

TI Guidelines and Experience Using Imaging Biomarker Explorer (IBEX) for

Radiomics

SO JOVE-JOURNAL OF VISUALIZED EXPERIMENTS

LA English

DT Article

DE Engineering; Issue 131; Radiomics; texture analysis; quantitative image

features; non-small cell lung cancer; quantitative analysis; image

analysis

ID TEXTURAL FEATURES; PROGNOSTIC VALUE; PREDICTION; CT; REPRODUCIBILITY;

UNCERTAINTY; INFORMATION; IMAGES

AB Imaging Biomarker Explorer (IBEX) is an open-source tool for medical imaging radiomics work. The purpose of this paper is to describe how to use IBEX's graphical user interface (GUI) and to demonstrate how IBEX calculated features have been used in clinical studies. IBEX allows for the import of DICOM images with DICOM radiation therapy structure files or Pinnacle files. Once the images are imported, IBEX has tools within the Data Selection GUI to manipulate the viewing of the images, measure voxel values and distances, and create and edit contours. IBEX comes with 27 preprocessing and 132 feature choices to design feature sets. Each preprocessing and feature category has parameters that can be altered. The output from IBEX is a spreadsheet that contains: 1) each feature from the feature set calculated for each contour in a data set, 2) image information about each contour in a data set, and 3) a summary of the preprocessing and features used with their selected parameters. Features calculated from IBEX have been used in studies to test the variability of features under different imaging conditions and in survival models to improve current clinical models.

C1 [Ger, Rachel B.; Cardenas, Carlos E.; Anderson, Brian M.; Yang, Jinzhong; Mackin, Dennis S.; Zhang, Lifei; Court, Laurence E.] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Houston, TX 77030 USA.

[Ger, Rachel B.; Cardenas, Carlos E.; Anderson, Brian M.; Yang, Jinzhong; Court, Laurence E.] Univ Texas MD Anderson Canc Ctr, UTHlth Grad Sch Biomed Sci, Houston, TX 77030 USA.

[Court, Laurence E.] Univ Texas MD Anderson Canc Ctr, Dept Imaging Phys, Houston, TX 77030 USA.

RP Court, LE (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Houston, TX 77030 USA.; Court, LE (通讯作者)，Univ Texas MD Anderson Canc Ctr, UTHlth Grad Sch Biomed Sci, Houston, TX 77030 USA.; Court, LE (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Imaging Phys, Houston, TX 77030 USA.

EM LECourt@mdanderson.org

RI Mackin, Dennis/Y-1503-2019; Anderson, Brian Mark/ABB-1934-2021

OI Anderson, Brian Mark/0000-0002-2748-1444; Court,

Laurence/0000-0002-3241-6145; Cardenas, Carlos/0000-0003-1414-3849

FU Rosalie B. Hite Graduate Fellowship; American Legion Auxiliary

Fellowship; George M. Stancel PhD Fellowship in the Biomedical Sciences;

NCI [R03 CA178495]; NATIONAL CANCER INSTITUTE [R03CA178495] Funding

Source: NIH RePORTER

FX Rachel Ger is funded by the Rosalie B. Hite Graduate Fellowship and

American Legion Auxiliary Fellowship. Carlos Cardenas has been funded by

the George M. Stancel PhD Fellowship in the Biomedical Sciences. The

development of IBEX was funded by the NCI (R03 CA178495).

CR AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

Court LE, 2016, TRANSL CANCER RES, V5, P340, DOI 10.21037/tcr.2016.06.17

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Fave X, 2016, TRANSL CANCER RES, V5, P349, DOI 10.21037/tcr.2016.07.11

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

Fave X, 2015, COMPUT MED IMAG GRAP, V44, P54, DOI 10.1016/j.compmedimag.2015.04.006

Fried DV, 2016, INT J RADIAT ONCOL, V94, P368, DOI 10.1016/j.ijrobp.2015.10.029

Fried DV, 2016, RADIOLOGY, V278, P214, DOI 10.1148/radiol.2015142920

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Gan J, 2016, MED PHYS, V43, P3706, DOI 10.1118/1.4957258

Hanania AN, 2016, ONCOTARGET, V7, P85776, DOI 10.18632/oncotarget.11769

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Huang W, 2016, MED PHYS, V43, P3377, DOI 10.1118/1.4955794

Hunter LA, 2016, COMPUT MED IMAG GRAP, V49, P29, DOI 10.1016/j.compmedimag.2015.11.004

Hunter LA, 2013, MED PHYS, V40, DOI 10.1118/1.4829514

Kassner A, 2009, J MAGN RESON IMAGING, V30, P933, DOI 10.1002/jmri.21940

Klawikowski S, 2016, MED PHYS, V43, P3350, DOI 10.1118/1.4955675

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Owens C., 2017, MED PHYS

Tang XO, 1998, IEEE T IMAGE PROCESS, V7, P1602, DOI 10.1109/83.725367

van Rossum PSN, 2016, J NUCL MED, V57, P691, DOI 10.2967/jnumed.115.163766

Yang JZ, 2016, COMPUT MED IMAG GRAP, V48, P1, DOI 10.1016/j.compmedimag.2015.12.001

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

NR 26

TC 12

Z9 12

U1 1

U2 7

PU JOURNAL OF VISUALIZED EXPERIMENTS

PI CAMBRIDGE

PA 1 ALEWIFE CENTER, STE 200, CAMBRIDGE, MA 02140 USA

SN 1940-087X

J9 JOVE-J VIS EXP

JI J. Vis. Exp.

PD JAN

PY 2018

IS 131

AR e57132

DI 10.3791/57132

PG 8

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA FX5CM

UT WOS:000426095700124

PM 29364284

OA Green Published

DA 2022-08-24

ER

PT J

AU Zhao, BH

Wang, YK

Wang, YN

Chen, WL

Zhou, LZ

Liu, PH

Kong, ZR

Dai, CX

Wang, Y

Ma, WB

AF Zhao, Binghao

Wang, Yuekun

Wang, Yaning

Chen, Wenlin

Zhou, Lizhou

Liu, Peng Hao

Kong, Ziren

Dai, Congxin

Wang, Yu

Ma, Wenbin

TI Efficacy and safety of therapies for EGFR-mutant non-small cell lung

cancer with brain metastasis: an evidence-based Bayesian network pooled

study of multivariable survival analyses

SO AGING-US

LA English

DT Article

DE EGFR-mutant; NSCLC; brain metastasis; Bayesian network pooled study

AB Preferable treatments for epidermal growth factor receptor (EGFR)-mutant non-small cell lung cancer (NSCLC) with brain metastasis are elusive. The study intended to estimate the relative efficacy and safety of systemic therapies. Clinical trials about therapies for EGFR-mutant, brain-metastatic NSCLC were identified. Progression-free survival (PFS) and overall survival (OS) were analysed using random effects Bayesian network meta-analyses (NMAs) on the hazard ratio (HR)-scale. Nomogram and Kaplan-Meier plots based on clinical or individual factors are displayed using data obtained from the Surveillance Epidemiology and End Results (SEER) database. Third-generation EGFRtyrosine kinase inhibitors (EGFR-TKI) (osimertinib), EGFR-TKIs + stereotactic radiosurgery (SRS)/whole brain radiotherapy (WBRT) (gefitinib/erlotinib + SRS/WBRT), and EGFR-TKIs (erlotinib) + anti-vascular endothelial growth factor receptor (anti-VEGFR) (bevacizumab) achieved superior PFS (HR: 0.30 (0.15-0.59); HR: 0.47 (0.31-0.72); HR: 0.50 (0.21-1.21) vs. deferring SRS/WBRT) and acceptability; EGFR-TKIs + SRS/WBRT was top ranking (vs. others) for OS followed by third-generation EGFR-TKI. In the dataset cohort of 1173 brain-metastatic NSCLC patients, the 6 month, 1-year, and 3-year survival rates were 59.8%, 41.3%, and 5.6%, respectively. Race and origin, and year of diagnosis were independent predictors of OS. Survival curves showed that the OS of patients varied significantly by histology and race. Third-generation EGFR-TKI and EGFR-TKIs + SRS/WBRT are more effective and potentially acceptable for EGFR-mutant NSCLC with brain metastases balancing OS and PFS. Surgeries without adjuvant therapies cannot significantly improve the OS of brain-metastatic NSCLC patients. The study highlights importance of osimertinib in these patients and provide a reference for clinical treatments.

C1 [Zhao, Binghao; Wang, Yuekun; Wang, Yaning; Chen, Wenlin; Zhou, Lizhou; Liu, Peng Hao; Kong, Ziren; Dai, Congxin; Wang, Yu; Ma, Wenbin] Chinese Acad Med Sci & Peking Union Med Coll, Peking Union Med Coll Hosp, Dept Neurosurg, Beijing 100730, Peoples R China.

RP Wang, Y; Ma, WB (通讯作者)，Chinese Acad Med Sci & Peking Union Med Coll, Peking Union Med Coll Hosp, Dept Neurosurg, Beijing 100730, Peoples R China.

EM ywang@pumch.cn; mawb2001@hotmail.com

FU Chinese Academy of Medical Sciences Innovation Fund for Medical Sciences

[2016-I2M-2-001]; Beijing Municipal Natural Science Foundation [7202150,

19JCZDJC64200]

FX The work is supported by Chinese Academy of Medical Sciences Innovation

Fund for Medical Sciences, number of grants (2016-I2M-2-001) and by

Beijing Municipal Natural Science Foundation, number of grants (7202150,

19JCZDJC64200(Z)).

CR Dias S, 2010, STAT MED, V29, P932, DOI 10.1002/sim.3767

Fritz A, 2000, INT CLASSIFICATION D

Greene F, 2010, JAMA-J AM MED ASSOC, V304, P1726, DOI DOI 10.1001/JAMA.2010.1525

Higgins JPT, 2003, BRIT MED J, V327, P557, DOI 10.1136/bmj.327.7414.557

Higgins JPT, 2011, BMJ-BRIT MED J, V343, DOI 10.1136/bmj.d5928

Lu G, 2004, STAT MED, V23, P3105, DOI 10.1002/sim.1875

Luo J., 2015, READING WRITING SEER

NAACCR Race and Ethnicity Work Group, NAACCR GUID ENH HISP

Salanti G, 2008, STAT METHODS MED RES, V17, P279, DOI 10.1177/0962280207080643

Salanti G, 2011, J CLIN EPIDEMIOL, V64, P163, DOI 10.1016/j.jclinepi.2010.03.016

The National Cancer Insititute Surveillance, OV SEER PROGR

Tierney JF, 2007, TRIALS, V8, DOI 10.1186/1745-6215-8-16

van Valkenhoef G, NETWORK METAANALYSIS

Wickham H, 2009, USE R, P1, DOI 10.1007/978-0-387-98141-3\_1

Woods BS, 2010, BMC MED RES METHODOL, V10, DOI 10.1186/1471-2288-10-54

NR 15

TC 7

Z9 7

U1 0

U2 17

PU IMPACT JOURNALS LLC

PI ORCHARD PARK

PA 6666 E QUAKER ST, STE 1, ORCHARD PARK, NY 14127 USA

SN 1945-4589

J9 AGING-US

JI Aging-US

PD JUL 31

PY 2020

VL 12

IS 14

BP 14244

EP 14270

DI 10.18632/aging.103455

PG 27

WC Cell Biology; Geriatrics & Gerontology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Cell Biology; Geriatrics & Gerontology

GA MY8MG

UT WOS:000558670600006

PM 32669477

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Amarasinghe, KC

Lopes, J

Beraldo, J

Kiss, N

Bucknell, N

Everitt, S

Jackson, P

Litchfield, C

Denehy, L

Blyth, BJ

Siva, S

MacManus, M

Ball, D

Li, JS

Hardcastle, N

AF Amarasinghe, Kaushalya C.

Lopes, Jamie

Beraldo, Julian

Kiss, Nicole

Bucknell, Nicholas

Everitt, Sarah

Jackson, Price

Litchfield, Cassandra

Denehy, Linda

Blyth, Benjamin J.

Siva, Shankar

MacManus, Michael

Ball, David

Li, Jason

Hardcastle, Nicholas

TI A Deep Learning Model to Automate Skeletal Muscle Area Measurement on

Computed Tomography Images

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE deep learning; convolutional neural networks; skeletal muscle; image

segmentation; sarcopenia; lung cancer

ID CANCER

AB Background

Muscle wasting (Sarcopenia) is associated with poor outcomes in cancer patients. Early identification of sarcopenia can facilitate nutritional and exercise intervention. Cross-sectional skeletal muscle (SM) area at the third lumbar vertebra (L3) slice of a computed tomography (CT) image is increasingly used to assess body composition and calculate SM index (SMI), a validated surrogate marker for sarcopenia in cancer. Manual segmentation of SM requires multiple steps, which limits use in routine clinical practice. This project aims to develop an automatic method to segment L3 muscle in CT scans.

Methods

Attenuation correction CTs from full body PET-CT scans from patients enrolled in two prospective trials were used. The training set consisted of 66 non-small cell lung cancer (NSCLC) patients who underwent curative intent radiotherapy. An additional 42 NSCLC patients prescribed curative intent chemo-radiotherapy from a second trial were used for testing. Each patient had multiple CT scans taken at different time points prior to and post- treatment (147 CTs in the training and validation set and 116 CTs in the independent testing set). Skeletal muscle at L3 vertebra was manually segmented by two observers, according to the Alberta protocol to serve as ground truth labels. This included 40 images segmented by both observers to measure inter-observer variation. An ensemble of 2.5D fully convolutional neural networks (U-Nets) was used to perform the segmentation. The final layer of U-Net produced the binary classification of the pixels into muscle and non-muscle area. The model performance was calculated using Dice score and absolute percentage error (APE) in skeletal muscle area between manual and automated contours.

Results

We trained five 2.5D U-Nets using 5-fold cross validation and used them to predict the contours in the testing set. The model achieved a mean Dice score of 0.92 and an APE of 3.1% on the independent testing set. This was similar to inter-observer variation of 0.96 and 2.9% for mean Dice and APE respectively. We further quantified the performance of sarcopenia classification using computer generated skeletal muscle area. To meet a clinical diagnosis of sarcopenia based on Alberta protocol the model achieved a sensitivity of 84% and a specificity of 95%.

Conclusions

This work demonstrates an automated method for accurate and reproducible segmentation of skeletal muscle area at L3. This is an efficient tool for large scale or routine computation of skeletal muscle area in cancer patients which may have applications on low quality CTs acquired as part of PET/CT studies for staging and surveillance of patients with cancer.

C1 [Amarasinghe, Kaushalya C.; Litchfield, Cassandra; Li, Jason] Peter MacCallum Canc Ctr, Canc Res Div, Bioinformat Core Facil, Melbourne, Vic, Australia.

[Amarasinghe, Kaushalya C.; Bucknell, Nicholas; Everitt, Sarah; Jackson, Price; Siva, Shankar; MacManus, Michael; Ball, David; Li, Jason] Univ Melbourne, Sir Peter MacCallum Dept Oncol, Parkville, Vic, Australia.

[Lopes, Jamie; Blyth, Benjamin J.] Peter MacCallum Canc Ctr, Canc Res Div, Melbourne, Vic, Australia.

[Beraldo, Julian; Everitt, Sarah] Peter MacCallum Canc Ctr, Radiat Therapy, Melbourne, Vic, Australia.

[Kiss, Nicole] Deakin Univ, Inst Phys Act & Nutr IPAN, Geelong, Vic, Australia.

[Kiss, Nicole; Denehy, Linda] Peter MacCallum Canc Ctr, Allied Hlth Dept, Melbourne, Vic, Australia.

[Bucknell, Nicholas; Siva, Shankar; MacManus, Michael; Ball, David] Peter MacCallum Canc Ctr, Radiat Oncol, Melbourne, Vic, Australia.

[Jackson, Price; Hardcastle, Nicholas] Peter MacCallum Canc Ctr, Phys Sci, Melbourne, Vic, Australia.

[Denehy, Linda] Univ Melbourne, Melbourne Sch Hlth Sci, Melbourne, Vic, Australia.

[Hardcastle, Nicholas] Univ Wollongong, Ctr Med Radiat Phys, Wollongong, NSW, Australia.

RP Hardcastle, N (通讯作者)，Peter MacCallum Canc Ctr, Phys Sci, Melbourne, Vic, Australia.; Hardcastle, N (通讯作者)，Univ Wollongong, Ctr Med Radiat Phys, Wollongong, NSW, Australia.

EM Nick.Hardcastle@petermac.org

OI Blyth, Benjamin/0000-0003-4754-6249; Kiss, Nicole/0000-0002-6476-9834;

MacManus, Michael/0000-0002-0900-5815

FU Peter MacCallum Cancer Centre Foundation

FX This work was supported by the Peter MacCallum Cancer Centre Foundation.

CR Arends J, 2017, CLIN NUTR, V36, P11, DOI 10.1016/j.clnu.2016.07.015

Blodgett TM, 2005, AM J ROENTGENOL, V184, pS138, DOI 10.2214/ajr.184.5\_supplement.0184s138

Bril SI, 2019, EUR ARCH OTO-RHINO-L, V276, P1175, DOI 10.1007/s00405-019-05307-w

Burns JE, 2020, ACAD RADIOL, V27, P311, DOI 10.1016/j.acra.2019.03.011

Cardenas CE, 2018, INT J RADIAT ONCOL, V101, P468, DOI 10.1016/j.ijrobp.2018.01.114

Cederholm T, 2019, J CACHEXIA SARCOPENI, V10, P207, DOI 10.1002/jcsm.12383

Chen YZ, 2020, IEEE T MED IMAGING, V39, P387, DOI 10.1109/TMI.2019.2927289

Cicek Ozgun, 2016, Medical Image Computing and Computer-Assisted Intervention - MICCAI 2016. 19th International Conference. Proceedings: LNCS 9901, P424, DOI 10.1007/978-3-319-46723-8\_49

Cruz-Jentoft AJ, 2019, AGE AGEING, V48, DOI 10.1093/ageing/afz046

Dabiri S, 2019, COMPUT MED IMAG GRAP, V75, P47, DOI 10.1016/j.compmedimag.2019.04.007

Everitt S, 2017, INT J RADIAT ONCOL, V99, P947, DOI 10.1016/j.ijrobp.2017.07.035

Fearon K, 2011, LANCET ONCOL, V12, P489, DOI 10.1016/S1470-2045(10)70218-7

Kingma D, 2014, ARXIV

Kiss N, 2019, SUPPORT CARE CANCER, V27, P2657, DOI 10.1007/s00520-018-4563-9

Levolger S, 2015, BRIT J SURG, V102, P1448, DOI 10.1002/bjs.9893

Lin Tsung-Yi, 2020, IEEE Trans Pattern Anal Mach Intell, V42, P318, DOI [10.1109/TPAMI.2018.2858826, 10.1109/ICCV.2017.324]

Lustberg T, 2018, RADIOTHER ONCOL, V126, P312, DOI 10.1016/j.radonc.2017.11.012

Martin L, 2013, J CLIN ONCOL, V31, P1539, DOI 10.1200/JCO.2012.45.2722

Milletari F, 2016, INT CONF 3D VISION, P565, DOI 10.1109/3DV.2016.79

Miyamoto Y, 2015, ANN SURG ONCOL, V22, P2663, DOI 10.1245/s10434-014-4281-6

Moses AWG, 2004, BRIT J CANCER, V90, P996, DOI 10.1038/sj.bjc.6601620

Mourtzakis M, 2008, APPL PHYSIOL NUTR ME, V33, P997, DOI 10.1139/H08-075

Paris MT, 2020, CLIN NUTR, V39, P3049, DOI 10.1016/j.clnu.2020.01.008

Perthen JE, 2018, EUR J RADIOL, V109, P142, DOI 10.1016/j.ejrad.2018.10.031

Podoloff DA., 2007, J NATL COMPR CANC NE, V5

Prado CMM, 2008, LANCET ONCOL, V9, P629, DOI 10.1016/S1470-2045(08)70153-0

Prado CMM, 2009, CLIN CANCER RES, V15, P2920, DOI 10.1158/1078-0432.CCR-08-2242

Price KL, 2019, EUR J CLIN NUTR, V73, P187, DOI 10.1038/s41430-018-0360-2

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

Sheean PM, 2014, JPEN-PARENTER ENTER, V38, P873, DOI 10.1177/0148607113500308

Shen W, 2004, J APPL PHYSIOL, V97, P2333, DOI 10.1152/japplphysiol.00744.2004

Silvestri GA, 2013, CHEST, V143, pE211, DOI 10.1378/chest.12-2355

Siva S, 2014, BMC CANCER, V14, DOI 10.1186/1471-2407-14-740

van Vugt JLA, 2016, AM J TRANSPLANT, V16, P2277, DOI 10.1111/ajt.13732

Wong TZ, 2007, AM J ROENTGENOL, V188, P622, DOI 10.2214/AJR.06.0813

Yararbas U, 2018, BOSNIAN J BASIC MED, V18, P72, DOI 10.17305/bjbms.2017.2179

NR 36

TC 8

Z9 8

U1 3

U2 7

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD MAY 7

PY 2021

VL 11

AR 580806

DI 10.3389/fonc.2021.580806

PG 10

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA SF1AL

UT WOS:000652495600001

PM 34026597

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Luo, Y

Jolly, S

Palma, D

Lawrence, TS

Tseng, HH

Valdes, G

McShan, D

Ten Haken, RK

Naqa, IE

AF Luo, Yi

Jolly, Shruti

Palma, David

Lawrence, Theodore S.

Tseng, Huan-Hsin

Valdes, Gilmer

McShan, Daniel

Ten Haken, Randall K.

Naqa, Issam Ei

TI A situational awareness Bayesian network approach for accurate and

credible personalized adaptive radiotherapy outcomes prediction in lung

cancer patients

SO PHYSICA MEDICA-EUROPEAN JOURNAL OF MEDICAL PHYSICS

LA English

DT Article

DE Situational awareness; Bayesian networks; Accuracy and credibility;

Personalized adaptive radiotherapy

ID POSITRON-EMISSION-TOMOGRAPHY; GROSS TUMOR VOLUME; RADIATION-THERAPY;

MODEL; PNEUMONITIS; INFORMATION; TOXICITY; AREAS

AB Purpose: A situational awareness Bayesian network (SA-BN) approach is developed to improve physicians' trust in the prediction of radiation outcomes and evaluate its performance for personalized adaptive radiotherapy (pART).

Methods: 118 non-small-cell lung cancer patients with their biophysical features were employed for discovery (n = 68) and validation (n = 50) of radiation outcomes prediction modeling. Patients' important characteristics identified by radiation experts to predict individual's tumor local control (LC) or radiation pneumonitis with grade >= 2 (RP2) were incorporated as expert knowledge (EK). Besides generating an EK-based naive BN (EKNBN), an SA-BN was developed by incorporating the EK features into pure data-driven BN (PD-BN) methods to improve the credibility of LC or / and RP2 prediction. After using area under the free-response receiver operating characteristics curve (AU-FROC) to assess the joint prediction of these outcomes, their prediction performances were compared with a regression approach based on the expert yielded estimates (EYE) penalty and its variants.

Results: In addition to improving the credibility of radiation outcomes prediction, the SA-BN approach outperformed the EYE penalty and its variants in terms of the joint prediction of LC and RP2. The value of AU-FROC improves from 0.70 (95% CI: 0.54-0.76) using EK-NBN, to 0.75 (0.65-0.82) using a variant of EYE penalty, to 0.83 (0.75-0.93) using PD-BN and 0.83 (0.77-0.90) using SA-BN; with similar trends in the validation cohort.

Conclusions: The SA-BN approach can provide an accurate and credible human-machine interface to gain physicians' trust in clinical decision-making, which has the potential to be an important component of pART.

C1 [Luo, Yi; Jolly, Shruti; Lawrence, Theodore S.; Tseng, Huan-Hsin; McShan, Daniel; Ten Haken, Randall K.; Naqa, Issam Ei] Univ Michigan, Dept Radiat Oncol, 519 West William St, Ann Arbor, MI 48109 USA.

[Palma, David] Western Univ, London Hlth Sci Ctr, London, ON, Canada.

[Valdes, Gilmer] UCSF Med Ctr Mission Bay, Dept Radiat Oncol, San Francisco, CA USA.

RP Luo, Y (通讯作者)，Univ Michigan, Dept Radiat Oncol, 519 West William St, Ann Arbor, MI 48109 USA.

EM YL1515@gmail.com

OI Luo, Yi/0000-0003-2519-5900; LAWRENCE, THEODORE S./0000-0002-4186-8821

FU National Institutes of Health [P01 CA059827, R37-CA222215, R01-CA233487]

FX This work was supported in part by the National Institutes of Health P01

CA059827, R37-CA222215 and R01-CA233487.

CR Aliferis C F, 2003, AMIA Annu Symp Proc, P21

[Anonymous], 2007, ADV PROBABILISTIC GR, V213, DOI [10.1007/978-3-540-68996-6\_1, DOI 10.1007/978-3-540-68996-6\_1]

Bandos AI, 2009, BIOMETRICS, V65, P247, DOI 10.1111/j.1541-0420.2008.01049.x

BENDAVID A, 1995, MACH LEARN, V19, P29, DOI 10.1007/BF00994659

Bradley JD, 2002, INT J RADIAT ONCOL, V52, P49, DOI 10.1016/S0360-3016(01)01772-2

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

Dong YM, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-42345-0

Endsley MR, 2015, J COGN ENG DECIS MAK, V9, P4, DOI 10.1177/1555343415572631

Gennatas ED, 2020, P NATL ACAD SCI USA, V117, P4571, DOI 10.1073/pnas.1906831117

Gilpin LH, 2018, PR INT CONF DATA SC, P80, DOI 10.1109/DSAA.2018.00018

GLOVER F, 1990, INTERFACES, V20, P74, DOI 10.1287/inte.20.4.74

Huaux F, 2005, AM J PATHOL, V167, P1485, DOI 10.1016/S0002-9440(10)61235-7

Hwang SJ, 2003, HUM GENET, V113, P238, DOI 10.1007/s00439-003-0968-7

Jochems A, 2017, INT J RADIAT ONCOL, V99, P344, DOI 10.1016/j.ijrobp.2017.04.021

Jochems A, 2016, RADIOTHER ONCOL, V121, P459, DOI 10.1016/j.radonc.2016.10.002

Kjaerulff UB, 2008, INFORM SCI STAT, P1, DOI 10.1007/978-0-387-74101-7

Kong FMS, 2007, J CLIN ONCOL, V25, P3116, DOI 10.1200/JCO.2006.10.3747

Kouloulias V, 2013, ASIAN PAC J CANCER P, V14, P2717, DOI 10.7314/APJCP.2013.14.5.2717

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Levina V, 2009, CLIN CANCER RES, V15, P2647, DOI 10.1158/1078-0432.CCR-08-2024

Luo Y, 2019, IEEE T RADIAT PLASMA, V3, P232, DOI 10.1109/TRPMS.2018.2832609

Luo Y, 2018, MED PHYS, V45, P3980, DOI 10.1002/mp.13029

Luo Y, 2017, RADIOTHER ONCOL, V123, P85, DOI 10.1016/j.radonc.2017.02.004

Martens D, 2011, DECIS SUPPORT SYST, V51, P782, DOI 10.1016/j.dss.2011.01.013

Pazzani MJ, 2001, METHOD INFORM MED, V40, P380

Perera AH, 2012, EXPERT KNOWLEDGE AND ITS APPLICATION IN LANDSCAPE ECOLOGY, P1, DOI 10.1007/978-1-4614-1034-8

Phillips MH, 2011, INT J RADIAT ONCOL, V79, P1089, DOI 10.1016/j.ijrobp.2009.12.037

Pierson C, 2018, RADIAT ONCOL, V13, DOI 10.1186/s13014-018-0980-7

Sesen MB, 2013, PLOS ONE, V8, DOI 10.1371/journal.pone.0082349

Smith WP, 2016, RADIAT ONCOL, V11, DOI 10.1186/s13014-016-0609-7

Sun Jimeng, 2012, AMIA Annu Symp Proc, V2012, P901

Sun X, 2014, IEEE SIGNAL PROC LET, V21, P1389, DOI 10.1109/LSP.2014.2337313

Tsamardinos I., 2003, FLAIRS C, V2, P376

Tseng HH, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00266

Wang JX, 2018, KDD'18: PROCEEDINGS OF THE 24TH ACM SIGKDD INTERNATIONAL CONFERENCE ON KNOWLEDGE DISCOVERY & DATA MINING, P2417, DOI 10.1145/3219819.3220070

Wang SL, 2017, INT J RADIAT ONCOL, V98, P615, DOI 10.1016/j.ijrobp.2017.03.011

Wang WL, 2013, INT J RADIAT ONCOL, V86, P956, DOI 10.1016/j.ijrobp.2013.05.003

Wright MC, 2004, QUAL SAF HEALTH CARE, V13, pI65, DOI 10.1136/qshc.2004.009951

Yu H, 2019, CLIN CANCER RES, V25, P4343, DOI 10.1158/1078-0432.CCR-18-1084

Zappa C, 2016, TRANSL LUNG CANCER R, V5, P288, DOI 10.21037/tlcr.2016.06.07

Zhao LJ, 2007, INT J RADIAT ONCOL, V68, P103, DOI 10.1016/j.ijrobp.2006.11.051

NR 42

TC 0

Z9 0

U1 2

U2 3

PU ELSEVIER SCI LTD

PI OXFORD

PA THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

SN 1120-1797

EI 1724-191X

J9 PHYS MEDICA

JI Phys. Medica

PD JUL

PY 2021

VL 87

BP 11

EP 23

DI 10.1016/j.ejmp.2021.05.032

EA JUN 2021

PG 13

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA TD9WL

UT WOS:000669669100002

PM 34091197

OA Green Accepted, Bronze

DA 2022-08-24

ER

PT J

AU Jensen, GL

Yost, CM

Mackin, DS

Fried, DV

Zhou, SH

Court, LE

Gomez, DR

AF Jensen, Garrett L.

Yost, Christine M.

Mackin, Dennis S.

Fried, David V.

Zhou, Shouhao

Court, Laurence E.

Gomez, Daniel R.

TI Prognostic value of combining a quantitative image feature from positron

emission tomography with clinical factors in oligometastatic non-small

cell lung cancer

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Risk stratification; Radiomics; FDG PET

ID PRIMARY TUMOR; FDG-PET; TEXTURAL FEATURES; F-18-FDG PET; PATHOLOGICAL

RESPONSE; DISTANT METASTASIS; LYMPH-NODES; RADIOMICS; SURVIVAL;

HETEROGENEITY

AB Background and purpose: Oligometastatic non-small cell lung cancer (NSCLC) is a heterogeneous condition with few known risk stratification factors. A quantitative imaging feature (QIF) on positron emission tomography (PET), gray-level co-occurrence matrix energy, has been linked with outcome of non metastatic NSCLC. We hypothesized that GLCM energy would enhance the ability of models comprising standard clinical prognostic factors (CPFs) to stratify oligometastatic patients based on overall survival (OS).

Materials and methods: We assessed 79 patients with oligometastatic NSCLC (<= 3 metastases) diagnosed in 2007-2015. The primary and largest metastases at diagnosis were delineated on pretreatment scans with GLCM energy extracted using imaging biomarker explorer (IBEX) software. Iterative stepwise elimination feature selection based on the Akaike information criterion identified the optimal model comprising CPFs for predicting OS in a multivariate Cox proportional hazards model. GLCM energy was tested for improving prediction accuracy.

Results: Energy was a significant predictor of OS (P = 0.028) in addition to the selected CPFs. The c-indexes for the CPF-only and CPF + Energy models were 0.720 and 0.739.

Conclusions: Incorporating Energy strengthened a CPF model for predicting OS. These findings support further exploration of QIFs, including markers of the primary tumor vs. those of the metastatic sites. (C) 2017 Elsevier B.V. All rights reserved. Radiotherapy and Oncology 126 (2018) 362-367

C1 [Jensen, Garrett L.; Yost, Christine M.] Univ Texas MD Anderson Canc Ctr, Dept Baylor Coll Med, Houston, TX 77030 USA.

[Mackin, Dennis S.; Fried, David V.; Court, Laurence E.] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Houston, TX 77030 USA.

[Zhou, Shouhao] Univ Texas MD Anderson Canc Ctr, Dept Biostat, Houston, TX 77030 USA.

[Gomez, Daniel R.] Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Houston, TX 77030 USA.

RP Gomez, DR (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Unit 1422, 1400 Pressler St, Houston, TX 77054 USA.

EM dgomez@mdanderson.org

RI Mackin, Dennis/Y-1503-2019

OI Court, Laurence/0000-0002-3241-6145

FU Cancer Center Support (Core) Grant from the National Cancer Institute,

National Institutes of Health [CA016672]

FX Funded in part by Cancer Center Support (Core) Grant CA016672 from the

National Cancer Institute, National Institutes of Health, to The

University of Texas MD Anderson Cancer Center.

CR Aerts HJWL, 2012, RADIOTHER ONCOL, V103, pS70

Bai H, 2016, ONCOTARGETS THER, V9, DOI 10.2147/OTT.S106696

Barone M, 2015, UPDATES SURG, V67, P383, DOI 10.1007/s13304-015-0336-x

Berghmans T, 2008, J THORAC ONCOL, V3, P6, DOI 10.1097/JTO.0b013e31815e6d6b

Berghmans Thierry, 2011, Ther Adv Med Oncol, V3, P127, DOI 10.1177/1758834011401951

Brooks FJ, 2014, J NUCL MED, V55, P37, DOI 10.2967/jnumed.112.116715

Campbell PJ, 2010, NATURE, V467, P1109, DOI 10.1038/nature09460

Cardone C, 2015, CURR COLORECT CANC R, V11, P217, DOI 10.1007/s11888-015-0278-1

Carvalho S, 2015, RADIOTHER ONCOL, V115, pS103

Carvalho S, 2016, RADIOTHER ONCOL, V118, pS20, DOI DOI 10.1016/S0167-8140(16)30042-1

Compter I, 2016, RADIOTHER ONCOL, V119, pS306, DOI 10.1016/S0167-8140(16)31907-7

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Coroller T, 2016, MED PHYS, V43, P3751, DOI 10.1118/1.4957514

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

de Geus-Oei LF, 2007, CANCER-AM CANCER SOC, V110, P1654, DOI 10.1002/cncr.22979

De Jong EEC, 2016, RADIOTHER ONCOL, V119, pS290, DOI 10.1016/S0167-8140(16)31859-X

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Dinapoli N, 2016, RADIOTHER ONCOL, V119, pS110, DOI 10.1016/S0167-8140(16)31490-6

Fried DV, 2016, RADIOLOGY, V278, P214, DOI 10.1148/radiol.2015142920

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Gomez DR, 2012, PULM MED, V2012, DOI 10.1155/2012/396592

Gomez-Roca C, 2009, J THORAC ONCOL, V4, P1212, DOI 10.1097/JTO.0b013e3181b44321

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Im HJ, 2015, EUR J NUCL MED MOL I, V42, P241, DOI 10.1007/s00259-014-2903-7

Kalikaki A, 2008, BRIT J CANCER, V99, P923, DOI 10.1038/sj.bjc.6604629

Kang SR, 2014, NUCL MED MOLEC IMAG, V48, P16, DOI 10.1007/s13139-013-0231-7

Kassambara A, 2016, SURVMINER DRAWING SU

Koksal D, 2013, J CARDIOTHORAC SURG, V8, DOI 10.1186/1749-8090-8-63

Leger S, 2016, RADIOTHER ONCOL, V119, pS121, DOI 10.1016/S0167-8140(16)31511-0

Leijenaar R, 2013, RADIOTHER ONCOL, V106, pS176

Leijenaar RTH, 2016, RADIOTHER ONCOL, V119, pS51, DOI 10.1016/S0167-8140(16)31360-3

Leijenaar RTH, 2015, RADIOTHER ONCOL, V115, pS512

Leijenaar RTH, 2015, RADIOTHER ONCOL, V115, pS9

Leijenaar RTH, 2016, RADIOTHER ONCOL, V119, pS196, DOI 10.1016/S0167-8140(16)31669-3

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Guerra JLL, 2012, INT J RADIAT ONCOL, V84, pE61, DOI 10.1016/j.ijrobp.2012.02.054

Machtay M, 2013, J CLIN ONCOL, V31, P3823, DOI 10.1200/JCO.2012.47.5947

MORENO AJC, 2014, RADIAT ONCOL, V9, DOI DOI 10.1186/S13014-014-0258-7

Park S, 2009, J THORAC ONCOL, V4, P809, DOI 10.1097/JTO.0b013e3181a94af4

Patel AN, 2016, THER ADV RESPIR DIS, V10, P338, DOI 10.1177/1753465816642636

Pencina MJ, 2004, STAT MED, V23, P2109, DOI 10.1002/sim.1802

Poplawski AB, 2010, EUR J HUM GENET, V18, P560, DOI 10.1038/ejhg.2009.230

R Development Core Team, 2009, R LANG ENV STAT COMP

Shimada Yoshihisa, 2015, Asian Cardiovasc Thorac Ann, V23, P937, DOI 10.1177/0218492315596463

Tamura T, 2015, MOL CLIN ONCOL, V3, P217, DOI 10.3892/mco.2014.410

Tang C, 2016, ACTA ONCOL, V8, P1

Therneau T, 2015, PACKAGE SURVIVAL ANA

Therneau TM., 2000, MODELING SURVIVAL DA

Tixier F, 2014, J NUCL MED, V55, P1235, DOI 10.2967/jnumed.113.133389

Tixier F, 2012, J NUCL MED, V53, P693, DOI 10.2967/jnumed.111.099127

Troost E, 2016, RADIOTHER ONCOL, V119, pS290, DOI 10.1016/S0167-8140(16)31858-8

Turner N, 2014, CANCERS, V6, P684, DOI 10.3390/cancers6020684

Uno H, 2011, STAT MED, V30, P1105, DOI 10.1002/sim.4154

Van Elmpt W, 2016, RADIOTHER ONCOL, V119, pS94, DOI 10.1016/S0167-8140(16)31455-4

Van Timmeren JE, 2016, RADIOTHER ONCOL, V119, pS446, DOI 10.1016/S0167-8140(16)32172-7

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

Weichselbaum RR, 2011, NAT REV CLIN ONCOL, V8, P378, DOI 10.1038/nrclinonc.2011.44

Werner-Wasik M, 2012, INT J RADIAT ONCOL, V82, P1164, DOI 10.1016/j.ijrobp.2010.12.055

Yachida S, 2010, NATURE, V467, P1114, DOI 10.1038/nature09515

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

NR 62

TC 15

Z9 15

U1 0

U2 8

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD FEB

PY 2018

VL 126

IS 2

BP 362

EP 367

DI 10.1016/j.radonc.2017.11.006

PG 6

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA GB6MX

UT WOS:000429184400026

PM 29196095

DA 2022-08-24

ER

PT J

AU Kakino, R

Nakamura, M

Mitsuyoshi, T

Shintani, T

Hirashima, H

Matsuo, Y

Mizowaki, T

AF Kakino, Ryo

Nakamura, Mitsuhiro

Mitsuyoshi, Takamasa

Shintani, Takashi

Hirashima, Hideaki

Matsuo, Yukinori

Mizowaki, Takashi

TI Comparison of radiomic features in diagnostic CT images with and without

contrast enhancement in the delayed phase for NSCLC patients

SO PHYSICA MEDICA-EUROPEAN JOURNAL OF MEDICAL PHYSICS

LA English

DT Article

DE Contrast enhancement; Diagnostic computed tomography; Non-small cell

lung cancer; Radiomics; Stereotactic body radiation therapy

ID BODY RADIATION-THERAPY; CELL LUNG-CANCER; TEXTURAL FEATURES; SIGNATURE

AB Purpose: To compare radiomic features extracted from diagnostic computed tomography (CT) images with and without contrast enhancement in delayed phase for non-small cell lung cancer (NSCLC) patients.

Methods: Diagnostic CT images from 269 tumors [non-contrast CT, 188 (dataset NE); contrast-enhanced CT, 81 (dataset CE)] were enrolled in this study. Eighteen first-order and seventy-five texture features were extracted by setting five bin width levels for CT values. Reproducible features were selected by the intraclass correlation coefficient (ICC). Radiomic features were compared between datasets NE and CE. Subgroup analyses were performed based on the CT acquisition period, exposure value, and patient characteristics.

Results: Eighty features were considered reproducible (0.5 <= ICC). Twelve of the sixteen first-order features, independent of the bin width levels, were statistically different between datasets NE and CE (p < 0.05), and the p-values of two first-order features depending on the bin width levels were reduced with narrower bin widths. Sixteen out of sixty-two features showed a significant difference, regardless of the bin width (p < 0.05). There were significant differences between datasets NE and CE with older age, lighter body weight, better performance status, being a smoker, larger gross tumor volume, and tumor location at central region.

Conclusions: Contrast enhancement in the delayed phase of CT images for NSCLC patients affected some of the radiomic features and the variability of radiomic features due to contrast uptake may depend largely on the patient characteristics.

C1 [Kakino, Ryo; Nakamura, Mitsuhiro] Kyoto Univ, Grad Sch Med, Dept Informat Technol & Med Engn, Human Hlth Sci,Div Med Phys, Kyoto 6068507, Japan.

[Kakino, Ryo; Nakamura, Mitsuhiro; Mitsuyoshi, Takamasa; Shintani, Takashi; Hirashima, Hideaki; Matsuo, Yukinori; Mizowaki, Takashi] Kyoto Univ, Grad Sch Med, Dept Radiat Oncol & Image Appl Therapy, Kyoto 6068507, Japan.

[Kakino, Ryo] Japan Soc Promot Sci, Tokyo, Japan.

RP Nakamura, M (通讯作者)，Kyoto Univ, Div Med Phys, Dept Informat Technol & Med Engn, Human Hlth Sci,Grad Sch Med,Sakyo Ku, 53 Kawahara Cho, Kyoto 6068507, Japan.

EM m\_nkmr@kuhp.kyoto-u.ac.jp

RI Matsuo, Yukinori/O-6200-2014

OI Matsuo, Yukinori/0000-0002-4372-8259; Kakino, Ryo/0000-0001-7767-9216;

Nakamura, Mitsuhiro/0000-0002-6406-2097; Mitsuyoshi,

Takamasa/0000-0001-9983-3106

FU Japan Society for the Promotion of Science [19J14339, 2019-2021]; Takeda

Science Foundation

FX This study was supported by the Japan Society for the Promotion of

Science Grant-in-Aid for JSPS fellows [grant number 19J14339; 2019-2021]

and the Takeda Science Foundation. The authors are grateful to Nakamura

Laboratory researchers (http://medicalphysics.hs.med.kyoto-u.ac.jp/) for

their valuable comments and discussions regarding this study.

CR AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

Aoki M, 2014, J RADIAT RES, V55, P917, DOI 10.1093/jrr/rru026

Avanzo M, 2017, PHYS MEDICA, V38, P122, DOI 10.1016/j.ejmp.2017.05.071

Bousabarah K, 2019, STRAHLENTHER ONKOL, V195, P830, DOI 10.1007/s00066-019-01452-7

Chen CC, 2008, COMPUT STAT DATA AN, V53, P554, DOI 10.1016/j.csda.2008.09.026

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

de Jong EEC, 2018, LUNG CANCER, V124, P6, DOI 10.1016/j.lungcan.2018.07.023

Dennie C, 2016, QUANT IMAG MED SURG, V6, P6, DOI 10.3978/j.issn.2223-4292.2016.02.01

Fan L, 2019, EUR RADIOL, V29, P889, DOI 10.1007/s00330-018-5530-z

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

He L, 2016, SCI REP-UK, V6, DOI 10.1038/srep34921

Hu PP, 2016, ONCOTARGET, V7, P71440, DOI 10.18632/oncotarget.12199

Huynh E, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169172

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Jia TY, 2019, EUR RADIOL, V29, P4742, DOI 10.1007/s00330-019-06024-y

Lafata KJ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf5a5

Larue RTHM, 2017, BRIT J RADIOL, V90, DOI 10.1259/bjr.20160665

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

Li SL, 2018, MED IMAGE ANAL, V50, P106, DOI 10.1016/j.media.2018.09.004

Mackin D, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-20713-6

McGraw KO, 1996, PSYCHOL METHODS, V1, P30, DOI 10.1037/1082-989X.1.4.390

Miller CJ, 2019, CLIN LUNG CANCER, V20, P37, DOI 10.1016/j.cllc.2018.09.002

Nagata Y, 2015, INT J RADIAT ONCOL, V93, P989, DOI 10.1016/j.ijrobp.2015.07.2278

Peeken JC, 2018, PHYS MEDICA, V48, P27, DOI 10.1016/j.ejmp.2018.03.012

Shafiq-ul-Hassan M, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-28895-9

SHROUT PE, 1979, PSYCHOL BULL, V86, P420, DOI 10.1037/0033-2909.86.2.420

Soufi M, 2018, MED PHYS, V45, P5116, DOI 10.1002/mp.13202

SUN CJ, 1983, COMPUT VISION GRAPH, V23, P341, DOI 10.1016/0734-189X(83)90032-4

Team RC, 2013, R LANGUAGE ENV STAT

Thibault G, 2009, P PATT REC INF PROC

Tu WT, 2019, LUNG CANCER, V132, P28, DOI 10.1016/j.lungcan.2019.03.025

Vallieres M, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-10371-5

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Yamaguchi Isao, 2002, Nihon Hoshasen Gijutsu Gakkai Zasshi, V58, P517

Yang XG, 2018, LUNG CANCER, V125, P109, DOI 10.1016/j.lungcan.2018.09.013

Zhao W, 2019, EUR J RADIOL, V112, P161, DOI 10.1016/j.ejrad.2019.01.021

Zhu XZ, 2018, EUR RADIOL, V28, P2772, DOI 10.1007/s00330-017-5221-1

NR 38

TC 18

Z9 18

U1 2

U2 4

PU ELSEVIER SCI LTD

PI OXFORD

PA THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

SN 1120-1797

EI 1724-191X

J9 PHYS MEDICA

JI Phys. Medica

PD JAN

PY 2020

VL 69

BP 176

EP 182

DI 10.1016/j.ejmp.2019.12.019

PG 7

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA KB6WK

UT WOS:000506632700022

PM 31918370

DA 2022-08-24

ER

PT J

AU Glover, J

Velez-Cubian, FO

Toosi, K

Ng, E

Moodie, CC

Garrett, JR

Fontaine, JP

Toloza, EM

AF Glover, Jessica

Velez-Cubian, Frank O.

Toosi, Kavian

Ng, Emily

Moodie, Carla C.

Garrett, Joseph R.

Fontaine, Jacques P.

Toloza, Eric M.

TI Perioperative outcomes and lymph node assessment after induction therapy

in patients with clinical N1 or N2 non-small cell lung cancer

SO JOURNAL OF THORACIC DISEASE

LA English

DT Article

DE Lymph node; induction therapy; lung cancer; lobectomy; robotics

ID RANDOMIZED CONTROLLED-TRIAL; PHASE-III; ADJUVANT CHEMOTHERAPY; SURGERY;

CISPLATIN; RESECTION; IMPACT; RADIOTHERAPY; MORBIDITY; MORTALITY

AB Background: Induction therapy has been shown to benefit patients with resectable stage-2 or stage-3 nonsmall cell lung cancer (NSCLC). We aimed to determine if induction chemotherapy (CTx) with or without radiation therapy (+/- RT) for NSCLC with clinical lymph node (LN) involvement (cN1 or cN2) affects LN dissection or perioperative outcomes during robotic-assisted video thoracoscopic (RAVTS) lobectomy.

Methods: We retrospectively analyzed patients who underwent RAVTS lobectomy for NSCLC over 45 months. We assessed clinical LN status by CT scan, PET scan, endobronchial ultrasound, and/or mediastinoscopy. We grouped patients with cN1 or cN2 as: "no induction therapy", "induction CTx alone" (ICTx), or "induction CTx + RT" (ICTx + RT). Intraoperative estimated blood loss (EBL), operative times, tumor size, LN status, and restaging were noted.

Results: Of 256 NSCLC patients who had lobectomy, there were 52 cN1 or cN2 patients, of whom 39 patients had "no induction", 7 had ICTx, and 6 had ICTx + RT. Higher rates of recurrent laryngeal nerve (RLN) injury, tracheal/bronchial injury, and pulmonary embolism were observed with ICTx +/- RT (P=0.02, 0.04, and 0.02, respectively). Total number of complications was not significantly different, nor were perioperative outcomes, such as EBL, operative time, and in-hospital mortality. Fewer N2 LN stations were assessed after ICTx +/- RT (3.7 +/- 0.2 vs. 4.2 +/- 0.2 stations; P=0.04), but total number of LNs reported were not significantly different (13.0 +/- 2.3 vs. 16.2 +/- 1.0 LNs, P=0.22). Of "no induction" patients, 15.4% were upstaged pathologically; no patients were upstaged after induction therapy. While 30.8% of ICTx +/- RT patients were downstaged, 38.5% of "no induction" patients were also downstaged on final pathology.

Conclusions: Induction CTx +/- RT for cN1 or cN2 NSCLC patients did not affect EBL, operative times, or in-house mortality after RAVTS lobectomy. Patients undergoing RAVTS lobectomy after ICTx+ RT may be at greater risk for RLN injury, tracheal/bronchial injury, and pulmonary embolism. Fewer N2 LN stations, but not numbers of LNs, are assessed after ICTx +/- RT. Induction therapy does not lead to increased downstaging.

C1 [Glover, Jessica; Toosi, Kavian; Ng, Emily] Univ S Florida, Morsani Coll Med, Tampa, FL USA.

[Velez-Cubian, Frank O.; Fontaine, Jacques P.; Toloza, Eric M.] Univ S Florida, Morsani Coll Med, Dept Surg, Tampa, FL USA.

[Moodie, Carla C.; Garrett, Joseph R.; Fontaine, Jacques P.; Toloza, Eric M.] H Lee Moffitt Canc Ctr & Res Inst, Dept Thorac Surg, Tampa, FL USA.

[Fontaine, Jacques P.; Toloza, Eric M.] Univ S Florida, Morsani Coll Med, Dept Oncol Sci, Tampa, FL USA.

RP Toloza, EM (通讯作者)，H Lee Moffitt Canc Ctr & Res Inst, 12902 USF Magnolia Dr,Suite FOB1, Tampa, FL 33612 USA.

EM eric.toloza@moffitt.org

FU Scholarly Concentrations Program at the University of South Florida

(USF) Health Morsani College of Medicine; Office of Research, Innovation

& Scholarly Endeavors (RISE) at the University of South Florida (USF)

Health Morsani College of Medicine

FX This manuscript is an update of our study previously given as an oral

presentation at the Inaugural Asian Congress of Robotic Surgery, Hong

Kong, December 16-17, 2015. This research was supported by 2014 Summer

Scholarly Awards to Jessica Glover and to Emily Ng from the Scholarly

Concentrations Program and by a 2015 Summer Scholarly Award to Kavian

Toosi from the Office of Research, Innovation & Scholarly Endeavors

(RISE), all at the University of South Florida (USF) Health Morsani

College of Medicine.

CR Albain KS, 2009, LANCET, V374, P379, DOI 10.1016/S0140-6736(09)60737-6

Coleman BK, 2015, J THORAC DIS, V7, P243, DOI 10.3978/j.issn.2072-1439.2015.01.42

Depierre A, 2002, J CLIN ONCOL, V20, P247, DOI 10.1200/JCO.20.1.247

Evans NR, 2010, J THORAC CARDIOV SUR, V139, P991, DOI 10.1016/j.jtcvs.2009.11.070

Felip E, 2000, Clin Lung Cancer, V1, P287, DOI 10.3816/CLC.2000.n.011

Felip E, 2010, J CLIN ONCOL, V28, P3138, DOI 10.1200/JCO.2009.27.6204

Gilligan D, 2007, LANCET, V369, P1929, DOI 10.1016/S0140-6736(07)60714-4

Peer M, 2015, HEART LUNG CIRC, V24, P69, DOI 10.1016/j.hlc.2014.07.055

Pignon JP, 2008, J CLIN ONCOL, V26, P3552, DOI 10.1200/JCO.2007.13.9030

Pisters KMW, 2010, J CLIN ONCOL, V28, P1843, DOI 10.1200/JCO.2009.26.1685

Ren Z, 2015, J THORAC DIS, V7, P1414, DOI 10.3978/j.issn.2072-1439.2015.08.14

Rosell R, 1999, LUNG CANCER, V26, P7, DOI 10.1016/S0169-5002(99)00045-8

Roth JA, 1998, LUNG CANCER-J IASLC, V21, P1, DOI 10.1016/S0169-5002(98)00046-4

ROTH JA, 1994, J NATL CANCER I, V86, P673, DOI 10.1093/jnci/86.9.673

Scagliotti GV, 2012, J CLIN ONCOL, V30, P172, DOI 10.1200/JCO.2010.33.7089

Stefani A, 2010, J THORAC CARDIOV SUR, V140, P356, DOI 10.1016/j.jtcvs.2010.02.018

Toyooka S, 2012, INTERACT CARDIOV TH, V14, P565, DOI 10.1093/icvts/ivs028

Yang CFJ, 2016, EUR J CARDIO-THORAC, V49, P1607, DOI 10.1093/ejcts/ezv431

Yang HT, 2015, J THORAC DIS, V7, P1616, DOI 10.3978/j.issn.2072-1439.2015.09.07

NR 19

TC 7

Z9 10

U1 0

U2 0

PU PIONEER BIOSCIENCE PUBL CO

PI HONG KONG

PA 9A GOLD SHINE TOWER, 346-348 QUEEN'S RD CENTRAL, SHEUNG WAN, HONG KONG,

00000, PEOPLES R CHINA

SN 2072-1439

EI 2077-6624

J9 J THORAC DIS

JI J. Thorac. Dis.

PD AUG

PY 2016

VL 8

IS 8

BP 2165

EP 2174

DI 10.21037/jtd.2016.07.09

PG 10

WC Respiratory System

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Respiratory System

GA DY3VO

UT WOS:000385023800104

PM 27621873

OA Green Published

DA 2022-08-24

ER

PT J

AU Shi, XX

Pang, HW

Ron, PR

Sun, XY

Wu, JB

Lin, S

AF Shi, Xiang-xiang

Pang, Hao-wen

Ron, Pei-rong

Sun, Xiao-yang

Wu, Jing-bo

Lin, Sheng

TI Template-assisted Ir-192-based stereotactic ablative brachytherapy as a

neoadjuvant treatment for operable peripheral non-small cell lung

cancer: a phase I clinical trial

SO JOURNAL OF CONTEMPORARY BRACHYTHERAPY

LA English

DT Article

DE brachytherapy; neoadjuvant therapy; non-small cell lung cancer;

radiotherapy; computer-assisted

ID HIGH-DOSE-RATE; INTERSTITIAL BRACHYTHERAPY; RADIATION; THERAPY;

COMBINATION; RESPONSES

AB Purpose: To evaluate safety, feasibility, and efficacy of template-assisted Ir-192-based stereotactic ablative brachytherapy (SABT), combined with surgery for peripheral non-small cell lung cancer (NSCLC).

Material and methods: Patients with pathologically confirmed operable peripheral NSCLC, who underwent template-assisted SABT (30 Gy delivered in one fraction) and were scheduled for tumor resection 4-6 weeks after SABT were included in this study. The perioperative adverse reactions of SABT were recorded to evaluate safety and feasibility of SABT for neoadjuvant therapy. Dosimetric data from both simulated and actual plans were collected and compared. Imaging with F-18-fluorodeoxyglucose-positron emission tomography/computed tomography (F-18-FDG-PET/CT) and dynamic contrast-enhanced computed tomography were scheduled before SABT and surgery to evaluate the efficacy of the neoadjuvant therapy with SABT.

Results: Patients did not experience any serious adverse events. None of the patients had a delay in receiving surgery. After 4-6 weeks, the indicators for the efficacy of neoadjuvant therapy significantly decreased in all patients: gross tumor volume (p < 0.001), maximum standardized uptake value (p < 0.001), tumor blood volume (p < 0.001), and tumor blood flow (p = 0.008). Dosimetric parameters in the delivered SABT plan slightly changed from the preoperative simulation, but the difference was not statistically significant (p > 0.05).

Conclusions: The efficacy of template-assisted SABT for neoadjuvant therapy was significant in operable peripheral NSCLC. Moreover, no serious adverse reactions were observed; when the coplanar template guidance technique was applied, dosimetric parameters were in good agreement between the actual SABT plan and the preoperative simulated plan.

C1 [Shi, Xiang-xiang; Pang, Hao-wen; Ron, Pei-rong; Sun, Xiao-yang; Wu, Jing-bo; Lin, Sheng] Southwest Med Univ, Affiliated Hosp, Dept Oncol, 25 TaiPing Rd, Luzhou 646000, Peoples R China.

[Shi, Xiang-xiang; Lin, Sheng] Southwest Med Univ, Affiliated Hosp, Nucl Med & Mol Imaging Key Lab Sichuan Prov, Luzhou, Peoples R China.

RP Lin, S (通讯作者)，Southwest Med Univ, Affiliated Hosp, Dept Oncol, 25 TaiPing Rd, Luzhou 646000, Peoples R China.

EM lslinsheng@163.com

CR Almoa SC, 2014, RADIAT RES, V182, P230, DOI 10.1667/RR13667.1

Borst GR, 2010, INT J RADIAT ONCOL, V77, P1596, DOI 10.1016/j.ijrobp.2009.10.015

Brennan SM, 2010, MED DOSIM, V35, P38, DOI 10.1016/j.meddos.2009.01.003

Bumette B, 2015, SEMIN RADIAT ONCOL, V25, P40, DOI 10.1016/j.semradonc.2014.07.009

Chi A, 2013, BIOMED RES INT, V2013, DOI 10.1155/2013/391021

Feuvret L, 2006, INT J RADIAT ONCOL, V64, P333, DOI 10.1016/j.ijrobp.2005.09.028

Georg D, 2014, INT J RADIAT ONCOL, V88, P715, DOI 10.1016/j.ijrobp.2013.11.241

Glover J, 2016, J THORAC DIS, V8, P2165, DOI 10.21037/jtd.2016.07.09

Golden EB, 2015, LANCET ONCOL, V16, P795, DOI 10.1016/S1470-2045(15)00054-6

Manning MA, 2001, INT J RADIAT ONCOL, V49, P839, DOI 10.1016/S0360-3016(00)01453-X

Palma DA, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0770-7

Roses RE, 2014, RADIAT RES, V182, P211, DOI 10.1667/RR13495.1

SAW CB, 1991, INT J RADIAT ONCOL, V20, P135, DOI 10.1016/0360-3016(91)90149-X

Tanvetyanon T, 2005, SOUTH MED J, V98, P338, DOI 10.1097/01.SMJ.0000145313.92610.12

Torre LA, 2015, CA-CANCER J CLIN, V65, P87, DOI 10.3322/caac.21262

Wang ZM, 2011, LUNG CANCER, V74, P253, DOI 10.1016/j.lungcan.2011.03.006

Wattenberg MM, 2014, RADIAT RES, V182, P126, DOI 10.1667/RR13374.1

Xiang L, 2015, INT J RADIAT ONCOL, V92, P1027, DOI 10.1016/j.ijrobp.2015.04.019

Yang B, 2017, J CONTEMP BRACHYTHER, V9, P566, DOI 10.5114/jcb.2017.72359

NR 19

TC 4

Z9 5

U1 2

U2 2

PU TERMEDIA PUBLISHING HOUSE LTD

PI POZNAN

PA KLEEBERGA ST 2, POZNAN, 61-615, POLAND

SN 1689-832X

EI 2081-2841

J9 J CONTEMP BRACHYTHER

JI J. Contemp. Brachytherapy

PY 2019

VL 11

IS 2

BP 162

EP 168

DI 10.5114/jcb.2019.84613

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA HY0BN

UT WOS:000467774300010

PM 31139225

OA Green Published, Green Submitted, gold

DA 2022-08-24

ER

PT J

AU Klement, RJ

Allgauer, M

Appold, S

Dieckmann, K

Ernst, I

Ganswindt, U

Holy, R

Nestle, U

Nevinny-Stickel, M

Semrau, S

Sterzing, F

Wittig, A

Andratschke, N

Guckenberger, M

AF Klement, Rainer J.

Allgaeuer, Michael

Appold, Steffen

Dieckmann, Karin

Ernst, Iris

Ganswindt, Ute

Holy, Richard

Nestle, Ursula

Nevinny-Stickel, Meinhard

Semrau, Sabine

Sterzing, Florian

Wittig, Andrea

Andratschke, Nicolaus

Guckenberger, Matthias

TI Support Vector Machine-Based Prediction of Local Tumor Control After

Stereotactic Body Radiation Therapy for Early-Stage Non-Small Cell Lung

Cancer

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

ID DOSE-RESPONSE RELATIONSHIP; RADIOTHERAPY; IRRADIATION; CLASSIFICATION;

OUTCOMES

AB Background: Several prognostic factors for local tumor control probability (TCP) after stereotactic body radiation therapy (SBRT) for early stage non-small cell lung cancer (NSCLC) have been described, but no attempts have been undertaken to explore whether a nonlinear combination of potential factors might synergistically improve the prediction of local control.

Methods and Materials: We investigated a support vector machine (SVM) for predicting TCP in a cohort of 399 patients treated at 13 German and Austrian institutions. Among 7 potential input features for the SVM we selected those most important on the basis of forward feature selection, thereby evaluating classifier performance by using 10-fold cross-validation and computing the area under the ROC curve (AUC). The final SVM classifier was built by repeating the feature selection 10 times with different splitting of the data for cross-validation and finally choosing only those features that were selected at least 5 out of 10 times. It was compared with a multivariate logistic model that was built by forward feature selection.

Results: Local failure occurred in 12% of patients. Biologically effective dose (BED) at the isocenter (BEDISO) was the strongest predictor of TCP in the logistic model and also the most frequently selected input feature for the SVM. A bivariate logistic function of BEDISO and the pulmonary function indicator forced expiratory volume in 1 second (FEV1) yielded the best description of the data but resulted in a significantly smaller AUC than the final SVM classifier with the input features BEDISO, age, baseline Karnofsky index, and FEV1 (0.696 +/- 0.040 vs 0.789 +/- 0.001, P < .03). The final SVM resulted in sensitivity and specificity of 67.0% +/- 0.5% and 78.7% +/- 0.3%, respectively.

Conclusions: These results confirm that machine learning techniques like SVMs can be successfully applied to predict treatment outcome after SBRT. Improvements over traditional TCP modeling are expected through a nonlinear combination of multiple features, eventually helping in the task of personalized treatment planning. (C) 2014 Elsevier Inc.

C1 [Klement, Rainer J.; Guckenberger, Matthias] Univ Wurzburg, Dept Radiat Oncol, Wurzburg, Germany.

[Klement, Rainer J.] Leopoldina Hosp, Dept Radiotherapy & Radiat Oncol, Schweinfurt, Germany.

[Allgaeuer, Michael] Barmherzige Bruder Regensburg, Dept Radiotherapy, Regensburg, Germany.

[Appold, Steffen] Tech Univ Dresden, Dept Radiat Oncol, Dresden, Germany.

[Dieckmann, Karin] Med Univ Vienna, Dept Radiotherapy, Vienna, Austria.

[Ernst, Iris] Univ Hosp Munster, Dept Radiotherapy, Munster, Germany.

[Ganswindt, Ute] Univ Munich, Dept Radiat Oncol, Munich, Germany.

[Holy, Richard] Rhein Westfal TH Aachen, Dept Radiat Oncol, Aachen, Germany.

[Nestle, Ursula] Univ Hosp Freiburg, Dept Radiat Oncol, Freiburg, Germany.

[Nevinny-Stickel, Meinhard] Med Univ Innsbruck, Dept Therapeut Radiol & Oncol, A-6020 Innsbruck, Austria.

[Semrau, Sabine] Univ Erlangen Nurnberg, Dept Radiat Oncol, D-91054 Erlangen, Germany.

[Sterzing, Florian] Univ Heidelberg Hosp, Dept Radiat Oncol, Heidelberg, Germany.

[Wittig, Andrea] Univ Marburg, Dept Radiotherapy & Radiat Oncol, D-35032 Marburg, Germany.

[Andratschke, Nicolaus] Tech Univ Munich, Dept Radiat Oncol, D-80290 Munich, Germany.

RP Klement, RJ (通讯作者)，Leopoldina Hosp Schweinfurt, Dept Radiotherapy & Radiat Oncol, Gustav Adolf Str 8, D-97422 Schweinfurt, Germany.

EM rainer\_klement@gmx.de

RI Guckenberger, Matthias/M-5114-2019; Nestle, Ursula/ABG-2339-2021;

Guckenberger, Matthias/AAX-4994-2020; Klement, Rainer J/H-3484-2019

OI Guckenberger, Matthias/0000-0002-7146-9071; Klement, Rainer

J/0000-0003-1401-4270; Ganswindt, Ute/0000-0003-4492-614X

CR Akbani R, 2004, LECT NOTES COMPUT SC, V3201, P39, DOI 10.1007/978-3-540-30115-8\_7

Chang CC, 2011, ACM T INTEL SYST TEC, V2, DOI 10.1145/1961189.1961199

Chawla NV, 2002, J ARTIF INTELL RES, V16, P321, DOI 10.1613/jair.953

Chen S, 2007, MED PHYS, V34, P3808, DOI 10.1118/1.2776669

Chi A, 2011, AM J CLIN ONCOL-CANC, V34, P432, DOI 10.1097/COC.0b013e3181df4b3f

Choi NC, 2002, INT J RADIAT ONCOL, V54, P1024, DOI 10.1016/S0360-3016(02)03038-9

CORTES C, 1995, MACH LEARN, V20, P273, DOI 10.1023/A:1022627411411

Das SK, 2008, MED PHYS, V35, P5098, DOI 10.1118/1.2996012

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

El Naqa I, 2012, WIRES DATA MIN KNOWL, V2, P173, DOI 10.1002/widm.1047

El Naqa I, 2010, ACTA ONCOL, V49, P1363, DOI 10.3109/02841861003649224

Fawcett T, 2006, PATTERN RECOGN LETT, V27, P861, DOI 10.1016/j.patrec.2005.10.010

Guckenberger M, 2013, J THORAC ONCOL, V8, P1050, DOI 10.1097/JTO.0b013e318293dc45

Guckenberger M, 2009, INT J RADIAT ONCOL, V74, P47, DOI 10.1016/j.ijrobp.2008.06.1939

Hirst DG, 2010, BRIT J RADIOL, V83, P723, DOI 10.1259/bjr/91488645

Hof H, 2007, CANCER-AM CANCER SOC, V110, P148, DOI 10.1002/cncr.22763

James G, 2013, SPRINGER TEXTS STAT, V103, P1, DOI 10.1007/978-1-4614-7138-7\_1

Klement RJ, 2011, ASTROPHYS J, V726, DOI 10.1088/0004-637X/726/2/103

Klement RJ, 2011, NUTR METAB, V8, DOI 10.1186/1743-7075-8-75

Kotsiantis S B, 2007, INFORMATICA, V31, P249, DOI DOI 10.31449/INF.V31I3.148

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Miles KA, 2008, CANCER IMAGING, V8, P81, DOI 10.1102/1470-7330.2008.0011

Nimeus-Malmstrom E, 2008, BREAST CANCER RES, V10, DOI 10.1186/bcr1997

Oh JH, 2011, PHYS MED BIOL, V56, P1635, DOI 10.1088/0031-9155/56/6/008

Ohri N, 2012, INT J RADIAT ONCOL, V84, pE379, DOI 10.1016/j.ijrobp.2012.04.040

OKUNIEFF P, 1995, INT J RADIAT ONCOL, V32, P1227, DOI 10.1016/0360-3016(94)00475-Z

Onimaru R, 2008, INT J RADIAT ONCOL, V70, P374, DOI 10.1016/j.ijrobp.2007.06.043

Onishi H, 2004, CANCER-AM CANCER SOC, V101, P1623, DOI 10.1002/cncr.20539

Perez BA, 2013, FRONT ONCOL, V3, DOI 10.3389/fonc.2013.00072

Robin X, 2011, BMC BIOINFORMATICS, V12, DOI 10.1186/1471-2105-12-77

Ruggieri R, 2013, PHYS MED BIOL, V58, P4611, DOI 10.1088/0031-9155/58/13/4611

Senthi S, 2013, RADIOTHER ONCOL, V106, P276, DOI 10.1016/j.radonc.2013.01.004

Stevens CW, 2001, INT J RADIAT ONCOL, V51, P62, DOI 10.1016/S0360-3016(01)01621-2

Stuschke M, 2010, FRONT RADIAT THER ON, V42, P150, DOI 10.1159/000262470

Wan XB, 2012, PLOS ONE, V7, DOI 10.1371/journal.pone.0031989

Wulf J, 2005, RADIOTHER ONCOL, V77, P83, DOI 10.1016/j.radonc.2005.09.003

NR 36

TC 40

Z9 44

U1 1

U2 20

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD MAR 1

PY 2014

VL 88

IS 3

BP 732

EP 738

DI 10.1016/j.ijrobp.2013.11.216

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA AB3YO

UT WOS:000331726300031

PM 24411630

DA 2022-08-24

ER

PT J

AU Jiang, J

Hu, YC

Tyagi, N

Zhang, PP

Rimner, A

Deasy, JO

Veeraraghavan, H

AF Jiang, Jue

Hu, Yu-Chi

Tyagi, Neelam

Zhang, Pengpeng

Rimner, Andreas

Deasy, Joseph O.

Veeraraghavan, Harini

TI Cross-modality (CT-MRI) prior augmented deep learning for robust lung

tumor segmentation from small MR datasets

SO MEDICAL PHYSICS

LA English

DT Article

DE cross-modality learning; data augmentation; generative adversarial

networks; magnetic resonance imaging; tumor segmentation

AB Purpose Accurate tumor segmentation is a requirement for magnetic resonance (MR)-based radiotherapy. Lack of large expert annotated MR datasets makes training deep learning models difficult. Therefore, a cross-modality (MR-CT) deep learning segmentation approach that augments training data using pseudo MR images produced by transforming expert-segmented CT images was developed. Methods Eighty-one T2-weighted MRI scans from 28 patients with non-small cell lung cancers (nine with pretreatment and weekly MRI and the remainder with pre-treatment MRI scans) were analyzed. Cross-modality model encoding the transformation of CT to pseudo MR images resembling T2w MRI was learned as a generative adversarial deep learning network. This model was used to translate 377 expert segmented non-small cell lung cancer CT scans from the Cancer Imaging Archive into pseudo MRI that served as additional training set. This method was benchmarked against shallow learning using random forest, standard data augmentation, and three state-of-the art adversarial learning-based cross-modality data (pseudo MR) augmentation methods. Segmentation accuracy was computed using Dice similarity coefficient (DSC), Hausdorff distance metrics, and volume ratio. Results The proposed approach produced the lowest statistical variability in the intensity distribution between pseudo and T2w MR images measured as Kullback-Leibler divergence of 0.069. This method produced the highest segmentation accuracy with a DSC of (0.75 +/- 0.12) and the lowest Hausdorff distance of (9.36 mm +/- 6.00 mm) on the test dataset using a U-Net structure. This approach produced highly similar estimations of tumor growth as an expert (P = 0.37). Conclusions A novel deep learning MR segmentation was developed that overcomes the limitation of learning robust models from small datasets by leveraging learned cross-modality information using a model that explicitly incorporates knowledge of tumors in modality translation to augment segmentation training. The results show the feasibility of the approach and the corresponding improvement over the state-of-the-art methods.

C1 [Jiang, Jue; Hu, Yu-Chi; Tyagi, Neelam; Zhang, Pengpeng; Deasy, Joseph O.; Veeraraghavan, Harini] Mem Sloan Kettering Canc Ctr, Dept Med Phys, New York, NY 10065 USA.

[Rimner, Andreas] Mem Sloan Kettering Canc Ctr, Dept Radiat Oncol, New York, NY 10065 USA.

RP Veeraraghavan, H (通讯作者)，Mem Sloan Kettering Canc Ctr, Dept Med Phys, New York, NY 10065 USA.

EM veerarah@mskcc.org

RI Hu, Yu-Chi/GMW-4176-2022

OI Deasy, Joseph/0000-0002-9437-266X; Hu, Yu-chi/0000-0001-7742-2971

FU Varian Medical Systems; MSK Cancer Center [P30 CA008748]; NIH [R01

CA198121-03]; NATIONAL CANCER INSTITUTE [R01CA198121, P30CA008748]

Funding Source: NIH RePORTER

FX This work was supported in part by Varian Medical Systems, and partially

by the MSK Cancer Center support grant/core grant P30 CA008748, and by

NIH R01 CA198121-03. We also thank Dr. Mageras for his insightful

suggestions for improving the clarity of the manuscript.

CR Aerts HJ, 2015, CANC IMAGING ARCH

Chartsias Agisilaos, 2017, Simulation and Synthesis in Medical Imaging. Second International Workshop, SASHIMI 2017. Held in Conjunction with MICCAI 2017. Proceedings: LNCS 10557, P3, DOI 10.1007/978-3-319-68127-6\_1

Chintala S, 2016, P ICLR 2016 INT C LE

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Cohen JP, 2018, LECT NOTES COMPUT SC, V11070, P529, DOI 10.1007/978-3-030-00928-1\_60

Duda R. O., 1973, PATTERN RECOGNITION

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Emami H, 2018, MED PHYS, V45, P3627, DOI 10.1002/mp.13047

Goodfellow IJ, 2014, ADV NEUR IN, V27, P2672

Hu YC, 2016, J MED IMAGING, V3, DOI 10.1117/1.JMI.3.2.024503

Huang G, 2017, PROC CVPR IEEE, P2261, DOI 10.1109/CVPR.2017.243

Huo YK, 2018, I S BIOMED IMAGING, P1217, DOI 10.1109/ISBI.2018.8363790

IOFFE S, 2015, J MACH LEARN RES, V37, P448

Isola P, 2017, PROC CVPR IEEE, P5967, DOI 10.1109/CVPR.2017.632

Jegou S, 2017, IEEE COMPUT SOC CONF, P1175, DOI 10.1109/CVPRW.2017.156

Jiang J, 2018, LECT NOTES COMPUT SC, V11071, P777, DOI 10.1007/978-3-030-00934-2\_86

Kaiming He, 2016, 2016 IEEE Conference on Computer Vision and Pattern Recognition (CVPR), P770, DOI 10.1109/CVPR.2016.90

Kamnitsas K, 2017, MED IMAGE ANAL, V36, P61, DOI 10.1016/j.media.2016.10.004

Kingma D. P., 2015, INT C LEARN REPR ICL, P1

Krahenbuhl P., 2011, P ADV NEUR INF PROC, P109

Lavagnini I, 2011, TALANTA, V87, P180, DOI 10.1016/j.talanta.2011.09.059

LIU MY, 2017, P ASM 36 INT C OC

Long J, 2015, PROC CVPR IEEE, P3431, DOI 10.1109/CVPR.2015.7298965

Menze BH, 2015, IEEE T MED IMAGING, V34, P1993, DOI 10.1109/TMI.2014.2377694

Milletari F, 2016, INT CONF 3D VISION, P565, DOI 10.1109/3DV.2016.79

Njeh CF, 2008, J MED PHYS, V33, P136, DOI 10.4103/0971-6203.44472

Nyul LG, 1999, MAGNET RESON MED, V42, P1072, DOI 10.1002/(SICI)1522-2594(199912)42:6<1072::AID-MRM11>3.3.CO;2-D

Pollard JM, 2017, BRIT J RADIOL, V90, DOI 10.1259/bjr.20160667

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

Roth HR, 2015, IEEE INT S BIOM IM I

Shrivastava Ashish, 2017, P IEEE C COMP VIS PA, P2107

Souly N, 2017, IEEE I CONF COMP VIS, P5689, DOI 10.1109/ICCV.2017.606

Springenberg J.T., 2016, INT C LEARN REPR

Thompson RF, 2018, INT J RADIAT ONCOL, V102, P247, DOI 10.1016/j.ijrobp.2018.05.072

ULYANOV D., 2017, CVPR, P6924

van Opbroek A, 2015, IEEE T MED IMAGING, V34, P1018, DOI 10.1109/TMI.2014.2366792

Wolterink Jelmer M., 2017, Simulation and Synthesis in Medical Imaging. Second International Workshop, SASHIMI 2017. Held in Conjunction with MICCAI 2017. Proceedings: LNCS 10557, P14, DOI 10.1007/978-3-319-68127-6\_2

Wong KCL, 2018, MED IMAGE ANAL, V49, P105, DOI 10.1016/j.media.2018.07.010

Zhang LH, 2015, INT CONF SOFTW ENG, P931, DOI 10.1109/ICSESS.2015.7339207

Zhang ZZ, 2018, PROC CVPR IEEE, P9242, DOI 10.1109/CVPR.2018.00963

Zhu JY, 2017, IEEE I CONF COMP VIS, P2242, DOI 10.1109/ICCV.2017.244

NR 41

TC 15

Z9 15

U1 2

U2 27

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD OCT

PY 2019

VL 46

IS 10

BP 4392

EP 4404

DI 10.1002/mp.13695

EA AUG 2019

PG 13

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA JE9WK

UT WOS:000482272000001

PM 31274206

OA Green Submitted, Green Accepted

DA 2022-08-24

ER

PT J

AU Wang, LL

Dong, TT

Xin, BW

Xu, CR

Guo, MY

Zhang, HQ

Feng, DG

Wang, XY

Yu, JM

AF Wang, Linlin

Dong, Taotao

Xin, Bowen

Xu, Chongrui

Guo, Meiying

Zhang, Huaqi

Feng, Dagan

Wang, Xiuying

Yu, Jinming

TI Integrative nomogram of CT imaging, clinical, and hematological features

for survival prediction of patients with locally advanced non-small cell

lung cancer

SO EUROPEAN RADIOLOGY

LA English

DT Article

DE Non-small cell lung cancer; Radiomics; Nomogram; Prognosis

ID NEUTROPHIL-LYMPHOCYTE; RADIATION-THERAPY; TEXTURAL FEATURES; FDG PET/CT;

STAGE I; RADIOMICS; METASTASIS; PLATELET; PRETREATMENT; INFLAMMATION

AB ObjectivesTo determine the integrative value of clinical, hematological, and computed tomography (CT) radiomic features in survival prediction for locally advanced non-small cell lung cancer (LA-NSCLC) patients.MethodsRadiomic features and clinical and hematological features of 118 LA-NSCLC cases were firstly extracted and analyzed in this study. Then, stable and prognostic radiomic features were automatically selected using the consensus clustering method with either Cox proportional hazard (CPH) model or random survival forest (RSF) analysis. Predictive radiomic, clinical, and hematological parameters were subsequently fitted into a final prognostic model using both the CPH model and the RSF model. A multimodality nomogram was then established from the fitting model and was cross-validated. Finally, calibration curves were generated with the predicted versus actual survival status.ResultsRadiomic features selected by clustering combined with CPH were found to be more predictive, with a C-index of 0.699 in comparison to 0.648 by clustering combined with RSF. Based on multivariate CPH model, our integrative nomogram achieved a C-index of 0.792 and retained 0.743 in the cross-validation analysis, outperforming radiomic, clinical, or hematological model alone. The calibration curve showed agreement between predicted and actual values for the 1-year and 2-year survival prediction. Interestingly, the selected important radiomic features were significantly correlated with levels of platelet, platelet/lymphocyte ratio (PLR), and lymphocyte/monocyte ratio (LMR) (p values all <0.05).ConclusionsThe integrative nomogram incorporated CT radiomic, clinical, and hematological features improved survival prediction in LA-NSCLC patients, which would offer a feasible and practical reference for individualized management of these patients.Key Points center dot An integrative nomogram incorporated CT radiomic, clinical, and hematological features was constructed and cross-validated to predict prognosis of LA-NSCLC patients.center dot The integrative nomogram outperformed radiomic, clinical, or hematological model alone.center dot This nomogram has value to permit non-invasive, comprehensive, and dynamical evaluation of the phenotypes of LA-NSCLC and can provide a feasible and practical reference for individualized management of LA-NSCLC patients.

C1 [Wang, Linlin; Guo, Meiying; Zhang, Huaqi; Yu, Jinming] Shandong Univ, Shandong Canc Hosp, Shandong Acad Med Sci, Dept Radiat Oncol, 440 Ji Yan Rd, Jinan 250017, Shandong, Peoples R China.

[Dong, Taotao] Shandong Univ, Qilu Hosp, Dept Gynecol & Obstet, Jinan, Shandong, Peoples R China.

[Xin, Bowen; Xu, Chongrui; Feng, Dagan; Wang, Xiuying] Univ Sydney, Sch Informat Technol, Bldg J12, Sydney, NSW 2006, Australia.

[Guo, Meiying] Shandong Univ, Med Coll, Jinan, Shandong, Peoples R China.

[Zhang, Huaqi] Tianjin Med Univ, Tianjin, Peoples R China.

RP Yu, JM (通讯作者)，Shandong Univ, Shandong Canc Hosp, Shandong Acad Med Sci, Dept Radiat Oncol, 440 Ji Yan Rd, Jinan 250017, Shandong, Peoples R China.; Wang, XY (通讯作者)，Univ Sydney, Sch Informat Technol, Bldg J12, Sydney, NSW 2006, Australia.

EM xiu.wang@sydney.edu.au; sdyujinming@163.com

OI Wang, Xiu Ying/0000-0001-7160-5929

FU China Scholarship Fund; Project of Postdoctoral Science Foundation of

China [2016M590640, 2016M592199]; Project of Postdoctoral Innovation of

Shandong Province [201501010]; National Health and Family Planning

Commission of China [201402011]; National Natural Science Foundation of

China [81472812]

FX This work was supported by China Scholarship Fund, the Project of

Postdoctoral Science Foundation of China (Grant Nos. 2016M590640 and

2016M592199), the Project of Postdoctoral Innovation of Shandong

Province (Grant No. 201501010), National Health and Family Planning

Commission of China (201402011), and National Natural Science Foundation

of China (81472812).

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Agrawal V, 2016, LUNG CANCER, V102, P1, DOI 10.1016/j.lungcan.2016.10.002

Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

Balkwill F, 2001, LANCET, V357, P539, DOI 10.1016/S0140-6736(00)04046-0

Bremnes RM, 2011, J THORAC ONCOL, V6, P824, DOI 10.1097/JTO.0b013e3182037b76

Cannon NA, 2015, J THORAC ONCOL, V10, P280, DOI 10.1097/JTO.0000000000000399

Cox G, 2000, LUNG CANCER, V29, P169, DOI 10.1016/S0169-5002(00)00124-0

Cui H, 2018, COMPUT METH PROG BIO, V159, P211, DOI 10.1016/j.cmpb.2018.03.018

Cui H, 2015, PHYS MED BIOL, V60, P4893, DOI 10.1088/0031-9155/60/12/4893

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Desseroit MC, 2016, EUR J NUCL MED MOL I, V43, P1477, DOI 10.1007/s00259-016-3325-5

Dong XZ, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0157836

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Galdiero MR, 2013, J CELL PHYSIOL, V228, P1404, DOI 10.1002/jcp.24260

Gerds TA, 2013, STAT MED, V32, P2173, DOI 10.1002/sim.5681

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Gittleman H, 2017, NEURO-ONCOLOGY, V19, P669, DOI 10.1093/neuonc/now208

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

Hanna N, 2008, J CLIN ONCOL, V26, P5755, DOI 10.1200/JCO.2008.17.7840

Hatt M, 2015, J NUCL MED, V56, P38, DOI 10.2967/jnumed.114.144055

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Jemal A, 2010, CA-CANCER J CLIN, V60, P277, DOI [10.3322/caac.20073, 10.3322/caac.20115, 10.3322/caac.20107]

Kirienko M, 2017, FRONT BIOSCI-LANDMRK, V22, P1713

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lee J, 2018, INT J RADIAT ONCOL, V102, P1098, DOI 10.1016/j.ijrobp.2018.01.006

Leger S, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-13448-3

Li YQ, 2016, INT J CANCER, V139, P220, DOI 10.1002/ijc.30071

Liu HB, 2013, NEOPLASMA, V60, P203, DOI 10.4149/neo\_2013\_027

Oberije C, 2015, INT J RADIAT ONCOL, V92, P935, DOI 10.1016/j.ijrobp.2015.02.048

Ohri N, 2016, J NUCL MED, V57, P842, DOI 10.2967/jnumed.115.166934

Pyka T, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0407-7

Rao SX, 2016, UNITED EUR GASTROENT, V4, P257, DOI 10.1177/2050640615601603

Salavati A, 2017, EUR J NUCL MED MOL I, V44, P1969, DOI 10.1007/s00259-017-3753-x

Schernberg A, 2018, EUR J NUCL MED MOL I, V45, P187, DOI 10.1007/s00259-017-3824-z

Schreiber RD, 2011, SCIENCE, V331, P1565, DOI 10.1126/science.1203486

Scilla KA, 2017, ONCOLOGIST, V22, P737, DOI 10.1634/theoncologist.2016-0443

Smith HA, 2013, J MOL MED, V91, P411, DOI 10.1007/s00109-013-1021-5

Tanadini-Lang S, 2017, RADIOTHER ONCOL, V123, P182, DOI 10.1016/j.radonc.2017.01.003

Tang XR, 2018, LANCET ONCOL, V19, P382, DOI 10.1016/S1470-2045(18)30080-9

Vokes EE, 2007, J CLIN ONCOL, V25, P1698, DOI 10.1200/JCO.2006.07.3569

Yang P, 2005, CHEST, V128, P452, DOI 10.1378/chest.128.1.452

NR 41

TC 36

Z9 40

U1 1

U2 20

PU SPRINGER

PI NEW YORK

PA ONE NEW YORK PLAZA, SUITE 4600, NEW YORK, NY, UNITED STATES

SN 0938-7994

EI 1432-1084

J9 EUR RADIOL

JI Eur. Radiol.

PD JUN

PY 2019

VL 29

IS 6

BP 2958

EP 2967

DI 10.1007/s00330-018-5949-2

PG 10

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA HX8HG

UT WOS:000467646300023

PM 30643940

DA 2022-08-24

ER

PT J

AU Chandy, E

Szmul, A

Stavropoulou, A

Jacob, J

Veiga, C

Landau, D

Wilson, J

Gulliford, S

Fenwick, JD

Hawkins, MA

Hiley, C

McClelland, JR

AF Chandy, Edward

Szmul, Adam

Stavropoulou, Alkisti

Jacob, Joseph

Veiga, Catarina

Landau, David

Wilson, James

Gulliford, Sarah

Fenwick, John D.

Hawkins, Maria A.

Hiley, Crispin

McClelland, Jamie R.

TI Quantitative Analysis of Radiation-Associated Parenchymal Lung Change

SO CANCERS

LA English

DT Article

DE radiotherapy-induced lung damage; lung cancer; deep learning

ID TISSUE DENSITY CHANGES; CHEMORADIATION THERAPY; RISK-FACTORS;

RADIOTHERAPY; DAMAGE; CANCER; INJURY; CHEMOTHERAPY; PNEUMONITIS;

QUANTIFICATION

AB Simple Summary Radiotherapy is commonly used to treat inoperable locally advanced lung cancer. Despite the use of sophisticated modern planning and imaging techniques to target the tumour and minimise dose to normal lung tissue, patients can suffer from acute and chronic respiratory problems after treatment. Currently, our understanding of the impact that radiotherapy has on patients' lungs is inadequate. We have, therefore, proposed a novel classification of the damage to the lung tissue, as seen on CT scans after a course of radiotherapy to a lung tumour. We have used deep learning algorithms to allow large numbers of CT scans to be labelled at the level of the individual voxel according to the degree of damage. The dose delivered to the tumour and the change in lung function of the patient after treatment both correlated well to the degree of radiological change measured. Our novel, automated classification combined with a dedicated image registration method has demonstrated an important clinical application that could be used to improve radiotherapy delivery in the future by allowing us to precisely track the changes seen after radiation treatment. We present a novel classification system of the parenchymal features of radiation-induced lung damage (RILD). We developed a deep learning network to automate the delineation of five classes of parenchymal textures. We quantify the volumetric change in classes after radiotherapy in order to allow detailed, quantitative descriptions of the evolution of lung parenchyma up to 24 months after RT, and correlate these with radiotherapy dose and respiratory outcomes. Diagnostic CTs were available pre-RT, and at 3, 6, 12 and 24 months post-RT, for 46 subjects enrolled in a clinical trial of chemoradiotherapy for non-small cell lung cancer. All 230 CT scans were segmented using our network. The five parenchymal classes showed distinct temporal patterns. Moderate correlation was seen between change in tissue class volume and clinical and dosimetric parameters, e.g., the Pearson correlation coefficient was <= 0.49 between V30 and change in Class 2, and was 0.39 between change in Class 1 and decline in FVC. The effect of the local dose on tissue class revealed a strong dose-dependent relationship. Respiratory function measured by spirometry and MRC dyspnoea scores after radiotherapy correlated with the measured radiological RILD. We demonstrate the potential of using our approach to analyse and understand the morphological and functional evolution of RILD in greater detail than previously possible.

C1 [Chandy, Edward; Szmul, Adam; Stavropoulou, Alkisti; Jacob, Joseph; Veiga, Catarina; McClelland, Jamie R.] UCL, Dept Med Phys & Biomed Engn, Ctr Med Image Comp, London WC1E 6BT, England.

[Chandy, Edward; Landau, David; Hiley, Crispin] UCL, UCL Canc Inst, London WC1E 6BT, England.

[Chandy, Edward] Royal Sussex Cty Hosp, Sussex Canc Ctr, Brighton BN2 5BE, E Sussex, England.

[Jacob, Joseph] Univ Coll London Hosp, UCL Resp Dept, London NW1 2PG, England.

[Wilson, James; Gulliford, Sarah; Hawkins, Maria A.] UCL, Med Phys & Biomed Engn, London WC1E 6BT, England.

[Fenwick, John D.] Univ Liverpool, Inst Syst Mol & Integrat Biol, Liverpool L69 3GE, Merseyside, England.

RP Chandy, E (通讯作者)，UCL, Dept Med Phys & Biomed Engn, Ctr Med Image Comp, London WC1E 6BT, England.; Chandy, E (通讯作者)，UCL, UCL Canc Inst, London WC1E 6BT, England.; Chandy, E (通讯作者)，Royal Sussex Cty Hosp, Sussex Canc Ctr, Brighton BN2 5BE, E Sussex, England.

EM john.fenwick@liverpool.ac.uk; alkisti.stavropoulou.16@ucl.ac.uk;

alkisti.stavropoulou.16@ucl.ac.uk; j.jacob@ucl.ac.uk; c.veiga@ucl.ac.uk;

dblandau@gmail.com; james.wilson4@nhs.net; s.gulliford@nhs.net;

john.fenwick@liverpool.ac.uk; m.hawkins@ucl.ac.uk;

Crispin.Hiley@crick.ac.uk; j.mcclelland@ucl.ac.uk

RI Hawkins, Maria Andreia/A-9404-2013

OI Hawkins, Maria Andreia/0000-0002-6669-0628; McClelland,

Jamie/0000-0002-4922-0093; Chandy, Edward/0000-0002-6117-8692; Veiga,

Catarina/0000-0002-4132-2554

FU EPSRC; UCL Centre for Doctoral Training in Intelligent, Integrated

Imaging in Healthcare (i4health) ( [EP/S021930/1]; Wellcome Trust

Clinical Research Career Development Fellowship [209,553/Z/17/Z]; NIHR

UCLH Biomedical Research Centre, UK; Wellcome Trust [209553/Z/17/Z];

NIHR Biomedical Research Centre at University College London Hospitals

NHS Foundation Trust; Royal Academy of Engineering under Research

Fellowship scheme [RF\201718\17140]; CRUK Centres Network Accelerator

Award Grant [A21993]; Cancer Research UK [C13530/A10424, C13530/A17007]

FX A.S. was supported by the EPSRC-funded UCL Centre for Doctoral Training

in Intelligent, Integrated Imaging in Healthcare (i4health)

(EP/S021930/1). J.J. was supported by the Wellcome Trust Clinical

Research Career Development Fellowship 209,553/Z/17/Z and the NIHR UCLH

Biomedical Research Centre, UK. This research was funded in whole or in

part by the Wellcome Trust [209553/Z/17/Z]. For the purpose of open

access, J.J. has applied a CC-BY public copyright licence to any

author-accepted manuscript version arising from this submission. M.A.H.

is supported by funding from the NIHR Biomedical Research Centre at

University College London Hospitals NHS Foundation Trust. C.V. is

supported by the Royal Academy of Engineering under the Research

Fellowship scheme (RF\201718\17140). J.R.M. is supported by a CRUK

Centres Network Accelerator Award Grant (A21993) to the ART-NET

consortium. The IDEAL CRT trial was funded by Cancer Research UK, grant

no. C13530/A10424 and C13530/A17007. The authors would like to thank the

Cancer Research UK and UCL Trials Unit.

CR Agnew M, 2010, BREATHE, V6, P195, DOI 10.1183/18106838.0603.196

Al Feghali KA, 2020, CLIN TRANSL RAD ONCO, V22, P1, DOI 10.1016/j.ctro.2020.02.004

Alharbi M, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0898-5

Avanzo M, 2015, PHYS MEDICA, V31, P1, DOI 10.1016/j.ejmp.2014.10.006

Barta JA, 2019, ANN GLOB HEALTH, V85, DOI 10.5334/aogh.2419

Bernchou U, 2017, RADIOTHER ONCOL, V123, P93, DOI 10.1016/j.radonc.2017.02.001

Bernchou U, 2015, RADIOTHER ONCOL, V117, P17, DOI 10.1016/j.radonc.2015.07.021

Bernchou U, 2013, RADIOTHER ONCOL, V109, P89, DOI 10.1016/j.radonc.2013.08.041

Bradley JD, 2017, INT J RADIAT ONCOL, V99, pS105, DOI 10.1016/j.ijrobp.2017.06.250

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

De Ruysscher D, 2013, ACTA ONCOL, V52, P1405, DOI 10.3109/0284186X.2013.813074

Defraene G, 2017, RADIOTHER ONCOL, V122, P300, DOI 10.1016/j.radonc.2016.11.021

Defraene G, 2015, RADIOTHER ONCOL, V117, P29, DOI 10.1016/j.radonc.2015.07.033

Delaunay M, 2019, EUR RESPIR REV, V28, DOI 10.1183/16000617.0012-2019

Diot Q, 2014, INT J RADIAT ONCOL, V89, P626, DOI 10.1016/j.ijrobp.2014.03.022

Diot Q, 2012, INT J RADIAT ONCOL, V84, P1024, DOI 10.1016/j.ijrobp.2011.11.080

Faivre-Finn C, 2021, J THORAC ONCOL, V16, P860, DOI 10.1016/j.jtho.2020.12.015

Faria SL, 2009, CLIN ONCOL-UK, V21, P371, DOI 10.1016/j.clon.2009.01.017

Fenwick JD, 2020, INT J RADIAT ONCOL, V106, P733, DOI 10.1016/j.ijrobp.2019.11.397

Frangi AF, 1998, LECT NOTES COMPUT SC, V1496, P130, DOI 10.1007/bfb0056195

Ghobadi G, 2015, RADIOTHER ONCOL, V117, P4, DOI 10.1016/j.radonc.2015.07.017

Ghobadi G, 2010, INT J RADIAT ONCOL, V76, P548, DOI 10.1016/j.ijrobp.2009.08.058

Giuranno L, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00877

Hanania AN, 2019, CHEST, V156, P150, DOI 10.1016/j.chest.2019.03.033

Hirose T, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-77552-7

IKEZOE J, 1988, AM J ROENTGENOL, V150, P765, DOI 10.2214/ajr.150.4.765

Jain V, 2018, CANCERS, V10, DOI 10.3390/cancers10070222

Koenig TR, 2002, AM J ROENTGENOL, V178, DOI 10.2214/ajr.178.6.1781383

Kong FM, 2015, SEMIN RADIAT ONCOL, V25, P100, DOI 10.1016/j.semradonc.2014.12.003

Lawrence MV, 2012, MED PHYS, V39, P7644, DOI 10.1118/1.4766433

Lee S, 2012, PHYS MED BIOL, V57, P3309, DOI 10.1088/0031-9155/57/11/3309

LIBSHITZ HI, 1984, J COMPUT ASSIST TOMO, V8, P15, DOI 10.1016/0149-936X(84)90005-5

LIBSHITZ HI, 1993, SEMIN ROENTGENOL, V28, P303, DOI 10.1016/S0037-198X(05)80092-6

LIBSHITZ HI, 1974, SEMIN ROENTGENOL, V9, P41, DOI 10.1016/0037-198X(74)90008-X

Linda A, 2011, EUR J RADIOL, V79, P147, DOI 10.1016/j.ejrad.2009.10.029

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Mattonen SA, 2013, ACTA ONCOL, V52, P910, DOI 10.3109/0284186X.2012.731525

Minami-Shimmyo Y, 2012, J THORAC ONCOL, V7, P177, DOI 10.1097/JTO.0b013e31823c4c07

Modat M, 2010, COMPUT METH PROG BIO, V98, P278, DOI 10.1016/j.cmpb.2009.09.002

MORGAN GW, 1995, INT J RADIAT ONCOL, V31, P361, DOI 10.1016/0360-3016(94)00477-3

O'Rourke N, 2010, COCHRANE DB SYST REV, DOI 10.1002/14651858.CD002140.pub3

PAGANI JJ, 1982, J COMPUT ASSIST TOMO, V6, P243, DOI 10.1097/00004728-198204000-00003

Palma DA, 2013, INT J RADIAT ONCOL, V85, P444, DOI 10.1016/j.ijrobp.2012.04.043

Palma DA, 2011, ACTA ONCOL, V50, P509, DOI 10.3109/0284186X.2010.541934

Schroder C, 2019, RADIAT ONCOL, V14, DOI 10.1186/s13014-019-1276-2

Sharifi H, 2016, ACTA ONCOL, V55, P156, DOI 10.3109/0284186X.2015.1080856

Shaverdian N, 2017, LANCET ONCOL, V18, P895, DOI 10.1016/S1470-2045(17)30380-7

Stavropoulou A, 2021, PHYS MED BIOL, V66, DOI 10.1088/1361-6560/ac1b1d

Szmul A, 2021, CANCERS

Trovo M, 2010, LUNG CANCER, V69, P77, DOI 10.1016/j.lungcan.2009.09.006

Tucker SL, 2010, INT J RADIAT ONCOL, V77, P691, DOI 10.1016/j.ijrobp.2009.05.055

Twyman-Saint Victor C, 2015, NATURE, V520, P373, DOI 10.1038/nature14292

Veiga C, 2020, RADIOTHER ONCOL, V148, P89, DOI 10.1016/j.radonc.2020.03.026

Veiga C, 2018, INT J RADIAT ONCOL, V102, P1287, DOI 10.1016/j.ijrobp.2018.06.006

Wuschner AE, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-021-92609-x

Yushkevich PA, 2006, NEUROIMAGE, V31, P1116, DOI 10.1016/j.neuroimage.2006.01.015

Zhang T, 2019, INT J RADIAT ONCOL, V105, pE543, DOI 10.1016/j.ijrobp.2019.06.2464

NR 57

TC 2

Z9 2

U1 0

U2 0

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2072-6694

J9 CANCERS

JI Cancers

PD FEB

PY 2022

VL 14

IS 4

AR 946

DI 10.3390/cancers14040946

PG 17

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA ZL8NU

UT WOS:000763928900001

PM 35205693

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Jochems, A

El-Naqa, I

Kessler, M

Mayo, CS

Jolly, S

Matuszak, M

Faivre-Finn, C

Price, G

Holloway, L

Vinod, S

Field, M

Barakat, MS

Thwaites, D

de Ruysscher, D

Dekker, A

Lambin, P

AF Jochems, Arthur

El-Naqa, Issam

Kessler, Marc

Mayo, Charles S.

Jolly, Shruti

Matuszak, Martha

Faivre-Finn, Corinne

Price, Gareth

Holloway, Lois

Vinod, Shalini

Field, Matthew

Barakat, Mohamed Samir

Thwaites, David

de Ruysscher, Dirk

Dekker, Andre

Lambin, Philippe

TI A prediction model for early death in non-small cell lung cancer

patients following curative-intent chemoradiotherapy

SO ACTA ONCOLOGICA

LA English

DT Article

ID LEARNING HEALTH-CARE; EXTERNAL VALIDATION; PROGNOSTIC-FACTOR; SURVIVAL;

STAGE; MORTALITY; OUTCOMES; SURGERY; NSCLC

AB Background: Early death after a treatment can be seen as a therapeutic failure. Accurate prediction of patients at risk for early mortality is crucial to avoid unnecessary harm and reducing costs. The goal of our work is two-fold: first, to evaluate the performance of a previously published model for early death in our cohorts. Second, to develop a prognostic model for early death prediction following radiotherapy.

Material and methods: Patients with NSCLC treated with chemoradiotherapy or radiotherapy alone were included in this study. Four different cohorts from different countries were available for this work (N=1540). The previous model used age, gender, performance status, tumor stage, income deprivation, no previous treatment given (yes/no) and body mass index to make predictions. A random forest model was developed by learning on the Maastro cohort (N=698). The new model used performance status, age, gender, T and N stage, total tumor volume (cc), total tumor dose (Gy) and chemotherapy timing (none, sequential, concurrent) to make predictions. Death within 4months of receiving the first radiotherapy fraction was used as the outcome.

Results: Early death rates ranged from 6 to 11% within the four cohorts. The previous model performed with AUC values ranging from 0.54 to 0.64 on the validation cohorts. Our newly developed model had improved AUC values ranging from 0.62 to 0.71 on the validation cohorts.

Conclusions: Using advanced machine learning methods and informative variables, prognostic models for early mortality can be developed. Development of accurate prognostic tools for early mortality is important to inform patients about treatment options and optimize care.

C1 [Jochems, Arthur; de Ruysscher, Dirk; Dekker, Andre; Lambin, Philippe] Maastricht Univ, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Med Ctr, Maastricht, Netherlands.

[El-Naqa, Issam; Kessler, Marc; Mayo, Charles S.; Jolly, Shruti; Matuszak, Martha] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

[Faivre-Finn, Corinne; Price, Gareth] Univ Manchester, Manchester Acad Hlth Sci Ctr, Christie NHS Fdn Trust, Manchester, Lancs, England.

[Holloway, Lois; Vinod, Shalini; Field, Matthew; Barakat, Mohamed Samir] Liverpool Hosp, Canc Therapy Ctr, Liverpool, NSW, Australia.

[Thwaites, David] Univ Sydney, Inst Med Phys, Sch Phys, Sydney, NSW, Australia.

RP Jochems, A (通讯作者)，Maastricht Univ, MAASTRO Clin, Dept Radiat Oncol, Doctor Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

EM arthur.jochems@maastro.nl

RI Naqa, Issam El/T-3066-2019; Field, Matthew/Y-6046-2019; Dekker,

Andre/AAE-4830-2019

OI Naqa, Issam El/0000-0001-6023-1132; Field, Matthew/0000-0002-6169-6721;

Dekker, Andre/0000-0002-0422-7996; Faivre-Finn,

Corinne/0000-0001-5617-9781; Lambin, Philippe/0000-0001-7961-0191;

Holloway, Lois/0000-0003-4337-2165; Price, Gareth/0000-0003-4353-3360

FU Interreg grant euroCAT; Dutch Technology Foundation STW [DuCAT], applied

science division of Nederlandse Organisatie voor Wetenschappelijk

Onderzoek (NWO) [10696]; Dutch Technology Foundation STW [Radiomics

STRaTegy], applied science division of Nederlandse Organisatie voor

Wetenschappelijk Onderzoek (NWO) [P14-19]; Technology Programme of the

Ministry of Economic Affairs; Cancer Research UK Manchester Centre

grants [C147/A18083, C147/A25254]; EU 7th framework program [ARTFORCE]

[257144]; EU 7th framework program [REQUITE] [601826]; CTMM-TraIT;

EUROSTARS (CloudAtlas); Kankeronderzoekfonds Limburg from the Health

Foundation Limburg; Alpe d'HuZes-KWF (DESIGN); Dutch Cancer Society; NIH

[P01 CA059827]; European Program H [ImmunoSABR] [733008]; ERC [694812];

SME Phase 2 (EU) [673780]; Cancer Research UK [20465] Funding Source:

researchfish; NATIONAL CANCER INSTITUTE [P01CA059827] Funding Source:

NIH RePORTER

FX This work was supported by the Interreg grant euroCAT and the Dutch

Technology Foundation STW [DuCAT, grant no. 10696; Radiomics STRaTegy,

grant no. P14-19], which is the applied science division of Nederlandse

Organisatie voor Wetenschappelijk Onderzoek (NWO); the Technology

Programme of the Ministry of Economic Affairs; and the Cancer Research

UK Manchester Centre grants (C147/A18083) and (C147/A25254). The authors

also acknowledge financial support from the EU 7th framework program

[ARTFORCE, grant no. 257144, REQUITE, grant no. 601826], CTMM-TraIT,

EUROSTARS (CloudAtlas), Kankeronderzoekfonds Limburg from the Health

Foundation Limburg, Alpe d'HuZes-KWF (DESIGN), The Dutch Cancer Society,

NIH P01 CA059827, the European Program H2020-2015-17 [ImmunoSABR, grant

no. 733008], the ERC advanced grant [ERC-ADG-2015, grant no. 694812;

Hypoximmuno], SME Phase 2 (EU proposal 673780, RAIL).

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Berghmans T, 2004, LUNG CANCER, V45, P339, DOI 10.1016/j.lungcan.2004.02.016

BREIMAN L, 2001, MACH LEARN, V0045

Caruana R., 2006, P 23 INT C MACH LEAR, P161, DOI 10.1145/1143844.1143865

Dehing-Oberije C, 2008, INT J RADIAT ONCOL, V70, P1039, DOI 10.1016/j.ijrobp.2007.07.2323

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Deist TM, 2017, CLIN TRANSL RAD ONCO, V4, P24, DOI 10.1016/j.ctro.2016.12.004

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

Halvorsen TO, 2016, ACTA ONCOL, V55, P1349, DOI 10.1080/0284186X.2016.1201216

Hansen O, 2015, ACTA ONCOL, V54, P333, DOI 10.3109/0284186X.2014.958529

Jemal A, 2010, CA-CANCER J CLIN, V60, P277, DOI [10.3322/caac.20073, 10.3322/caac.20115, 10.3322/caac.20107]

Jochems A, 2017, INT J RADIAT ONCOL, V99, P344, DOI 10.1016/j.ijrobp.2017.04.021

Jochems A, 2016, RADIOTHER ONCOL, V121, P459, DOI 10.1016/j.radonc.2016.10.002

Kvarnbrink S, 2015, ACTA ONCOL, V54, P1113, DOI 10.3109/0284186X.2015.1021427

Lambin P, 2017, ADV DRUG DELIVER REV, V109, P131, DOI 10.1016/j.addr.2016.01.006

Lambin P, 2015, ACTA ONCOL, V54, P1289, DOI 10.3109/0284186X.2015.1062136

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Leeser R., 2011, GT LOND AUTH, V232

Leijenaar RTH, 2015, ACTA ONCOL, V54, P1423, DOI 10.3109/0284186X.2015.1061214

Makita C, 2015, ACTA ONCOL, V54, P307, DOI 10.3109/0284186X.2014.948060

Myrdal G, 2001, EUR J CARDIO-THORAC, V20, P694, DOI 10.1016/S1010-7940(01)00875-2

Pfister DG, 2004, J CLIN ONCOL, V22, P330, DOI 10.1200/JCO.2004.09.053

Pottgen C, 2017, ONCOTARGET, V8, P41670, DOI 10.18632/oncotarget.16471

Pohl M, 2016, ACTA ONCOL, V55, P167, DOI 10.3109/0284186X.2015.1049291

Robin X, 2011, BMC BIOINFORMATICS, V12, DOI 10.1186/1471-2105-12-77

Stekhoven DJ, 2012, BIOINFORMATICS, V28, P112, DOI 10.1093/bioinformatics/btr597

Therneau T, 2011, R PACKAGE VERSION, V2, P36, DOI DOI 10.HTTP://CRAN.R-PR0JECT.0RG/PACKAGE

Wallington M, 2016, LANCET ONCOL, V17, P1203, DOI 10.1016/S1470-2045(16)30383-7

NR 28

TC 19

Z9 19

U1 0

U2 4

PU TAYLOR & FRANCIS LTD

PI ABINGDON

PA 2-4 PARK SQUARE, MILTON PARK, ABINGDON OR14 4RN, OXON, ENGLAND

SN 0284-186X

EI 1651-226X

J9 ACTA ONCOL

JI Acta Oncol.

PY 2018

VL 57

IS 2

BP 226

EP 230

DI 10.1080/0284186X.2017.1385842

PG 5

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA FT9LI

UT WOS:000423473200008

PM 29034756

OA hybrid, Green Accepted

DA 2022-08-24

ER

PT J

AU Takeda, K

Takanami, K

Shirata, Y

Yamamoto, T

Takahashi, N

Ito, K

Takase, K

Jingu, K

AF Takeda, Kazuya

Takanami, Kentaro

Shirata, Yuko

Yamamoto, Takaya

Takahashi, Noriyoshi

Ito, Kengo

Takase, Kei

Jingu, Keiichi

TI Clinical utility of texture analysis of 18F-FDG PET/CT in patients with

Stage I lung cancer treated with stereotactic body radiotherapy

SO JOURNAL OF RADIATION RESEARCH

LA English

DT Article

DE lung cancer; stereotactic body radiotherapy (SBRT); F-18-FDG PET; CT;

texture analysis; radiomics; prognostic factor

ID METABOLIC TUMOR VOLUME; ABLATIVE RADIOTHERAPY; RADIATION-THERAPY;

FDG-PET/CT; PREDICTS SURVIVAL; HETEROGENEITY; FEATURES; PRETREATMENT;

OUTCOMES; IMAGES

AB We evaluated the reproducibility and predictive value of texture parameters and existing parameters of F-18-FDG PET/CT images in Stage I non-small-cell lung cancer (NSCLC) patients treated with stereotactic body radiotherapy (SBRT). Twenty-six patients with Stage I NSCLC (T1-2N0M0) were retrospectively analyzed. All of the patients underwent an F-18-FDG PET/CT scan before treatment and were treated with SBRT. Each tumor was delineated using PET Edge (MIM Software Inc., Cleveland, OH), and texture parameters were calculated using open-source code CGITA. From F-18-FDG PET/CT images, three conventional parameters, including maximum standardized uptake value (SUV), metabolic tumor volume (MTV) and total lesion glycolysis (TLG), and four texture parameters, including entropy and dissimilarity (derived from a co-occurrence matrix) and high-intensity large-area emphasis (HILAE) and zone percentage (derived from a size-zone matrix) were analyzed. Reproducibility was evaluated using two independent delineations conducted by two observers. The ability to predict local control (LC), progression-free survival (PFS) and overall survival (OS) was tested for each parameter. All of the seven parameters except zone percentage showed good reproducibility, with intraclass correlation coefficient values > 0.8. In univariate analysis, only HILAE was a significant predictor for LC. Histology, dose fractionation, and maximum SUV were associated with PFS, and histology and dose fractionation were associated with OS. We showed that texture parameters derived from F-18-FDG PET/CT were reproducible and potentially beneficial for predicting LC in Stage I lung cancer patients treated with SBRT.

C1 [Takeda, Kazuya; Shirata, Yuko; Yamamoto, Takaya; Takahashi, Noriyoshi; Ito, Kengo; Jingu, Keiichi] Tohoku Univ, Grad Sch Med, Dept Radiat Oncol, Aoba Ku, 1-1 Seiryo Machi, Sendai, Miyagi 9808574, Japan.

[Takanami, Kentaro; Takase, Kei] Tohoku Univ, Grad Sch Med, Dept Diagnost Radiol, Aoba Ku, Sendai, Miyagi 9808574, Japan.

RP Takeda, K (通讯作者)，Tohoku Univ, Grad Sch Med, Dept Radiat Oncol, Aoba Ku, 1-1 Seiryo Machi, Sendai, Miyagi 9808574, Japan.

EM takeda7616@gmail.com

RI Takahashi, Noriyoshi/GPP-0779-2022; Yamamoto, Takaya/AAO-6488-2020; 健太郎,

高浪/GFB-3270-2022

OI Yamamoto, Takaya/0000-0003-3562-1037; Takanami,

Kentaro/0000-0002-0098-7760

CR Abelson JA, 2012, LUNG CANCER, V78, P219, DOI 10.1016/j.lungcan.2012.08.016

Brambilla E., 2014, WORLD CANC REPORT

Burdick MJ, 2010, INT J RADIAT ONCOL, V78, P1033, DOI 10.1016/j.ijrobp.2009.09.081

Chang JY, 2015, LANCET ONCOL, V16, P630, DOI 10.1016/S1470-2045(15)70168-3

Cheng NM, 2015, EUR J NUCL MED MOL I, V42, P419, DOI 10.1007/s00259-014-2933-1

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Dibble EH, 2012, J NUCL MED, V53, P709, DOI 10.2967/jnumed.111.099531

El Naqa I, 2009, PATTERN RECOGN, V42, P1162, DOI 10.1016/j.patcog.2008.08.011

Fang YHD, 2014, BIOMED RES INT, V2014, DOI 10.1155/2014/248505

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Hamamoto Y, 2011, JPN J CLIN ONCOL, V41, P543, DOI 10.1093/jjco/hyq249

Hatt M, 2015, J NUCL MED, V56, P38, DOI 10.2967/jnumed.114.144055

Hatt M, 2013, EUR J NUCL MED MOL I, V40, P1662, DOI 10.1007/s00259-013-2486-8

Hoopes DJ, 2007, LUNG CANCER, V56, P229, DOI 10.1016/j.lungcan.2006.12.009

Hyun SH, 2016, EUR J NUCL MED MOL I, V43, P1461, DOI 10.1007/s00259-016-3316-6

Lagerwaard FJ, 2012, INT J RADIAT ONCOL, V83, P348, DOI 10.1016/j.ijrobp.2011.06.2003

Liao SR, 2012, EUR J NUCL MED MOL I, V39, P27, DOI 10.1007/s00259-011-1934-6

Lovinfosse P, 2016, EUR J NUCL MED MOL I, V43, P1453, DOI 10.1007/s00259-016-3314-8

Nakajo M, 2017, EUR J NUCL MED MOL I, V44, P206, DOI 10.1007/s00259-016-3506-2

Pyka T, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0407-7

Satoh Y, 2014, RADIOLOGY, V270, P275, DOI 10.1148/radiol.13130652

Shirata Y, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-182

Takahashi N, 2016, J RADIAT RES, V57, P655, DOI 10.1093/jrr/rrw048

Takeda A, 2014, J THORAC ONCOL, V9, P65, DOI 10.1097/JTO.0000000000000031

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Tixier F, 2012, J NUCL MED, V53, P693, DOI 10.2967/jnumed.111.099127

Verstegen NE, 2011, RADIOTHER ONCOL, V101, P250, DOI 10.1016/j.radonc.2011.09.017

Wu J, 2016, RADIOLOGY, V281, P270, DOI 10.1148/radiol.2016151829

Yamamoto T, 2014, BMC CANCER, V14, DOI 10.1186/1471-2407-14-464

Ypsilantis PP, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0137036

NR 30

TC 28

Z9 30

U1 0

U2 6

PU OXFORD UNIV PRESS

PI OXFORD

PA GREAT CLARENDON ST, OXFORD OX2 6DP, ENGLAND

SN 0449-3060

EI 1349-9157

J9 J RADIAT RES

JI J. Radiat. Res.

PD NOV

PY 2017

VL 58

IS 6

BP 862

EP 869

DI 10.1093/jrr/rrx050

PG 8

WC Biology; Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Life Sciences & Biomedicine - Other Topics; Oncology; Radiology, Nuclear

Medicine & Medical Imaging

GA FO8SQ

UT WOS:000417158100013

PM 29036692

OA gold, Green Published, Green Submitted

DA 2022-08-24

ER

PT J

AU Sher, A

Medavaram, S

Nemesure, B

Clouston, S

Keresztes, R

AF Sher, Amna

Medavaram, Sowmini

Nemesure, Barbara

Clouston, Sean

Keresztes, Roger

TI Risk Stratification of Locally Advanced Non-Small Cell Lung Cancer

(NSCLC) Patients Treated with Chemo-Radiotherapy: An Institutional

Analysis

SO CANCER MANAGEMENT AND RESEARCH

LA English

DT Article

DE prediction model; survival; locally advanced; NSCLC

ID LEUKEMIA GROUP-B; PROGNOSTIC-FACTORS; RADIATION-THERAPY; SURVIVAL;

CONCURRENT; ONCOLOGY; CARBOPLATIN; PACLITAXEL; CARCINOMA; IMPACT

AB Background: The purpose of this study was to determine which factors predicted survival and to derive a risk prediction model for patients with locally advanced non-small cell lung cancer (NSCLC) receiving concurrent chemo-radiotherapy (cCRT).

Methods: This investigation included 149 patients with locally advanced NSCLC who were treated with cCRT at Stony Brook University Hospital between 2007 and 2015. A finite set of demographic, clinical, and treatment variables were evaluated as independent prognostic factors. Kaplan-Meier survival curves were generated, and log rank tests were used to evaluate difference in survival between groups. To derive a risk score for mortality, a machine learning approach was utilized. To maximize statistical power while examining replicability, the sample was split into discovery (n=99) and replication (n=50) subsamples. Elastic-net regression was used to identify a linear prediction model. Youden's index was used to identify appropriate cutoffs. Cox proportional hazards regression was used to examine mortality risk; model concordance and hazards ratios were reported.

Results: One-quarter of the patients survived for three years after initiation of cCRT. Prognostic factors for survival in the discovery group included age, sex, smoking status, albumin, histology, largest tumor size, number of nodal stations, stage, induction therapy, and radiation dose. The derived model had good risk predictive accuracy (C=0.70). Median survival time was shorter in the high-risk group (0.93 years) vs the low-risk group (2.40 years). Similar findings were noted in the replication sample with strong model accuracy (C=0.69) and median survival time of 0.93 years and 2.03 years for the high- and low-risk groups, respectively.

Conclusion: This novel risk prediction model for overall survival in patients with stage III NSCLC highlights the importance of integrating patient, clinical, and treatment variables for accurately predicting outcomes. Clinicians can use this tool to make personalized treatment decisions for patients with locally advanced NSCLC treated with concurrent chemo-radiation.

C1 [Sher, Amna; Medavaram, Sowmini; Keresztes, Roger] Stony Brook Univ Hosp, Dept Med, Stony Brook, NY 11794 USA.

[Nemesure, Barbara; Clouston, Sean] Stony Brook Univ Hosp, Dept Family Populat & Prevent Med, Stony Brook, NY USA.

RP Sher, A (通讯作者)，Stony Brook Univ Hosp, Dept Med, Stony Brook, NY 11794 USA.

EM Amna.Sher@Stonybrookmedicine.edu

CR Ademuyiwa FO, 2007, CLIN LUNG CANCER, V8, P478, DOI 10.3816/CLC.2007.n.031

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Basaki K, 2006, INT J RADIAT ONCOL, V64, P449, DOI 10.1016/j.ijrobp.2005.07.967

Belani CP, 2005, J CLIN ONCOL, V23, P5883, DOI 10.1200/JCO.2005.55.405

Berghmans T, 2005, EUR RESPIR J, V25, P329, DOI 10.1183/09031936.05.00060804

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Brundage MD, 2002, CHEST, V122, P1037, DOI 10.1378/chest.122.3.1037

Dillman RO, 1996, J NATL CANCER I, V88, P1210, DOI 10.1093/jnci/88.17.1210

Firat S, 2002, INT J RADIAT ONCOL, V54, P357, DOI 10.1016/S0360-3016(02)02939-5

Gandara David R, 2003, J Clin Oncol, V21, P2004, DOI 10.1200/JCO.2003.04.197

Gupta D, 2010, NUTR J, V9, DOI 10.1186/1475-2891-9-69

Hanna N, 2008, J CLIN ONCOL, V26, P5755, DOI 10.1200/JCO.2008.17.7840

JEREMIC B, 1995, LUNG CANCER, V13, P21, DOI 10.1016/0169-5002(95)00480-O

Kramer H, 2006, LUNG CANCER, V52, P213, DOI 10.1016/j.lungcan.2005.12.011

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Langendijk H, 2000, RADIOTHER ONCOL, V56, P197, DOI 10.1016/S0167-8140(00)00218-8

Mantzorou M, 2017, NUTR CANCER, V69, P1151, DOI 10.1080/01635581.2017.1367947

Mascaux C, 2005, BRIT J CANCER, V92, P131, DOI 10.1038/sj.bjc.6602258

PEREZ CA, 1980, CANCER, V45, P2744, DOI 10.1002/1097-0142(19800601)45:11<2744::AID-CNCR2820451108>3.0.CO;2-U

Siegel RL, 2021, CA-CANCER J CLIN, V71, P7, DOI 10.3322/caac.21654

Socinski MA, 2004, ANN ONCOL, V15, P1033, DOI 10.1093/annonc/mdh282

Solan Merrill J, 2003, Semin Surg Oncol, V21, P64, DOI 10.1002/ssu.10023

Vokes EE, 2007, J CLIN ONCOL, V25, P1698, DOI 10.1200/JCO.2006.07.3569

Werner-Wasik M, 2000, INT J RADIAT ONCOL, V48, P1475, DOI 10.1016/S0360-3016(00)00801-4

YOUDEN WJ, 1950, BIOMETRICS, V6, P172, DOI 10.1002/1097-0142(1950)3:1<32::AID-CNCR2820030106>3.0.CO;2-3

Zou H, 2005, J R STAT SOC B, V67, P301, DOI 10.1111/j.1467-9868.2005.00503.x

NR 26

TC 1

Z9 1

U1 0

U2 1

PU DOVE MEDICAL PRESS LTD

PI ALBANY

PA PO BOX 300-008, ALBANY, AUCKLAND 0752, NEW ZEALAND

SN 1179-1322

J9 CANCER MANAG RES

JI Cancer Manag. Res.

PY 2020

VL 12

BP 7165

EP 7171

DI 10.2147/CMAR.S250868

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA NG7YD

UT WOS:000564196300004

PM 32848470

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Falahatpour, Z

Geramifar, P

Mahdavi, SR

Abdollahi, H

Salimi, Y

Nikoofar, A

Ay, MR

AF Falahatpour, Zahra

Geramifar, Parham

Mahdavi, Seyed Rabie

Abdollahi, Hamid

Salimi, Yazdan

Nikoofar, Alireza

Ay, Mohammad Reza

TI Potential advantages of FDG-PET radiomic feature map for target volume

delineation in lung cancer radiotherapy

SO JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS

LA English

DT Article; Early Access

DE grey-level co-occurrence matrix; non-small cell lung cancer; positron

emission tomography; computed tomography; radiomics; radiotherapy;

segmentation

ID DOSE-ESCALATION; F-18-FDG; REPEATABILITY; MEDICINE; IMAGES

AB Purpose To investigate the potential benefits of FDG PET radiomic feature maps (RFMs) for target delineation in non-small cell lung cancer (NSCLC) radiotherapy. Methods Thirty-two NSCLC patients undergoing FDG PET/CT imaging were included. For each patient, nine grey-level co-occurrence matrix (GLCM) RFMs were generated. gross target volume (GTV) and clinical target volume (CTV) were contoured on CT (GTV(CT), CTVCT), PET (GTV(PET40), CTVPET40), and RFMs (GTV(RFM), CTVRFM,). Intratumoral heterogeneity areas were segmented as GTV(PET50-Boost) and radiomic boost target volume (RTVBoost) on PET and RFMs, respectively. GTV(CT) in homogenous tumors and GTV(PET40) in heterogeneous tumors were considered as GTV(gold standard) (GTV(GS)). One-way analysis of variance was conducted to determine the threshold that finds the best conformity for GTV(RFM) with GTV(GS). Dice similarity coefficient (DSC) and mean absolute percent error (MAPE) were calculated. Linear regression analysis was employed to report the correlations between the gold standard and RFM-derived target volumes. Results Entropy, contrast, and Haralick correlation (H-correlation) were selected for tumor segmentation. The threshold values of 80%, 50%, and 10% have the best conformity of GTV(RFM-entropy), GTV(RFM-contrast), and GTV(RFM-H-correlation) with GTV(GS), respectively. The linear regression results showed a positive correlation between GTV(GS) and GTV(RFM-entropy) (r = 0.98, p < 0.001), between GTV(GS) and GTV(RFM-contrast) (r = 0.93, p < 0.001), and between GTV(GS) and GTV(RFM-H-correlation) (r = 0.91, p < 0.001). The average threshold values of 45% and 15% were resulted in the best segmentation matching between CTVRFM-entropy and CTVRFM-contrast with CTVGS, respectively. Moreover, we used RFM to determine RTVBoost in the heterogeneous tumors. Comparison of RTVBoost with GTV(PET50-Boost) MAPE showed the volume error differences of 31.7%, 36%, and 34.7% in RTVBoost-entropy, RTVBoost-contrast, and RTVBoost-H-correlation, respectively. Conclusions FDG PET-based radiomics features in NSCLC demonstrated a promising potential for decision support in radiotherapy, helping radiation oncologists delineate tumors and generate accurate segmentation for heterogeneous region of tumors.

C1 [Falahatpour, Zahra; Ay, Mohammad Reza] Univ Tehran Med Sci, Dept Med Phys, Tehran, Iran.

[Geramifar, Parham] Univ Tehran Med Sci, Shariati Hosp, Res Ctr Nucl Med, Tehran, Iran.

[Mahdavi, Seyed Rabie] Iran Univ Med Sci, Fac Med Sci, Dept Med Phys, Tehran, Iran.

[Abdollahi, Hamid] Kerman Univ Med Sci, Fac Allied Med, Dept Radiol Technol, Kerman, Iran.

[Salimi, Yazdan] Shahid Beheshti Univ Med Sci, Dept Biomed Engn & Med Phys, Tehran, Iran.

[Nikoofar, Alireza] Iran Univ Med Sci, Fac Med Sci, Dept Radiat Oncol, Tehran, Iran.

RP Geramifar, P (通讯作者)，Shariati Hosp, Res Ctr Nucl Med, North Kargar Ave 1411713135, Tehran, Iran.; Mahdavi, SR (通讯作者)，Iran Univ Med Sci, Radiobiol Res Ctr, Tehran, Iran.; Mahdavi, SR (通讯作者)，Iran Univ Med Sci, Med Phys Dept, Tehran, Iran.

EM pgeramifar@tums.ac.ir; mandavi.r@iums.ac.ir

FU Tehran University of Medical Sciences [43226]

FX Tehran University of Medical Sciences, Grant/Award Number: 43226

CR Abdollahi H, 2019, MED HYPOTHESES, V133, DOI 10.1016/j.mehy.2019.109415

Abel S, 2019, LUNG CANCER, V135, P169, DOI 10.1016/j.lungcan.2019.07.014

Bundschuh L, 2022, DIAGNOSTICS, V12, DOI 10.3390/diagnostics12030576

Cardenas CE, 2018, INT J RADIAT ONCOL, V101, P468, DOI 10.1016/j.ijrobp.2018.01.114

Cheebsumon P, 2012, EJNMMI RES, V2, DOI 10.1186/2191-219X-2-56

Constanzo J, 2017, TRANSL LUNG CANCER R, V6, P635, DOI 10.21037/tlcr.2017.09.07

Deasy JO, 2003, MED PHYS, V30, P979, DOI 10.1118/1.1568978

Dercle L, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-08310-5

Dong XZ, 2015, J MED IMAG RADIAT ON, V59, P338, DOI 10.1111/1754-9485.12289

Even AJG, 2015, RADIOTHER ONCOL, V116, P281, DOI 10.1016/j.radonc.2015.07.013

Fornacon-Wood I, 2020, LUNG CANCER, V146, P197, DOI 10.1016/j.lungcan.2020.05.028

Frings V, 2010, J NUCL MED, V51, P1870, DOI 10.2967/jnumed.110.077255

Gkogkou C, 2014, SPRINGERPLUS, V3, DOI 10.1186/2193-1801-3-120

Hatt M, 2018, MED IMAGE ANAL, V44, P177, DOI 10.1016/j.media.2017.12.007

Hatt M, 2010, INT J RADIAT ONCOL, V77, P301, DOI 10.1016/j.ijrobp.2009.08.018

Hong R, 2007, INT J RADIAT ONCOL, V67, P720, DOI 10.1016/j.ijrobp.2006.09.039

Jouanjan L., 2020, NUKLEARMEDIZIN NUCLE, V59, P113

Kirienko M, 2018, EUR J NUCL MED MOL I, V45, P207, DOI 10.1007/s00259-017-3837-7

Kong FM, 2017, JAMA ONCOL, V3, P1358, DOI 10.1001/jamaoncol.2017.0982

Liu GC, 2013, IEEE NUCL SCI CONF R

Liu X, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.717039

Lovinfosse P, 2016, EUR J NUCL MED MOL I, V43, P1453, DOI 10.1007/s00259-016-3314-8

Mall PK., 2019, 2019 IEEE C INFORM C

Markel Daniel, 2013, Int J Mol Imaging, V2013, P980769, DOI 10.1155/2013/980769

Miller TR, 2003, J NUCL MED, V44, P192

Moreno JJM, 2013, PSICOTHEMA, V25, P500, DOI 10.7334/psicothema2013.23

Nagata Y, 2005, INT J RADIAT ONCOL, V63, P1427, DOI 10.1016/j.ijrobp.2005.05.034

Raman S, 2018, CLIN LUNG CANCER, V19, pE699, DOI 10.1016/j.cllc.2018.05.002

Reuze S, 2018, INT J RADIAT ONCOL, V102, P1117, DOI 10.1016/j.ijrobp.2018.05.022

Shao Y, 2019, PHYS MEDICA, V67, P77, DOI 10.1016/j.ejmp.2019.09.080

Shi LT, 2018, TECHNOL CANCER RES T, V17, DOI 10.1177/1533033818782788

Shi XR, 2014, CANCER LETT, V355, P169, DOI 10.1016/j.canlet.2014.07.042

Sollini M, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00426-y

Soufi M, 2017, MOL IMAGING BIOL, V19, P456, DOI 10.1007/s11307-016-1015-0

Sun R, 2016, INT J RADIAT ONCOL, V95, P1544, DOI 10.1016/j.ijrobp.2016.03.038

Sung JY, 2019, PLOS ONE, V14, DOI 10.1371/journal.pone.0219682

van Elmpt W, 2012, RADIOTHER ONCOL, V104, P67, DOI 10.1016/j.radonc.2012.03.005

van Loon J, 2012, INT J RADIAT ONCOL, V82, P448, DOI 10.1016/j.ijrobp.2010.09.001

van Velden FHP, 2016, MOL IMAGING BIOL, V18, P788, DOI 10.1007/s11307-016-0940-2

Vinod SK, 2020, RESPIROLOGY, V25, P61, DOI 10.1111/resp.13870

Wang LJ, 2020, DOSE-RESPONSE, V18, DOI 10.1177/1559325820982421

Wang X, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-20382-5

WESZKA JS, 1976, IEEE T SYST MAN CYB, V6, P269, DOI 10.1109/TSMC.1976.5408777

Wu KL, 2010, J NUCL MED, V51, P1517, DOI 10.2967/jnumed.110.077974

Wu KL, 2010, INT J RADIAT ONCOL, V77, P699, DOI 10.1016/j.ijrobp.2009.05.028

Xu H, 2020, MOL IMAGING BIOL, V22, P1414, DOI 10.1007/s11307-019-01439-x

Yan D, 2019, INT J RADIAT ONCOL, V104, P207, DOI 10.1016/j.ijrobp.2019.01.077

Yang YW, 2020, TECHNOL CANCER RES T, V19, DOI 10.1177/1533033820915710

Yu H, 2009, INT J RADIAT ONCOL, V75, P618, DOI 10.1016/j.ijrobp.2009.04.043

Yue Y, 2017, J GASTROINTEST ONCOL, V8, P127, DOI 10.21037/jgo.2016.12.04

Zayed N, 2015, INT J BIOMED IMAGING, V2015, DOI 10.1155/2015/267807

Zhang FL, 2020, TECHNOL CANCER RES T, V19, DOI 10.1177/1533033820947484

Zhao Q, 2014, CHINESE J CANCER RES, V26, P451, DOI 10.3978/j.issn.1000-9604.2014.08.07

Zukotynski KA, 2022, PET CLIN, V17, P77, DOI 10.1016/j.cpet.2021.09.001

NR 54

TC 0

Z9 0

U1 0

U2 0

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1526-9914

J9 J APPL CLIN MED PHYS

JI J. Appl. Clin. Med. Phys

AR e13696

DI 10.1002/acm2.13696

EA JUN 2022

PG 13

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 2C0VO

UT WOS:000810596600001

PM 35699200

DA 2022-08-24

ER

PT J

AU Bazan, J

Duan, FH

Snyder, BS

Horng, D

Graves, EE

Siegel, BA

Machtay, M

Loo, BW

AF Bazan, Jose G.

Duan, Fenghai

Snyder, Bradley S.

Horng, Dunstan

Graves, Edward E.

Siegel, Barry A.

Machtay, Mitchell

Loo, Billy W., Jr.

TI Metabolic tumor volume predicts overall survival and local control in

patients with stage III non-small cell lung cancer treated in ACRIN

6668/RTOG 0235

SO EUROPEAN JOURNAL OF NUCLEAR MEDICINE AND MOLECULAR IMAGING

LA English

DT Article

DE Metabolic tumor volume; FDG-PET; NSCLC; SUV

ID POSITRON-EMISSION-TOMOGRAPHY; PROGNOSTIC VALUE; RADIATION-THERAPY;

PROGRESSION; BURDEN

AB Purpose To determine whether higher pre-treatment metabolic tumor volume (tMTV-pre) is associated with worse overall survival (OS) in patients with inoperable NSCLC treated with definitive chemoradiation (CRT).

Methods This is a secondary analysis of the American College of Radiology Imaging Network (ACRIN) 6668/Radiation Therapy Oncology Group 0235 trial. Pretreatment PET scans were performed on ACRIN-qualified scanners. Computer-aided MTV measurement was performed using RT\_Image. Kaplan-Meier curves and Cox proportional hazards regression models were used to assess the association between tMTV and OS.

Results Of the 250 patients enrolled on the study, 230 were evaluable for tMTV-pre. Patients with MTV-pre > 32 mL (median value) vs. <= 32 mL had worse median OS (14.8 vs. 29.7 months, p < 0.001). As a continuous variable, higher tMTV-pre (per 10-mL increase) remained associated with worse OS (HR = 1.03, p < 0.001) after controlling for other variables. A significant interaction between radiation dose and tMTV-pre occurred for OS (p = 0.002), demonstrating that the negative prognostic impact of tMTV-pre decreased as radiotherapy dose increased. Among patients with tMTV-pre <= 32 mL, there was no difference in survival according to radiotherapy dose delivered (p = 0.694). However, median OS was inferior in patients with tMTV-pre > 32 mL who received <= 60 Gy compared with those who received 61-69 Gy or >= 70 Gy (p = 0.001).

Conclusions Higher tMTV-pre is associated with significantly worse OS in inoperable stage III NSCLC treated with definitive CRT. Our findings suggest that for patients with large tMTV-pre, achieving a therapeutic radiation dose may help maximize OS. Prospective studies are needed to confirm this finding.

C1 [Bazan, Jose G.] Ohio State Univ, Dept Radiat Oncol, 460 W 10th Ave, Columbus, OH 43210 USA.

[Duan, Fenghai] Brown Univ, Sch Publ Hlth, Dept Biostat, Providence, RI 02912 USA.

[Duan, Fenghai; Snyder, Bradley S.] Brown Univ, Sch Publ Hlth, Ctr Stat Sci, Providence, RI 02912 USA.

[Horng, Dunstan] ECOG ACRIN Canc Res Grp, Philadelphia, PA USA.

[Graves, Edward E.; Loo, Billy W., Jr.] Stanford Univ, Sch Med, Stanford Canc Inst, Dept Radiat Oncol, 875 Blake Wilbur Dr, Stanford, CA 94305 USA.

[Siegel, Barry A.] Washington Univ, Sch Med, Mallinckrodt Inst Radiol, St Louis, MO USA.

[Siegel, Barry A.] Washington Univ, Sch Med, Siteman Canc Ctr, St Louis, MO USA.

[Machtay, Mitchell] Case Comprehens Canc Ctr, Cleveland, OH USA.

[Machtay, Mitchell] Case Western Reserve Univ, Univ Hosp, Seidman Canc Ctr, Cleveland, OH 44106 USA.

RP Bazan, J (通讯作者)，Ohio State Univ, Dept Radiat Oncol, 460 W 10th Ave, Columbus, OH 43210 USA.; Loo, BW (通讯作者)，Stanford Univ, Sch Med, Stanford Canc Inst, Dept Radiat Oncol, 875 Blake Wilbur Dr, Stanford, CA 94305 USA.

EM jose.bazan2@osumc.edu; bwloo@stanford.edu

OI Snyder, Bradley/0000-0003-2757-7195; Graves, Edward/0000-0003-4265-9041

FU National Cancer Institute [U01 CA079778, UO1 CA080098]; NATIONAL CANCER

INSTITUTE [U01CA079778, U10CA079778, U10CA180794, U01CA080098,

U10CA180820, U10CA180868, U10CA180822, UG1CA189828, U10CA180833] Funding

Source: NIH RePORTER

FX ACRIN receives funding from the National Cancer Institute through grants

U01 CA079778 and UO1 CA080098.

CR Bradley JD, 2002, INT J RADIAT ONCOL, V52, P49, DOI 10.1016/S0360-3016(01)01772-2

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Brundage MD, 2002, CHEST, V122, P1037, DOI 10.1378/chest.122.3.1037

Chen HHW, 2012, RADIOLOGY, V264, P559, DOI 10.1148/radiol.12111148

Goldstraw P, 2007, J THORAC ONCOL, V2, P706, DOI 10.1097/JTO.0b013e31812f3c1a

Graves EE, 2007, TECHNOL CANCER RES T, V6, P111, DOI 10.1177/153303460700600207

Kong F-M MM, 2011, 1106ACRIN RTOG

Lee P, 2007, INT J RADIAT ONCOL, V69, P328, DOI 10.1016/j.ijrobp.2007.04.036

Lee P, 2012, CLIN LUNG CANCER, V13, P52, DOI 10.1016/j.cllc.2011.05.001

Liao SR, 2012, EUR J NUCL MED MOL I, V39, P27, DOI 10.1007/s00259-011-1934-6

Machtay M, 2013, J CLIN ONCOL, V31, P3823, DOI 10.1200/JCO.2012.47.5947

Obara P, 2013, CHINESE J CANCER RES, V25, P615, DOI 10.3978/j.issn.1000-9604.2013.11.10

Ohri N, 2015, JNCI-J NATL CANCER I, V107, DOI 10.1093/jnci/djv004

Paesmans M, 2010, J THORAC ONCOL, V5, P612, DOI 10.1097/JTO.0b013e3181d0a4f5

Siegel R, 2014, CA-CANCER J CLIN, V64, P9, DOI [10.3322/caac.21208, 10.3322/caac.21254, 10.1001/jamaoto.2014.2530, 10.1136/bmj.g1502]

Suissa S, 2008, AM J EPIDEMIOL, V167, P492, DOI 10.1093/aje/kwm324

Therneau T. M., 2000, STAT BIOL HEALTH, P39

Vesselle H, 2007, CLIN CANCER RES, V13, P3255, DOI 10.1158/1078-0432.CCR-06-1128

Werner-Wasik M, 2008, INT J RADIAT ONCOL, V70, P385, DOI 10.1016/j.ijrobp.2007.06.034

Zhang H, 2013, INT J COMPUT ASS RAD, V8, P181, DOI 10.1007/s11548-012-0749-7

NR 20

TC 24

Z9 26

U1 0

U2 5

PU SPRINGER

PI NEW YORK

PA ONE NEW YORK PLAZA, SUITE 4600, NEW YORK, NY, UNITED STATES

SN 1619-7070

EI 1619-7089

J9 EUR J NUCL MED MOL I

JI Eur. J. Nucl. Med. Mol. Imaging

PD JAN

PY 2017

VL 44

IS 1

BP 17

EP 24

DI 10.1007/s00259-016-3520-4

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA EE0CX

UT WOS:000389242200004

PM 27645692

OA Green Accepted, Green Published

DA 2022-08-24

ER

PT J

AU Oh, JH

Craft, J

Al Lozi, R

Vaidya, M

Meng, YF

Deasy, JO

Bradley, JD

El Naqa, I

AF Oh, Jung Hun

Craft, Jeffrey

Al Lozi, Rawan

Vaidya, Manushka

Meng, Yifan

Deasy, Joseph O.

Bradley, Jeffrey D.

El Naqa, Issam

TI A Bayesian network approach for modeling local failure in lung cancer

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

ID TUMOR-CONTROL PROBABILITY; RADIOTHERAPY; CLASSIFIERS; INFORMATION;

MANAGEMENT; INFERENCE

AB Locally advanced non-small cell lung cancer (NSCLC) patients suffer from a high local failure rate following radiotherapy. Despite many efforts to develop new dose-volume models for early detection of tumor local failure, there was no reported significant improvement in their application prospectively. Based on recent studies of biomarker proteins' role in hypoxia and inflammation in predicting tumor response to radiotherapy, we hypothesize that combining physical and biological factors with a suitable framework could improve the overall prediction. To test this hypothesis, we propose a graphical Bayesian network framework for predicting local failure in lung cancer. The proposed approach was tested using two different datasets of locally advanced NSCLC patients treated with radiotherapy. The first dataset was collected retrospectively, which comprises clinical and dosimetric variables only. The second dataset was collected prospectively in which in addition to clinical and dosimetric information, blood was drawn from the patients at various time points to extract candidate biomarkers as well. Our preliminary results show that the proposed method can be used as an efficient method to develop predictive models of local failure in these patients and to interpret relationships among the different variables in the models. We also demonstrate the potential use of heterogeneous physical and biological variables to improve the model prediction. With the first dataset, we achieved better performance compared with competing Bayesian-based classifiers. With the second dataset, the combined model had a slightly higher performance compared to individual physical and biological models, with the biological variables making the largest contribution. Our preliminary results highlight the potential of the proposed integrated approach for predicting post-radiotherapy local failure in NSCLC patients.

C1 [Oh, Jung Hun; Craft, Jeffrey; Al Lozi, Rawan; Vaidya, Manushka; Meng, Yifan; Deasy, Joseph O.; Bradley, Jeffrey D.; El Naqa, Issam] Washington Univ, Dept Radiat Oncol, Mallinckrodt Inst Radiol, Sch Med, St Louis, MO 63110 USA.

RP Oh, JH (通讯作者)，Washington Univ, Dept Radiat Oncol, Mallinckrodt Inst Radiol, Sch Med, St Louis, MO 63110 USA.

EM elnaqa@wustl.edu

RI Naqa, Issam El/T-3066-2019

OI Naqa, Issam El/0000-0001-6023-1132; Deasy, Joseph/0000-0002-9437-266X;

Oh, Jung Hun/0000-0001-8791-2755

FU NIH [K25CA128809]; Fast Foundation; NATIONAL CANCER INSTITUTE

[K25CA128809] Funding Source: NIH RePORTER

FX The authors would like to thank Dr Patricia Lindsay and Dr Andrew Hope

for their help with collecting the retrospective data. This work was

supported by NIH K25CA128809 and Fast Foundation grants.

CR Abramyuk A, 2009, RADIOTHER ONCOL, V91, P399, DOI 10.1016/j.radonc.2009.01.003

\*AM CANC SOC, 2008, CANC FACTS FIG

Armananzas R, 2008, COMPUT METH PROG BIO, V91, P110, DOI 10.1016/j.cmpb.2008.02.010

ARMSTRONG JG, 1995, ANN ONCOL, V6, P693, DOI 10.1093/oxfordjournals.annonc.a059286

Chen XW, 2006, BIOINFORMATICS, V22, P1367, DOI 10.1093/bioinformatics/btl090

Choy H, 2005, J CLIN ONCOL, V23, P5918, DOI 10.1200/JCO.2005.08.011

CHU YJ, 1965, SCI SINICA, V14, P1396

COOPER G, 1992, MACH LEARN, V7, P309

Deasy JO, 2003, MED PHYS, V30, P979, DOI 10.1118/1.1568978

EDMONDS J, 1967, J RES NBS B MATH SCI, VB 71, P233, DOI 10.6028/jres.071B.032

El Naqa I, 2006, PHYS MED BIOL, V51, P5719, DOI 10.1088/0031-9155/51/22/001

El Naqa I, 2010, ACTA ONCOL, V49, P1363, DOI 10.3109/02841861003649224

ElNaqa I, 2008, MED PHYS, V35, DOI 10.1118/1.2962788

Fleckenstein K, 2007, SEMIN RADIAT ONCOL, V17, P89, DOI 10.1016/j.semradonc.2006.11.004

Friedman N, 1997, MACH LEARN, V29, P131, DOI 10.1023/A:1007465528199

Heckerman D, 1996, IEEE T SYST MAN CY A, V26, P826, DOI 10.1109/3468.541341

Jayasurya K, 2010, MED PHYS, V37, P1401, DOI 10.1118/1.3352709

Kuschner KW, 2010, BMC BIOINFORMATICS, V11, DOI 10.1186/1471-2105-11-177

Le QT, 2006, CLIN CANCER RES, V12, P1507, DOI 10.1158/1078-0432.CCR-05-2049

Lindsay PE, 2007, MED PHYS, V34, P334, DOI 10.1118/1.2400826

Lucas PJF, 2005, ARTIF INTELL, V163, P233, DOI 10.1016/j.artint.2004.10.011

Mu Y, 2008, INT J RADIAT ONCOL, V72, pS448, DOI 10.1016/j.ijrobp.2008.06.1829

Murphy K, 2007, BAYESIAN NETWORK TOO

Pernkopf F, 2003, PATTERN RECOGN LETT, V24, P2839, DOI 10.1016/S0167-8655(03)00142-9

Rube CE, 2008, PLOS ONE, V3, DOI 10.1371/journal.pone.0002898

SARKAR S, 1993, IEEE T PATTERN ANAL, V15, P256, DOI 10.1109/34.204907

Smith WP, 2009, ARTIF INTELL MED, V46, P119, DOI 10.1016/j.artmed.2008.12.002

van Gerven MAJ, 2008, J BIOMED INFORM, V41, P515, DOI 10.1016/j.jbi.2008.01.006

VARELA AS, 1993, ONCOLOGY, V50, P430

Velikova M, 2009, PHYS MED BIOL, V54, P1131, DOI 10.1088/0031-9155/54/5/003

Witten I.H., 2005, DATA MINING PRACTICA

NR 31

TC 34

Z9 35

U1 0

U2 11

PU IOP PUBLISHING LTD

PI BRISTOL

PA DIRAC HOUSE, TEMPLE BACK, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD MAR 21

PY 2011

VL 56

IS 6

BP 1635

EP 1651

DI 10.1088/0031-9155/56/6/008

PG 17

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA 728BK

UT WOS:000287848600008

PM 21335651

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Jiao, ZC

Li, HM

Xiao, Y

Aggarwal, C

Galperin-Aizenberg, M

Pryma, D

Simone, CB

Feigenberg, SJ

Kao, GD

Fan, Y

AF Jiao, Zhicheng

Li, Hongming

Xiao, Ying

Aggarwal, Charu

Galperin-Aizenberg, Maya

Pryma, Daniel

Simone, Charles B., II

Feigenberg, Steven J.

Kao, Gary D.

Fan, Yong

TI Integration of Risk Survival Measures Estimated From Pre- and

Posttreatment Computed Tomography Scans Improves Stratification of

Patients With Early-Stage Non-small Cell Lung Cancer Treated With

Stereotactic Body Radiation Therapy

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

ID ABLATIVE RADIOTHERAPY; PRECISION MEDICINE; RADIOMIC FEATURES;

PREDICTION; OUTCOMES; BIOMARKERS; SIGNATURE; TOXICITY; IMAGES

AB Purpose: To predict overall survival of patients receiving stereotactic body radiation therapy (SBRT) for early-stage non-small cell lung cancer (ES-NSCLC), we developed a radiomic model that integrates risk of death estimates and changes based on pre-and posttreatment computed tomography (CT) scans. We hypothesize this innovation will improve our ability to strat-ify patients into various oncologic outcomes with greater accuracy.

Methods and Materials: Two cohorts of patients with ES-NSCLC uniformly treated with SBRT (a median dose of 50 Gy in 4-5 fractions) were studied. Prediction models were built on a discovery cohort of 100 patients with treatment planning CT scans, and then were applied to a separate validation cohort of 60 patients with pre-and posttreatment CT scans for evaluating their performance.

Results: Prediction models achieved a c-index up to 0.734 in predicting survival outcomes of the validation cohort. The integration of the pretreatment risk of survival measures (risk-high vs risk-low) and changes (risk-increase vs risk-decrease) in risk of survival measures between the pretreatment and posttreatment scans further stratified the patients into 4 subgroups (risk: high, increase; risk: high, decrease; risk: low, increase; risk: low, decrease) with significant difference (chi(2) = 18.549, P = .0003, log-rank test). There was also a significant difference between the risk-increase and risk-decrease groups (chi(2) = 6.80, P = .0091, log-rank test). In addition, a significant difference (chi(2) = 7.493, P = .0062, log-rank test) was observed between the risk-high and risk-low groups obtained based on the pretreatment risk of survival measures.

Conclusion: The integration of risk of survival measures estimated from pre-and posttreatment CT scans can help differentiate patients with good expected survival from those who will do more poorly following SBRT. The analysis of these radiomics-based longitudinal risk measures may help identify patients with early-stage NSCLC who will benefit from adjuvant treatment after SBRT, such as immunotherapy. (C) 2020 Elsevier Inc. All rights reserved.

C1 [Jiao, Zhicheng; Li, Hongming; Galperin-Aizenberg, Maya; Pryma, Daniel; Fan, Yong] Univ Penn, Dept Radiol, Perelman Sch Med, Philadelphia, PA 19104 USA.

[Xiao, Ying; Feigenberg, Steven J.; Kao, Gary D.] Univ Penn, Perelman Sch Med, Dept Radiat Oncol, Philadelphia, PA 19104 USA.

[Aggarwal, Charu] Univ Penn, Div Hematol & Oncol, Dept Med, Philadelphia, PA 19104 USA.

[Simone, Charles B., II] New York Proton Ctr, New York, NY USA.

[Simone, Charles B., II] Mem Sloan Kettering Canc Ctr, 1275 York Ave, New York, NY 10021 USA.

RP Fan, Y (通讯作者)，Univ Penn, Dept Radiol, Perelman Sch Med, Philadelphia, PA 19104 USA.

EM yong.fan@pennmedicine.upenn.edu

OI Jiao, Zhicheng/0000-0002-6968-0919

FU National Cancer Institute of the National Institutes of Health

[CA223358]

FX Research reported in this study was supported by the National Cancer

Institute of the National Institutes of Health under award number of

CA223358. The content is solely the responsibility of the authors and

does not necessarily represent the official views of the National

Institutes of Health.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Bak SH, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-45117-y

Breiman L., 2001, RANDOM FORESTS, V45, P5

Chang JY, 2015, LANCET ONCOL, V16, P630, DOI 10.1016/S1470-2045(15)70168-3

Chen BJ, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0885-x

Choi JI, 2019, J THORAC DIS, V11, pS1360, DOI 10.21037/jtd.2019.03.91

Constanzo J, 2017, TRANSL LUNG CANCER R, V6, P635, DOI 10.21037/tlcr.2017.09.07

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

De Petris L, 2005, MED ONCOL, V22, P375, DOI 10.1385/MO:22:4:375

Desseroit MC, 2016, EUR J NUCL MED MOL I, V43, P1477, DOI 10.1007/s00259-016-3325-5

Ettinger DS, 2012, J NATL COMPR CANC NE, V10, P1236, DOI 10.6004/jnccn.2012.0130

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Fitzgerald K, 2020, THORAC SURG CLIN, V30, P221, DOI 10.1016/j.thorsurg.2020.01.002

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Hawkins SH, 2014, IEEE ACCESS, V2, P1418, DOI 10.1109/ACCESS.2014.2373335

Henschke CI, 2006, NEW ENGL J MED, V355, P1763, DOI 10.1056/NEJMoa060476

Hosny A, 2018, PLOS MED, V15, DOI 10.1371/journal.pmed.1002711

Howlader N., SEER CANC STAT REV C

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Ishwaran H, 2008, ANN APPL STAT, V2, P841, DOI 10.1214/08-AOAS169

Ishwaran H, 2007, ELECTRON J STAT, V1, P519, DOI 10.1214/07-EJS039

Kang JJ, 2020, INT J RADIAT ONCOL, V106, P90, DOI 10.1016/j.ijrobp.2019.09.037

Kapadia NS, 2017, ANN THORAC SURG, V104, P1881, DOI 10.1016/j.athoracsur.2017.06.065

Kong FM, 2017, TRANSL LUNG CANCER R, V6, P713, DOI 10.21037/tlcr.2017.09.11

Kovalchik SA, 2013, NEW ENGL J MED, V369, P245, DOI 10.1056/NEJMoa1301851

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Li HM, 2018, RADIOTHER ONCOL, V129, P218, DOI 10.1016/j.radonc.2018.06.025

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

Lim C, 2017, CURR ONCOL, V24, P103, DOI 10.3747/co.24.3495

Liu HF, 2020, IEEE T BIO-MED ENG, V67, P2735, DOI 10.1109/TBME.2020.2969839

Louie AV, 2015, INT J RADIAT ONCOL, V93, P82, DOI 10.1016/j.ijrobp.2015.05.003

Mattonen SA, 2016, INT J RADIAT ONCOL, V94, P1121, DOI 10.1016/j.ijrobp.2015.12.369

Nie K, 2019, INT J RADIAT ONCOL, V104, P302, DOI 10.1016/j.ijrobp.2019.01.087

Palma D, 2010, J CLIN ONCOL, V28, P5153, DOI 10.1200/JCO.2010.30.0731

Palma DA, 2019, JAMA ONCOL, V5, P681, DOI 10.1001/jamaoncol.2018.6993

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

Pedregosa F, 2011, J MACH LEARN RES, V12, P2825

Plautz TE, 2019, MED PHYS, V46, P1663, DOI 10.1002/mp.13395

Sampath S, 2019, INT J RADIAT ONCOL, V105, P659, DOI 10.1016/j.ijrobp.2019.06.2536

Scrivener M, 2016, TRANSL CANCER RES, V5, P398, DOI 10.21037/tcr.2016.06.18

Shah JL, 2017, SEMIN RADIAT ONCOL, V27, P218, DOI 10.1016/j.semradonc.2017.03.001

Siegel RL., 2020, CA-CANCER J CLIN, V70, P7, DOI [DOI 10.3322/caac.21551, 10.3322/caac.21590]

Starkov P, 2019, BRIT J RADIOL, V92, DOI 10.1259/bjr.20180228

Timmerman RD, 2018, JAMA ONCOL, V4, P1263, DOI 10.1001/jamaoncol.2018.1251

Vachani A, 2017, AM J RESP CRIT CARE, V195, P1150, DOI 10.1164/rccm.201702-0433CI

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Verma V, 2017, INT J RADIAT ONCOL, V97, P146, DOI 10.1016/j.ijrobp.2016.09.036

Videtic GMM, 2017, PRACT RADIAT ONCOL, V7, P295, DOI 10.1016/j.prro.2017.04.014

Wang WL, 2013, INT J RADIAT ONCOL, V86, P956, DOI 10.1016/j.ijrobp.2013.05.003

Yu W, 2018, INT J RADIAT ONCOL, V102, P1090, DOI 10.1016/j.ijrobp.2017.10.046

NR 56

TC 1

Z9 1

U1 1

U2 7

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD APR 1

PY 2021

VL 109

IS 5

BP 1647

EP 1656

DI 10.1016/j.ijrobp.2020.12.014

EA MAR 2021

PG 10

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA RB3ES

UT WOS:000631998000010

PM 33333202

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Dong, XZ

Wu, PP

Sun, XR

Li, WW

Wan, HL

Yu, JM

Xing, LG

AF Dong, Xinzhe

Wu, Peipei

Sun, Xiaorong

Li, Wenwu

Wan, Honglin

Yu, Jinming

Xing, Ligang

TI Intra-tumour F-18-FDG uptake heterogeneity decreases the reliability on

target volume definition with positron emission tomography/computed

tomography imaging

SO JOURNAL OF MEDICAL IMAGING AND RADIATION ONCOLOGY

LA English

DT Article

DE fluorodeoxyglucose (FDG) uptake heterogeneity; nonsmall cell lung cancer

(NSCLC); positron emission tomography (PET); squamous cell oesophageal

carcinoma (SCEC); target volume

ID CELL LUNG-CANCER; STANDARDIZED UPTAKE VALUE; TEXTURAL FEATURES; PET

IMAGES; RADIOTHERAPY; DELINEATION; CARCINOMA; THRESHOLD; IMPACT

AB IntroductionThis study aims to explore whether the intra-tumour F-18-fluorodeoxyglucose (FDG) uptake heterogeneity affects the reliability of target volume definition with FDG positron emission tomography/computed tomography (PET/CT) imaging for nonsmall cell lung cancer (NSCLC) and squamous cell oesophageal cancer (SCEC).

MethodsPatients with NSCLC (n=50) or SCEC (n=50) who received F-18-FDG PET/CT scanning before treatments were included in this retrospective study. Intra-tumour FDG uptake heterogeneity was assessed by visual scoring, the coefficient of variation (COV) of the standardised uptake value (SUV) and the image texture feature (entropy). Tumour volumes (gross tumour volume (GTV)) were delineated on the CT images (GTV(CT)), the fused PET/CT images (GTV(PET-CT)) and the PET images, using a threshold at 40% SUVmax (GTV(PET40%)) or the SUV cut-off value of 2.5 (GTV(PET2.5)). The correlation between the FDG uptake heterogeneity parameters and the differences in tumour volumes among GTV(CT,) GTV(PET-CT), GTV(PET40%) and GTV(PET2.5) was analysed.

ResultsFor both NSCLC and SCEC, obvious correlations were found between uptake heterogeneity, SUV or tumour volumes. Three types of heterogeneity parameters were consistent and closely related to each other. Substantial differences between the four methods of GTV definition were found. The differences between the GTV correlated significantly with PET heterogeneity defined with the visual score, the COV or the textural feature-entropy for NSCLC and SCEC.

ConclusionsIn tumours with a high FDG uptake heterogeneity, a larger GTV delineation difference was found. Advance image segmentation algorithms dealing with tracer uptake heterogeneity should be incorporated into the treatment planning system.

C1 [Dong, Xinzhe; Wu, Peipei; Yu, Jinming; Xing, Ligang] Shandong Univ, Shandong Canc Hosp & Inst, Dept Radiat Oncol, Jinan 250100, Shandong, Peoples R China.

[Sun, Xiaorong; Li, Wenwu] Shandong Canc Hosp & Inst, Dept Radiol, Jinan 250117, Shandong, Peoples R China.

[Wan, Honglin] Shandong Normal Univ, Coll Phys & Elect Sci, Jinan, Shandong, Peoples R China.

RP Xing, LG (通讯作者)，Shandong Canc Hosp & Inst, Dept Radiat Oncol, 440 Jiyan Rd, Jinan 250117, Shandong, Peoples R China.

EM xinglg@gmail.com

FU National Natural Science Foundation of China [81001004, 81272502];

Shandong Natural Science Foundation [ZR2014YL033, ZR2009CL023]

FX This work was supported in part by grants from the National Natural

Science Foundation of China (81001004 and 81272502) and the Shandong

Natural Science Foundation (ZR2014YL033 and ZR2009CL023). The authors

thank Dr. Dengwang Li from the College of Physics and Electronic

Science, Shandong Normal University, for the image analysis, code

development and implementation.

CR Biehl KJ, 2006, J NUCL MED, V47, P1808

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Dong XZ, 2013, NUCL MED COMMUN, V34, P40, DOI 10.1097/MNM.0b013e32835ae50c

El Naqa I, 2009, PATTERN RECOGN, V42, P1162, DOI 10.1016/j.patcog.2008.08.011

Erdi YE, 1997, CANCER, V80, P2505, DOI 10.1002/(SICI)1097-0142(19971215)80:12+<2505::AID-CNCR24>3.0.CO;2-F

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Greco C, 2007, LUNG CANCER, V57, P125, DOI 10.1016/j.lungcan.2007.03.020

Han DL, 2010, INT J RADIAT ONCOL, V76, P1235, DOI 10.1016/j.ijrobp.2009.07.1681

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Hatt M, 2011, J NUCL MED, V52, P1690, DOI 10.2967/jnumed.111.092767

Hatt M, 2010, INT J RADIAT ONCOL, V77, P301, DOI 10.1016/j.ijrobp.2009.08.018

Henriksson E, 2007, ANTICANCER RES, V27, P2155

Le Maitre A, 2012, PHYS MED BIOL, V57, P5381, DOI 10.1088/0031-9155/57/17/5381

Markel Daniel, 2013, Int J Mol Imaging, V2013, P980769, DOI 10.1155/2013/980769

Marusyk A, 2010, BBA-REV CANCER, V1805, P105, DOI 10.1016/j.bbcan.2009.11.002

Miller TR, 2003, J NUCL MED, V44, P192

Nestle U, 2005, J NUCL MED, V46, P1342

Tixier F, 2011, J NUCL MED, V52, P369, DOI 10.2967/jnumed.110.082404

van Velden FHP, 2011, EUR J NUCL MED MOL I, V38, P1636, DOI 10.1007/s00259-011-1845-6

Yu H, 2009, INT J RADIAT ONCOL, V75, P618, DOI 10.1016/j.ijrobp.2009.04.043

Yu JM, 2009, INT J RADIAT ONCOL, V75, P1468, DOI 10.1016/j.ijrobp.2009.01.019

Zhao SJ, 2005, J NUCL MED, V46, P675

NR 22

TC 19

Z9 20

U1 0

U2 7

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1754-9477

EI 1754-9485

J9 J MED IMAG RADIAT ON

JI J. Med. Imag. Radiat. Oncol.

PD JUN

PY 2015

VL 59

IS 3

BP 338

EP 345

DI 10.1111/1754-9485.12289

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA CJ9QB

UT WOS:000355836200014

PM 25708154

DA 2022-08-24

ER

PT J

AU Suga, M

Nishii, R

Miwa, K

Kamitaka, Y

Yamazaki, K

Tamura, K

Yamamoto, N

Kohno, R

Kobayashi, M

Tanimoto, K

Tsuji, H

Higashi, T

AF Suga, Makito

Nishii, Ryuichi

Miwa, Kenta

Kamitaka, Yuto

Yamazaki, Kana

Tamura, Kentaro

Yamamoto, Naoyoshi

Kohno, Ryosuke

Kobayashi, Masato

Tanimoto, Katsuyuki

Tsuji, Hiroshi

Higashi, Tatsuya

TI Differentiation between non-small cell lung cancer and radiation

pneumonitis after carbon-ion radiotherapy by F-18-FDG PET/CT texture

analysis

SO SCIENTIFIC REPORTS

LA English

DT Article

ID POSITRON-EMISSION-TOMOGRAPHY; FDG-PET; PROGNOSTIC VALUE; BREAST-CANCER;

PULMONARY; FEATURES; TUMOR; HETEROGENEITY; RADIOMICS; CARCINOMA

AB The differentiation of non-small cell lung cancer (NSCLC) and radiation pneumonitis (RP) is critically essential for selecting optimal clinical therapeutic strategies to manage post carbon-ion radiotherapy (CIRT) in patients with NSCLC. The aim of this study was to assess the ability of F-18-FDG PET/CT metabolic parameters and its textural image features to differentiate NSCLC from RP after CIRT to develop a differential diagnosis of malignancy and benign lesion. We retrospectively analyzed F-18-FDG PET/CT image data from 32 patients with histopathologically proven NSCLC who were scheduled to undergo CIRT and 31 patients diagnosed with RP after CIRT. The SUV parameters, metabolic tumor volume (MTV), total lesion glycolysis (TLG) as well as fifty-six texture parameters derived from seven matrices were determined using PETSTAT image-analysis software. Data were statistically compared between NSCLC and RP using Wilcoxon rank-sum tests. Diagnostic accuracy was assessed using receiver operating characteristics (ROC) curves. Several texture parameters significantly differed between NSCLC and RP (p<0.05). The parameters that were high in areas under the ROC curves (AUC) were as follows: SUVmax, 0.64; GLRLM run percentage, 0.83 and NGTDM coarseness, 0.82. Diagnostic accuracy was improved using GLRLM run percentage or NGTDM coarseness compared with SUVmax (p<0.01). The texture parameters of F-18-FDG uptake yielded excellent outcomes for differentiating NSCLC from radiation pneumonitis after CIRT, which outperformed SUV-based evaluation. In particular, GLRLM run percentage and NGTDM coarseness of F-18-FDG PET/CT images would be appropriate parameters that can offer high diagnostic accuracy.

C1 [Suga, Makito; Nishii, Ryuichi; Yamazaki, Kana; Tamura, Kentaro; Higashi, Tatsuya] Natl Inst Radiol Sci, Dept Mol Imaging & Theranost, QST, Inage Ku, 4-9-1 Anagawa, Chiba 2638555, Japan.

[Suga, Makito] Kanagawa Canc Ctr, Dept Med Technol, Div Radiat Therapy Technol, Yokohama, Kanagawa, Japan.

[Suga, Makito; Kamitaka, Yuto; Yamamoto, Naoyoshi; Kohno, Ryosuke; Tanimoto, Katsuyuki; Tsuji, Hiroshi] Natl Inst Quantum & Radiol Sci & Technol QST, QST Hosp, Chiba, Japan.

[Miwa, Kenta] Int Univ Hlth & Welf, Sch Hlth Sci, Dept Radiol Sci, Otawara, Tochigi, Japan.

[Kobayashi, Masato] Kanazawa Univ, Sch Hlth Sci, Inst Med Pharmaceut & Hlth Sci, Kanazawa, Ishikawa, Japan.

RP Nishii, R (通讯作者)，Natl Inst Radiol Sci, Dept Mol Imaging & Theranost, QST, Inage Ku, 4-9-1 Anagawa, Chiba 2638555, Japan.

EM nishii.ryuichi@qst.go.jp

CR Abdollahi A, 2005, J EXP MED, V201, P925, DOI 10.1084/jem.20041393

AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

Bashir U, 2017, EJNMMI RES, V7, DOI 10.1186/s13550-017-0310-3

Bashir U, 2016, AM J ROENTGENOL, V207, P534, DOI 10.2214/AJR.15.15864

Burger IA, 2016, J NUCL MED, V57, P849, DOI 10.2967/jnumed.115.167684

Burger IA, 2014, NUCL MED BIOL, V41, P410, DOI 10.1016/j.nucmedbio.2014.02.006

Bury T, 1999, EUR RESPIR J, V14, P1376

Carles M, 2017, PHYS MED BIOL, V62, P652, DOI 10.1088/1361-6560/62/2/652

Chen S, 2019, CANCER IMAGING, V19, DOI 10.1186/s40644-019-0243-3

Chen W, 2018, DIAGN INTERV RADIOL, V24, P336, DOI 10.5152/dir.2018.17367

Chua KLM, 2017, CHIN CLIN ONCOL, V6, DOI 10.21037/cco.2017.08.02

Cook GJR, 2014, CLIN TRANSL IMAGING, V2, P269, DOI 10.1007/s40336-014-0064-0

Giannini V, 2019, EUR J NUCL MED MOL I, V46, P878, DOI 10.1007/s00259-018-4250-6

Graves PR, 2010, SEMIN RADIAT ONCOL, V20, P201, DOI 10.1016/j.semradonc.2010.01.010

Han S, 2018, ANN NUCL MED, V32, P602, DOI 10.1007/s12149-018-1281-9

Hayashi K, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0830-z

Hellwig D, 2006, EUR J NUCL MED MOL I, V33, P13, DOI 10.1007/s00259-005-1919-4

Hotta M, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-52279-2

Juweid ME, 2006, NEW ENGL J MED, V354, P496, DOI 10.1056/NEJMra050276

Kanai T, 1999, INT J RADIAT ONCOL, V44, P201, DOI 10.1016/S0360-3016(98)00544-6

Liao ZX, 2018, TRANSL LUNG CANCER R, V7, P141, DOI 10.21037/tlcr.2018.04.11

Miwa K, 2014, EUR J RADIOL, V83, P715, DOI 10.1016/j.ejrad.2013.12.020

Nakajo M, 2019, MOL IMAGING BIOL, V21, P771, DOI 10.1007/s11307-018-1290-z

Nishimura H, 2003, INT J RADIAT ONCOL, V55, P861, DOI 10.1016/S0630-3016(02)04495-4

Novello S, 2016, ANN ONCOL, V27, pv1, DOI 10.1093/annonc/mdw326

Park GC, 2013, ANN ONCOL, V24, P208, DOI 10.1093/annonc/mds247

Shim SS, 2006, AM J ROENTGENOL, V186, P639, DOI 10.2214/AJR.04.1896

Shirai K, 2017, ONCOL LETT, V13, P4420, DOI 10.3892/ol.2017.5952

Shrestha S, 2020, EUR J NUCL MED MOL I, V47, P1220, DOI 10.1007/s00259-019-04585-0

Sugihara T, 2017, ANN NUCL MED, V31, P719, DOI 10.1007/s12149-017-1202-3

Wong RJ, 2002, J CLIN ONCOL, V20, P4199, DOI 10.1200/JCO.2002.02.590

Yu H, 2009, INT J RADIAT ONCOL, V75, P618, DOI 10.1016/j.ijrobp.2009.04.043

Yu H, 2009, IEEE T MED IMAGING, V28, P374, DOI 10.1109/TMI.2008.2004425

NR 33

TC 1

Z9 1

U1 1

U2 4

PU NATURE RESEARCH

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD JUN 1

PY 2021

VL 11

IS 1

AR 11509

DI 10.1038/s41598-021-90674-w

PG 9

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA SR1ZY

UT WOS:000660844900034

PM 34075072

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Bitterman, DS

Selesnick, P

Bredfeldt, J

Williams, CL

Guthier, C

Huynh, E

Kozono, DE

Lewis, JH

Cormack, RA

Carpenter, CM

Mak, RH

Atkins, KM

AF Bitterman, Danielle S.

Selesnick, Philip

Bredfeldt, Jeremy

Williams, Christopher L.

Guthier, Christian

Huynh, Elizabeth

Kozono, David E.

Lewis, John H.

Cormack, Robert A.

Carpenter, Colin M.

Mak, Raymond H.

Atkins, Katelyn M.

TI Dosimetric Planning Tradeoffs to Reduce Heart Dose Using Machine

Learning-Guided Decision Support Software in Patients with Lung Cancer

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

ID RADIATION PNEUMONITIS; ESCALATION TRIALS; CARDIAC TOXICITY;

RADIOTHERAPY; THERAPY; DISEASE

AB Purpose: Cardiac toxicity is a well-recognized risk after radiation therapy (RT) in patients with non-small cell lung cancer (NSCLC). However, the extent to which treatment planning optimization can reduce mean heart dose (MHD) without untoward increases in lung dose is unknown.

Methods and Materials: Retrospective analysis of RT plans from 353 consecutive patients with locally advanced NSCLC treated with intensity modulated RT (IMRT) or 3-dimensional conformal RT. Commercially available machine learning-guided clinical decision support software was used to match RT plans. A leave-one-out predictive model was used to examine lung dosimetric tradeoffs necessary to achieve a MHD reduction.

Results: Of all 232 patients, 91 patients (39%) had RT plan matches showing potential MHD reductions of >4 to 8 Gy without violating the upper limit of lung dose constraints (lung volume [V] receiving 20 Gy (V20 Gy) <37%, V5 Gy <70%, and mean lung dose [MLD] <20 Gy). When switching to IMRT, 75 of 103 patients (72.8%) had plan matches demonstrating improved MHD (average 2.0 Gy reduction, P < .0001) without violating lung constraints. Examining specific lung dose tradeoffs, a mean >= 3.7 Gy MHD reduction was achieved with corresponding absolute increases in lung V20 Gy, V5 Gy, and MLD of 3.3%, 5.0%, and 1.0 Gy, respectively.

Conclusions: Nearly 40% of RT plans overall, and 73% when switched to IMRT, were predicted to have reductions in MHD >4 Gy with potentially clinically acceptable tradeoffs in lung dose. These observations demonstrate that decision support software for optimizing heart-lung dosimetric tradeoffs is feasible and may identify patients who might benefit most from more advanced RT technologies. (C) 2021 Elsevier Inc. All rights reserved.

C1 [Bitterman, Danielle S.; Selesnick, Philip; Bredfeldt, Jeremy; Williams, Christopher L.; Guthier, Christian; Huynh, Elizabeth; Kozono, David E.; Cormack, Robert A.; Mak, Raymond H.; Atkins, Katelyn M.] Dana Farber Canc Inst, Dept Radiat Oncol, Boston, MA 02115 USA.

[Bitterman, Danielle S.; Selesnick, Philip; Bredfeldt, Jeremy; Williams, Christopher L.; Guthier, Christian; Huynh, Elizabeth; Kozono, David E.; Cormack, Robert A.; Mak, Raymond H.; Atkins, Katelyn M.] Brigham & Womens Hosp, 75 Francis St, Boston, MA 02115 USA.

[Lewis, John H.; Atkins, Katelyn M.] Cedars Sinai Med Ctr, Dept Radiat Oncol, Los Angeles, CA 90048 USA.

[Carpenter, Colin M.] Siris Med Inc, Burlingame, CA USA.

RP Atkins, KM (通讯作者)，Dana Farber Canc Inst, Dept Radiat Oncol, Boston, MA 02115 USA.; Atkins, KM (通讯作者)，Brigham & Womens Hosp, 75 Francis St, Boston, MA 02115 USA.; Atkins, KM (通讯作者)，Cedars Sinai Med Ctr, Dept Radiat Oncol, Los Angeles, CA 90048 USA.

EM katelyn.atkins@cshs.org

OI Bitterman, Danielle/0000-0003-0345-2232

CR Al-Kindi SG, 2016, MAYO CLIN PROC, V91, P81, DOI 10.1016/j.mayocp.2015.09.009

Appenzoller LM, 2012, MED PHYS, V39, P7446, DOI 10.1118/1.4761864

Atkins KM, 2021, INT J RADIAT ONCOL, V110, P1473, DOI 10.1016/j.ijrobp.2021.03.005

Atkins KM, 2021, PRACT RADIAT ONCOL, V11, pE459, DOI 10.1016/j.prro.2020.12.006

Atkins KM, 2021, JAMA ONCOL, V7, P206, DOI 10.1001/jamaoncol.2020.6332

Atkins KM, 2019, J AM COLL CARDIOL, V73, P2976, DOI 10.1016/j.jacc.2019.03.500

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Celik E, 2021, ACTA ONCOL, V60, P285, DOI 10.1080/0284186X.2020.1845396

Cornell M, 2020, INT J RADIAT ONCOL, V106, P430, DOI 10.1016/j.ijrobp.2019.10.036

Dess RT, 2017, J CLIN ONCOL, V35, P1395, DOI 10.1200/JCO.2016.71.6142

GAYNOR JJ, 1993, J AM STAT ASSOC, V88, P400, DOI 10.2307/2290318

Ge YR, 2019, MED PHYS, V46, P2760, DOI 10.1002/mp.13526

Guthier CV, 2021, MED PHYS, V48, P2108, DOI 10.1002/mp.14775

Hicks KA, 2018, J AM COLL CARDIOL, V71, P1021, DOI 10.1016/j.jacc.2017.12.048

Hoffmann L, 2021, ACTA ONCOL, V60, P293, DOI 10.1080/0284186X.2020.1856409

Howlader N, 2020, NEW ENGL J MED, V383, P640, DOI 10.1056/NEJMoa1916623

Kwa SLS, 1998, INT J RADIAT ONCOL, V42, P1, DOI 10.1016/S0360-3016(98)00196-5

Liao ZX, 2018, J CLIN ONCOL, V36, P1813, DOI 10.1200/JCO.2017.74.0720

Liao ZXX, 2010, INT J RADIAT ONCOL, V76, P775, DOI 10.1016/j.ijrobp.2009.02.032

Murshed H, 2004, INT J RADIAT ONCOL, V58, P1258, DOI 10.1016/j.ijrobp.2003.09.086

National Comprehensive Cancer Network (NCCN), 2020, NONSM CELL LUNG CANC

Palma DA, 2013, INT J RADIAT ONCOL, V85, P444, DOI 10.1016/j.ijrobp.2012.04.043

Shiraishi S, 2015, MED PHYS, V42, P908, DOI 10.1118/1.4906183

Speirs CK, 2017, J THORAC ONCOL, V12, P293, DOI 10.1016/j.jtho.2016.09.134

Tamura M, 2020, J MED PHYS, V45, P71, DOI 10.4103/jmp.JMP\_109\_19

Valdes G, 2017, RADIOTHER ONCOL, V125, P392, DOI 10.1016/j.radonc.2017.10.014

van Schie MA, 2020, INT J RADIAT ONCOL, V108, P1055, DOI 10.1016/j.ijrobp.2020.06.072

Venkatesulu BP, 2018, JACC-BASIC TRANSL SC, V3, P563, DOI 10.1016/j.jacbts.2018.01.014

Wang K, 2017, RADIOTHER ONCOL, V125, P293, DOI 10.1016/j.radonc.2017.10.001

Wang K, 2017, J CLIN ONCOL, V35, P1387, DOI 10.1200/JCO.2016.70.0229

Yu SH, 2020, MED DOSIM, V45, P346, DOI 10.1016/j.meddos.2020.04.004

Zhu XF, 2011, MED PHYS, V38, P719, DOI 10.1118/1.3539749

NR 32

TC 1

Z9 1

U1 1

U2 1

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD MAR 15

PY 2022

VL 112

IS 4

BP 996

EP 1003

DI 10.1016/j.ijrobp.2021.11.009

PG 8

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA ZG5QP

UT WOS:000760312800021

PM 34774998

DA 2022-08-24

ER

PT J

AU El Naqa, I

Yang, D

Apte, A

Khullar, D

Mutic, S

Zheng, J

Bradley, JD

Grigsby, P

Deasy, JO

AF El Naqa, Issam

Yang, Deshan

Apte, Aditya

Khullar, Divya

Mutic, Sasa

Zheng, Jie

Bradley, Jeffrey D.

Grigsby, Perry

Deasy, Joseph O.

TI Concurrent multimodality image segmentation by active contours for

radiotherapy treatment planning

SO MEDICAL PHYSICS

LA English

DT Article; Proceedings Paper

CT Laughlin-Science-Council Research Symposium

CY 2006

CL Orlando, FL

SP Laughlin Sci Council

DE multimodality imaging; segmentation; active contours; treatment planning

ID TARGET VOLUME DEFINITION; GROSS TUMOR VOLUME; CERVICAL-CANCER;

LUNG-CANCER; FDG-PET; REGISTRATION; PROSTATE; CT; FEASIBILITY;

DELINEATION

AB Multimodality imaging information is regularly used now in radiotherapy treatment planning for cancer patients. The authors are investigating methods to take advantage of all the imaging information available for joint target registration and segmentation, including multimodality images or multiple image sets from the same modality. In particular, the authors have developed variational methods based on multivalued level set deformable models for simultaneous 2D or 3D segmentation of multimodality images consisting of combinations of coregistered PET, CT, or MR data sets. The combined information is integrated to define the overall biophysical structure volume. The authors demonstrate the methods on three patient data sets, including a nonsmall cell lung cancer case with PET/CT, a cervix cancer case with PET/CT, and a prostate patient case with CT and MRI. CT, PET, and MR phantom data were also used for quantitative validation of the proposed multimodality segmentation approach. The corresponding Dice similarity coefficient (DSC) was 0.90+/-0.02 (p<0.0001) with an estimated target volume error of 1.28+/-1.23% volume. Preliminary results indicate that concurrent multimodality segmentation methods can provide a feasible and accurate framework for combining imaging data from different modalities and are potentially useful tools for the delineation of biophysical structure volumes in radiotherapy treatment planning. (C) 2007 American Association of Physicists in Medicine.

C1 [El Naqa, Issam; Yang, Deshan; Apte, Aditya; Khullar, Divya; Mutic, Sasa; Zheng, Jie; Bradley, Jeffrey D.; Grigsby, Perry; Deasy, Joseph O.] Washington Univ, Sch Med, Dept Radiat Oncol, St Louis, MO 63110 USA.

RP El Naqa, I (通讯作者)，Washington Univ, Sch Med, Dept Radiat Oncol, St Louis, MO 63110 USA.

EM elnaqa@wustl.edu

RI Apte, Aditya/E-5583-2010; Naqa, Issam El/T-3066-2019

OI Naqa, Issam El/0000-0001-6023-1132; Deasy, Joseph/0000-0002-9437-266X

CR Agresti A., 2013, CATEGORICAL DATA ANA, V341, P384

Aubert G., 2006, SEEING ANTHR, V2nd Edition, DOI 10.1007/978-0-387-44588-5

AUJOL J, 2002, 4507

Beyer T, 2000, J NUCL MED, V41, P1369

Biehl KJ, 2006, J NUCL MED, V47, P1808

Bondiau P Y, 2004, Cancer Radiother, V8, P120, DOI 10.1016/j.canrad.2003.10.002

Boucher L, 2004, J NUCL MED, V45, P214

Bradley J, 2004, INT J RADIAT ONCOL, V59, P78, DOI 10.1016/j.ijrobp.2003.10.044

Bradley JD, 2004, J NUCL MED, V45, p96S

Brock KK, 2006, INT J RADIAT ONCOL, V64, P1245, DOI 10.1016/j.ijrobp.2005.10.027

CHAN T, 2006, 0652 UCLA

Chan TE, 2000, J VIS COMMUN IMAGE R, V11, P130, DOI 10.1006/jvci.1999.0442

Chan TF, 2001, IEEE T IMAGE PROCESS, V10, P266, DOI 10.1109/83.902291

Chen L, 2004, PHYS MED BIOL, V49, P5157, DOI 10.1088/0031-9155/49/22/010

Ciernik I F, 2004, Praxis (Bern 1994), V93, P1441

Deasy JO, 2000, PHYS MED BIOL, V45, P1765, DOI 10.1088/0031-9155/45/7/305

Deasy JO, 2003, MED PHYS, V30, P979, DOI 10.1118/1.1568978

Desouza NM, 2006, GYNECOL ONCOL, V102, P80, DOI 10.1016/j.ygyno.2005.11.038

El Naqa I, 2006, MED PHYS, V33, P3587, DOI 10.1118/1.2336500

ELNAQA I, 2004, MED IMAGING SAN DIEG

ELNAQA I, 2005, MED IMAGING SYSTEMS, V4, P15

ELNAQA I, 2004, ICCR P, V1, P361

Erdi YE, 1997, CANCER, V80, P2505, DOI 10.1002/(SICI)1097-0142(19971215)80:12+<2505::AID-CNCR24>3.0.CO;2-F

Fiorino C, 1998, RADIOTHER ONCOL, V47, P285, DOI 10.1016/S0167-8140(98)00021-8

Fox JL, 2005, INT J RADIAT ONCOL, V62, P70, DOI 10.1016/j.ijrobp.2004.09.020

Giraud P, 2002, RADIOTHER ONCOL, V62, P27, DOI 10.1016/S0167-8140(01)00444-3

HAJNAL JV, 2001, MED IMAGE REGISTRATI

KASS M, 1987, INT J COMPUT VISION, V1, P321, DOI 10.1007/BF00133570

Keall P, 2004, SEMIN RADIAT ONCOL, V14, P81, DOI 10.1053/j.semradonc.2003.10.006

Khan FM., 2007, TREATMENT PLANNING R

Kulkarni S, 2003, TENCON IEEE REGION, P16, DOI 10.1109/TENCON.2003.1273204

Lind P, 2004, EUR J NUCL MED MOL I, V31, pS125

Messa C, 2005, Q J NUCL MED MOL IM, V49, P259

Milker-Zabel S, 2006, INT J RADIAT ONCOL, V65, P222, DOI 10.1016/j.ijrobp.2005.12.006

Miller TR, 2002, INT J RADIAT ONCOL, V53, P353, DOI 10.1016/S0360-3016(02)02705-0

Mutic S, 2001, INT J RADIAT ONCOL, V51, P255, DOI 10.1016/S0360-3016(01)01659-5

Nanayakkara ND, 2006, PHYS MED BIOL, V51, P1831, DOI 10.1088/0031-9155/51/7/014

Narayan Kailash, 2003, Am J Clin Oncol, V26, pe163, DOI 10.1097/01.coc.0000091358.78047.b5

Osher S., 2003, APPL MATH SCI SERIES

Payne GS, 2006, BRIT J RADIOL, V79, pS16, DOI 10.1259/bjr/84072695

Pekar V, 2004, INT J RADIAT ONCOL, V60, P973, DOI 10.1016/j.ijrobp.2004.06.004

Pizer SM, 2005, MED PHYS, V32, P1335, DOI 10.1118/1.1869872

Pluim JPW, 2003, IEEE T MED IMAGING, V22, P986, DOI 10.1109/TMI.2003.815867

Pohl KA, 2006, NEUROIMAGE, V31, P228, DOI 10.1016/j.neuroimage.2005.11.044

Rasch C, 2005, SEMIN RADIAT ONCOL, V15, P136, DOI 10.1016/j.semradonc.2005.01.005

Schwartz DL, 2005, INT J RADIAT ONCOL, V61, P129, DOI 10.1016/j.ijrobp.2004.03.040

Sethian JA., 1999, LEVEL SET METHODS FA, Vvol 3

SHAH J, 1996, IEEE INT C IMAGE P, V9, P461

Studholme C, 1999, PATTERN RECOGN, V32, P71, DOI 10.1016/S0031-3203(98)00091-0

Suri JS, 2002, IEEE T INF TECHNOL B, V6, P8, DOI 10.1109/4233.992158

Toloza EM, 2003, CHEST, V123, p137S, DOI 10.1378/chest.123.1\_suppl.137S

Viola P. A., 1995, ALIGNMENT MAXIMIZATI

Webb S, 2001, PHYS 3 DIMENSIONAL R

Woolson RF, 2002, STAT METHODS ANAL BI, DOI 10.1002/9781118033050

Xu Pham C., 2000, HDB MED IMAGING, P129, DOI 10.1117/3.831079.ch3

Yezzi A, 2003, MED IMAGE ANAL, V7, P171, DOI 10.1016/S1361-8415(03)00004-5

Young YN, 2005, MATH BIOSCI ENG, V2, P79

Zangheri B, 2004, EUR J NUCL MED MOL I, V31, pS135, DOI 10.1007/s00259-004-1536-7

ZHA XF, 2007, ARTIFICIAL INTELLIGE

Zheng J, 2005, MAGNET RESON MED, V54, P1360, DOI 10.1002/mrm.20724

Zhuge F, 2006, MED PHYS, V33, P1440, DOI 10.1118/1.2193247

Zou KH, 2004, STAT MED, V23, P1259, DOI 10.1002/sim.1723

Zou KH, 2004, ACAD RADIOL, V11, P178, DOI 10.1016/S1076-6332(03)00671-8

NR 63

TC 83

Z9 83

U1 1

U2 15

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD DEC

PY 2007

VL 34

IS 12

BP 4738

EP 4749

DI 10.1118/1.2799886

PG 12

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED); Conference Proceedings Citation Index - Science (CPCI-S)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 245BT

UT WOS:000251910200021

PM 18196801

DA 2022-08-24

ER

PT J

AU Bousabarah, K

Blanck, O

Temming, S

Wilhelm, ML

Hoevels, M

Baus, WW

Ruess, D

Visser-Vandewalle, V

Ruge, MI

Treuer, H

Kocher, M

AF Bousabarah, Khaled

Blanck, Oliver

Temming, Susanne

Wilhelm, Maria-Lisa

Hoevels, Mauritius

Baus, Wolfgang W.

Ruess, Daniel

Visser-Vandewalle, Veerle

Ruge, Maximilian I.

Treuer, Harald

Kocher, Martin

TI Radiomics for prediction of radiation-induced lung injury and oncologic

outcome after robotic stereotactic body radiotherapy of lung cancer:

results from two independent institutions

SO RADIATION ONCOLOGY

LA English

DT Article

ID PATHOLOGICAL RESPONSE; DISTANT METASTASIS; THERAPY; SURVIVAL; FEATURES;

RECURRENCE; PNEUMONITIS; PHENOTYPE; PROGNOSIS; TOXICITY

AB Objectives To generate and validate state-of-the-art radiomics models for prediction of radiation-induced lung injury and oncologic outcome in non-small cell lung cancer (NSCLC) patients treated with robotic stereotactic body radiation therapy (SBRT). Methods Radiomics models were generated from the planning CT images of 110 patients with primary, inoperable stage I/IIa NSCLC who were treated with robotic SBRT using a risk-adapted fractionation scheme at the University Hospital Cologne (training cohort). In total, 199 uncorrelated radiomic features fulfilling the standards of the Image Biomarker Standardization Initiative (IBSI) were extracted from the outlined gross tumor volume (GTV). Regularized models (Coxnet and Gradient Boost) for the development of local lung fibrosis (LF), local tumor control (LC), disease-free survival (DFS) and overall survival (OS) were built from either clinical/ dosimetric variables, radiomics features or a combination thereof and validated in a comparable cohort of 71 patients treated by robotic SBRT at the Radiosurgery Center in Northern Germany (test cohort). Results Oncologic outcome did not differ significantly between the two cohorts (OS at 36 months 56% vs. 43%, p = 0.065; median DFS 25 months vs. 23 months, p = 0.43; LC at 36 months 90% vs. 93%, p = 0.197). Local lung fibrosis developed in 33% vs. 35% of the patients (p = 0.75), all events were observed within 36 months. In the training cohort, radiomics models were able to predict OS, DFS and LC (concordance index 0.77-0.99, p < 0.005), but failed to generalize to the test cohort. In opposite, models for the development of lung fibrosis could be generated from both clinical/dosimetric factors and radiomic features or combinations thereof, which were both predictive in the training set (concordance index 0.71- 0.79, p < 0.005) and in the test set (concordance index 0.59-0.66, p < 0.05). The best performing model included 4 clinical/dosimetric variables (GTV-D-mean, PTV-D-95%, Lung-D-1ml, age) and 7 radiomic features (concordance index 0.66, p < 0.03). Conclusion Despite the obvious difficulties in generalizing predictive models for oncologic outcome and toxicity, this analysis shows that carefully designed radiomics models for prediction of local lung fibrosis after SBRT of early stage lung cancer perform well across different institutions.

C1 [Bousabarah, Khaled; Hoevels, Mauritius; Ruess, Daniel; Visser-Vandewalle, Veerle; Ruge, Maximilian I.; Treuer, Harald; Kocher, Martin] Univ Hosp Cologne, Dept Stereotact & Funct Neurosurg, Kerpener Str 62, D-50937 Cologne, Germany.

[Bousabarah, Khaled] Univ Hosp Cologne, Inst Diagnost & Intervent Radiol, Cologne, Germany.

[Blanck, Oliver] Univ Med Ctr Schleswig Holstein, Dept Radiat Oncol, Kiel, Germany.

[Blanck, Oliver; Wilhelm, Maria-Lisa] Saphir Radiosurg Ctr Northern Germany, Guestrow, Germany.

[Temming, Susanne; Baus, Wolfgang W.] Univ Hosp Cologne, Dept Radiat Oncol, Cologne, Germany.

[Wilhelm, Maria-Lisa] Univ Med Rostock, Dept Radiat Oncol, Rostock, Germany.

RP Kocher, M (通讯作者)，Univ Hosp Cologne, Dept Stereotact & Funct Neurosurg, Kerpener Str 62, D-50937 Cologne, Germany.

EM martin.kocher@uk-koeln.de

OI Blanck, Oliver/0000-0003-1391-1308

FU Projekt DEAL

FX Open Access funding enabled and organized by Projekt DEAL.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

[Anonymous], 2016, RADIOLOGY

Baek S, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-53461-2

Baumann R, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00171

Benner A, 2010, BIOMETRICAL J, V52, P50, DOI 10.1002/bimj.200900064

Bousabarah K, 2019, STRAHLENTHER ONKOL, V195, P830, DOI 10.1007/s00066-019-01452-7

Chen YF, 2013, COMPUT MATH METHOD M, V2013, DOI 10.1155/2013/873595

Coroller TP, 2017, J THORAC ONCOL, V12, P467, DOI 10.1016/j.jtho.2016.11.2226

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Dahele M, 2011, J THORAC ONCOL, V6, P1221, DOI 10.1097/JTO.0b013e318219aac5

Diamant A, 2018, RADIOTHER ONCOL

Dissaux G, 2019, J NUCL MED

Febbo JA, 2018, RADIOGRAPHICS, V38, P1312, DOI 10.1148/rg.2018170155

Franceschini D, 2020, STRAHLENTHER ONKOL, V196, P922, DOI 10.1007/s00066-019-01542-6

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

Grove O, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0118261

Guckenberger M, 2014, STRAHLENTHER ONKOL, V190, P26, DOI 10.1007/s00066-013-0450-y

Guckenberger M, 2019, J THORAC CARDIOV SUR, V157, P358, DOI 10.1016/j.jtcvs.2018.09.107

Guckenberger M, 2017, RADIOTHER ONCOL, V124, P11, DOI 10.1016/j.radonc.2017.05.012

Guckenberger M, 2016, RADIOTHER ONCOL, V118, P485, DOI 10.1016/j.radonc.2015.09.008

Guckenberger M, 2013, INT J RADIAT ONCOL, V85, P1074, DOI 10.1016/j.ijrobp.2012.09.016

Hao HX, 2018, PHYS MED BIOL, V63, DOI 10.1088/1361-6560/aabb5e

Huynh E, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169172

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Inoue T, 2015, J RADIAT RES, V56, P727, DOI 10.1093/jrr/rrv019

Knoll MA, 2016, QUANT IMAG MED SURG, V6, P35, DOI 10.3978/j.issn.2223-4292.2016.02.07

Lafata KJ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf5a5

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Li HM, 2018, RADIOTHER ONCOL, V129, P218, DOI 10.1016/j.radonc.2018.06.025

Li Q, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0892-y

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

Li SL, 2018, MED IMAGE ANAL, V50, P106, DOI 10.1016/j.media.2018.09.004

Liang B, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00269

Lombardo E, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-021-85671-y

Lou B, 2019, LANCET DIGIT HEALTH, V1, pE136, DOI 10.1016/S2589-7500(19)30058-5

Luo Y, 2018, MED PHYS

Nakamura M, 2019, J THORAC DIS, V11, P214, DOI 10.21037/jtd.2018.12.115

NCCN. National Comprehensive Cancer Network, 2019, NCCN CLIN PRACTICE G

Oikonomou A, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-22357-y

Okubo M, 2017, BRIT J RADIOL, V90, DOI 10.1259/bjr.20160508

Polsterl S, 2020, J MACH LEARN RES, V21

Ricardi U, 2009, ACTA ONCOL, V48, P571, DOI 10.1080/02841860802520821

Schmitt D, 2020, STRAHLENTHER ONKOL, V196, P421, DOI 10.1007/s00066-020-01583-2

Starke S, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-70542-9

Starkov P, 2019, BRIT J RADIOL, V92, DOI 10.1259/bjr.20180228

Stera S, 2018, STRAHLENTHER ONKOL, V194, P143, DOI 10.1007/s00066-017-1204-z

Takeda K, 2017, J RADIAT RES, V58, P862, DOI 10.1093/jrr/rrx050

Tang C, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-20471-5

Temming S, 2018, STRAHLENTHER ONKOL, V194, P91, DOI 10.1007/s00066-017-1194-x

Trovo M, 2010, LUNG CANCER, V69, P77, DOI 10.1016/j.lungcan.2009.09.006

Tsoutsou PG, 2006, INT J RADIAT ONCOL, V66, P1281, DOI 10.1016/j.ijrobp.2006.08.058

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

van Timmeren JE, 2019, PLOS ONE, V14, DOI 10.1371/journal.pone.0217536

Wang SL, 2017, INT J RADIAT ONCOL, V98, P615, DOI 10.1016/j.ijrobp.2017.03.011

Wilke L, 2019, STRAHLENTHER ONKOL, V195, P193, DOI 10.1007/s00066-018-1416-x

Yu W, 2017, INT J RADIAT ONCOL

Zhang YC, 2017, SCI REP-UK, V7, DOI 10.1038/srep46349

Zhao J, 2016, INT J RADIAT ONCOL, V95, P1357, DOI 10.1016/j.ijrobp.2016.03.024

NR 59

TC 4

Z9 4

U1 1

U2 5

PU BMC

PI LONDON

PA CAMPUS, 4 CRINAN ST, LONDON N1 9XW, ENGLAND

EI 1748-717X

J9 RADIAT ONCOL

JI Radiat. Oncol.

PD APR 16

PY 2021

VL 16

IS 1

AR 74

DI 10.1186/s13014-021-01805-6

PG 14

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA RO1AU

UT WOS:000640782100001

PM 33863358

OA gold, Green Published, Green Submitted

DA 2022-08-24

ER

PT J

AU Bousabarah, K

Temming, S

Hoevels, M

Borggrefe, J

Baus, WW

Ruess, D

Visser-Vandewalle, V

Ruge, M

Kocher, M

Treuer, H

AF Bousabarah, Khaled

Temming, Susanne

Hoevels, Mauritius

Borggrefe, Jan

Baus, Wolfgang W.

Ruess, Daniel

Visser-Vandewalle, Veerle

Ruge, Maximilian

Kocher, Martin

Treuer, Harald

TI Radiomic analysis of planning computed tomograms for predicting

radiation-induced lung injury and outcome in lung cancer patients

treated with robotic stereotactic body radiation therapy

SO STRAHLENTHERAPIE UND ONKOLOGIE

LA English

DT Article

DE Image analysis; Radiobiology; Machine learning; Toxicity; Biomarker

ID PATHOLOGICAL RESPONSE; TEXTURE ANALYSIS; STAGE-I; FEATURES; SURVIVAL;

REPRODUCIBILITY; RADIOTHERAPY; PNEUMONITIS; RECURRENCE; SIGNATURE

AB Objectives To predict radiation-induced lung injury and outcome in non-small cell lung cancer (NSCLC) patients treated with robotic stereotactic body radiation therapy (SBRT) from radiomic features of the primary tumor. Methods In all, 110 patients with primary stage I/IIa NSCLC were analyzed for local control (LC), disease-free survival (DFS), overall survival (OS) and development of local lung injury up to fibrosis (LF). First-order (histogram), second-order (GLCM, Gray Level Co-occurrence Matrix) and shape-related radiomic features were determined from the unprocessed or filtered planning CT images of the gross tumor volume (GTV), subjected to LASSO (Least Absolute Shrinkage and Selection Operator) regularization and used to construct continuous and dichotomous risk scores for each endpoint. Results Continuous scores comprising 1-5 histogram or GLCM features had a significant (p= 0.0001-0.032) impact on all endpoints that was preserved in a multifactorial Cox regression analysis comprising additional clinical and dosimetric factors. At 36 months, LC did not differ between the dichotomous risk groups (93% vs. 85%, HR 0.892, 95%CI 0.222-3.590), while DFS (45% vs. 17%, p< 0.05, HR 0.457, 95%CI 0.240-0.868) and OS (80% vs. 37%, p< 0.001, HR 0.190, 95%CI 0.065-0.556) were significantly lower in the high-risk groups. Also, the frequency of LF differed significantly between the two risk groups (63% vs. 20% at 24 months, p< 0.001, HR 0.158, 95%CI 0.054-0.458). Conclusion Radiomic analysis of the gross tumor volume may help to predict DFS and OS and the development of local lung fibrosis in early stage NSCLC patients treated with stereotactic radiotherapy.

C1 [Bousabarah, Khaled; Hoevels, Mauritius; Ruess, Daniel; Visser-Vandewalle, Veerle; Ruge, Maximilian; Kocher, Martin; Treuer, Harald] Univ Hosp Cologne, Dept Stereotact & Funct Neurosurg, Kerpener Str 62, D-50937 Cologne, Germany.

[Temming, Susanne; Baus, Wolfgang W.; Kocher, Martin] Univ Hosp Cologne, Dept Radiat Oncol, Kerpener Str 62, D-50937 Cologne, Germany.

[Borggrefe, Jan] Univ Hosp Cologne, Inst Diagnost & Intervent Radiol, Kerpener Str 62, D-50937 Cologne, Germany.

RP Kocher, M (通讯作者)，Univ Hosp Cologne, Dept Stereotact & Funct Neurosurg, Kerpener Str 62, D-50937 Cologne, Germany.; Kocher, M (通讯作者)，Univ Hosp Cologne, Dept Radiat Oncol, Kerpener Str 62, D-50937 Cologne, Germany.

EM martin.kocher@uk-koeln.de

RI Borggrefe, Jan/N-6549-2018

OI Borggrefe, Jan/0000-0003-2908-7560

CR Abrol Srishti, 2017, Top Magn Reson Imaging, V26, P43, DOI 10.1097/RMR.0000000000000117

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Baker M, 2016, NATURE, V533, P452, DOI 10.1038/533452a

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Baumann R, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00171

Braman NM, 2017, BREAST CANCER RES, V19, DOI 10.1186/s13058-017-0846-1

Brentnall AR, 2016, STAT METHODS MED RES

Choi W, 2018, MED PHYS

Constanzo J, 2017, TRANSL LUNG CANCER R, V6, P635, DOI 10.21037/tlcr.2017.09.07

Coroller TP, 2017, J THORAC ONCOL, V12, P467, DOI 10.1016/j.jtho.2016.11.2226

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

de Oliveira MS, 2011, AM J NEURORADIOL, V32, P60, DOI 10.3174/ajnr.A2232

Deasy JO, 2010, INT J RADIAT ONCOL, V76, pS151, DOI 10.1016/j.ijrobp.2009.06.094

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

Folkert MR, 2017, ADV DRUG DELIVER REV, V109, P3, DOI 10.1016/j.addr.2016.11.005

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Grossmann P, 2017, ELIFE, V6, DOI 10.7554/eLife.23421

Grove O, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0118261

Guckenberger M, 2017, RADIOTHER ONCOL, V124, P11, DOI 10.1016/j.radonc.2017.05.012

Guckenberger M, 2016, RADIOTHER ONCOL, V118, P485, DOI 10.1016/j.radonc.2015.09.008

Guckenberger M, 2013, INT J RADIAT ONCOL, V85, P1074, DOI 10.1016/j.ijrobp.2012.09.016

He L, 2016, SCI REP

Huang YQ, 2016, J CLIN ONCOL, V34, P2157, DOI 10.1200/JCO.2015.65.9128

Huang YQ, 2016, RADIOLOGY, V281, P947, DOI 10.1148/radiol.2016152234

Huynh E, 2017, PLOS ONE

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Jager KJ, 2008, KIDNEY INT, V74, P560, DOI 10.1038/ki.2008.217

Kalman NS, 2018, ADV RADIAT ONCOL, V3, P655, DOI 10.1016/j.adro.2018.05.004

Kalpathy-Cramer J, 2016, TOMOGRAPHY, V2, P430, DOI 10.18383/j.tom.2016.00235

Katsila T, 2017, OMICS, V21, P429, DOI 10.1089/omi.2017.0087

Kimura T, 2006, INT J RADIAT ONCOL, V66, P483, DOI 10.1016/j.ijrobp.2006.05.008

Larue RTHM, 2017, RADIOTHER ONCOL, V125, P147, DOI 10.1016/j.radonc.2017.07.023

Lee G, 2017, EUR J RADIOL, V86, P297, DOI 10.1016/j.ejrad.2016.09.005

Li Q, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0892-y

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

Lopez CJ, 2017, INT J RADIAT ONCOL, V97, P586, DOI 10.1016/j.ijrobp.2016.11.011

Ma LJ, 2017, CHIN CLIN ONCOL, V6, DOI 10.21037/cco.2017.06.19

Maquilan G, 2016, CANCER J, V22, P274, DOI 10.1097/PPO.0000000000000204

Mattonen SA, 2015, J MED IMAGING BELLIN

Mattonen SA, 2016, INT J RADIAT ONCOL, V94, P1121, DOI 10.1016/j.ijrobp.2015.12.369

Molina D, 2016, COMPUT BIOL MED, V78, P49, DOI 10.1016/j.compbiomed.2016.09.011

Moran A, 2017, CLIN LUNG CANCER, V18, pE425, DOI 10.1016/j.cllc.2017.05.014

Paddick I, 2000, J NEUROSURG, V93, P219, DOI 10.3171/jns.2000.93.supplement\_3.0219

Palma DA, 2011, INT J RADIAT ONCOL, V80, P506, DOI 10.1016/j.ijrobp.2010.02.032

Parekh VS, 2017, NPJ BREAST CANCER, V3, DOI 10.1038/s41523-017-0045-3

Peeken JC, 2018, STRAHLENTHER ONKOL, V194, P580, DOI 10.1007/s00066-018-1276-4

Peeken JC, 2017, STRAHLENTHER ONKOL, V193, P767, DOI 10.1007/s00066-017-1175-0

Pinker K, 2017, J MAGN RESON IMAGING

Postmus PE, 2017, ANN ONCOL, V28, P1, DOI 10.1093/annonc/mdx222

SHAW E, 1993, INT J RADIAT ONCOL, V27, P1231, DOI 10.1016/0360-3016(93)90548-A

SHIRADKAR R, 2016, REPROD HEALTH, V13, DOI DOI 10.1186/S13014-016-0718-3

Simon N, 2011, J STAT SOFTW, V39, P1

Stera S, 2018, STRAHLENTHER ONKOL, V194, P143, DOI 10.1007/s00066-017-1204-z

Takeda K, 2017, J RADIAT RES, V58, P862, DOI 10.1093/jrr/rrx050

Temming S, 2018, STRAHLENTHER ONKOL, V194, P91, DOI 10.1007/s00066-017-1194-x

Tibshirani R, 1997, STAT MED, V16, P385, DOI 10.1002/(SICI)1097-0258(19970228)16:4<385::AID-SIM380>3.0.CO;2-3

Traverso A, 2018, INT J RADIAT ONCOL, V102, P1143, DOI 10.1016/j.ijrobp.2018.05.053

Tsoutsou PG, 2006, INT J RADIAT ONCOL, V66, P1281, DOI 10.1016/j.ijrobp.2006.08.058

Vallieres M, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-10371-5

van Timmeren JE, 2017, ACTA ONCOL, V56, P1537, DOI 10.1080/0284186X.2017.1350285

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

Verma V, 2017, J NATL CANC I

Videtic GMM, 2017, PRACT RADIAT ONCOL, V7, P295, DOI 10.1016/j.prro.2017.04.014

Wang SL, 2017, INT J RADIAT ONCOL, V98, P615, DOI 10.1016/j.ijrobp.2017.03.011

Wu WM, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00071

Yu W, 2017, INT J RAD ONCOL BIOL

Zhang Y, 2017, SCI REP

Zhao B, 2016, SCI REP

Zhu X, 2018, EUR RADIOL

Zwanenburg A., 2017, IMAGE BIOMARKER STAN

NR 72

TC 18

Z9 18

U1 0

U2 4

PU SPRINGER HEIDELBERG

PI HEIDELBERG

PA TIERGARTENSTRASSE 17, D-69121 HEIDELBERG, GERMANY

SN 0179-7158

EI 1439-099X

J9 STRAHLENTHER ONKOL

JI Strahlenther. Onkol.

PD SEP

PY 2019

VL 195

IS 9

BP 830

EP 842

DI 10.1007/s00066-019-01452-7

PG 13

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA IS6CA

UT WOS:000482238500006

PM 30874846

DA 2022-08-24

ER

PT J

AU van Amsterdam, WAC

Harlianto, NI

Verhoeff, JJC

Moeskops, P

de Jong, PA

Leiner, T

AF van Amsterdam, Wouter A. C.

Harlianto, Netanja, I

Verhoeff, Joost J. C.

Moeskops, Pim

de Jong, Pim A.

Leiner, Tim

TI The Association between Muscle Quantity and Overall Survival Depends on

Muscle Radiodensity: A Cohort Study in Non-Small-Cell Lung Cancer

Patients

SO JOURNAL OF PERSONALIZED MEDICINE

LA English

DT Article

DE cachexia; carcinoma; non-small-cell lung; survival analysis; prognosis

ID BODY-COMPOSITION; PROGNOSTIC VALUE; SARCOPENIA; CHEMOTHERAPY;

PREDICTION; RESECTION; TOXICITY; MARKER; TUMOR; MASS

AB The prognostic value of CT-derived muscle quantity for overall survival (OS) in patients with non-small-cell lung cancer (NSCLC) is uncertain due to conflicting evidence. We hypothesize that increased muscle quantity is associated with better OS in patients with normal muscle radiodensity but not in patients with fatty degeneration of muscle tissue and low muscle radiodensity. We performed an observational cohort study in NSCLC patients treated with radiotherapy. A deep learning algorithm was used to measure muscle quantity as psoas muscle index (PMI) and psoas muscle radiodensity (PMD) on computed tomography. The potential interaction between PMI and PMD for OS was investigated using Cox proportional-hazards regression. Baseline adjustment variables were age, sex, histology, performance score and body mass index. We investigated non-linear effects of continuous variables and imputed missing values using multiple imputation. We included 2840 patients and observed 1975 deaths in 5903 patient years. The average age was 68.9 years (standard deviation 10.4, range 32 to 96) and 1692 patients (59.6%) were male. PMI was more positively associated with OS for higher values of PMD (hazard ratio for interaction 0.915; 95% confidence interval 0.861-0.972; p-value 0.004). We found evidence that high muscle quantity is associated with better OS when muscle radiodensity is higher, in a large cohort of NSCLC patients treated with radiotherapy. Future studies on the association between muscle status and OS should accommodate this interaction in their analysis for more accurate and more generalizable results.

C1 [van Amsterdam, Wouter A. C.; Harlianto, Netanja, I; de Jong, Pim A.; Leiner, Tim] Univ Utrecht, Univ Med Ctr Utrecht, Dept Radiol, Heidelberglaan 100, NL-3584 CX Utrecht, Netherlands.

[van Amsterdam, Wouter A. C.] Babylon Hlth, 1 Knightsbridge Green, London SW1X 7QA, England.

[van Amsterdam, Wouter A. C.; Verhoeff, Joost J. C.] Univ Utrecht, Univ Med Ctr Utrecht, Dept Radiat Oncol, Heidelberglaan 100, NL-3584 CX Utrecht, Netherlands.

[Moeskops, Pim] Quantib BV, Westblaak 106, NL-3012 KM Rotterdam, Netherlands.

[Leiner, Tim] Mayo Clin, Dept Radiol, 200 First St SW, Rochester, MN 55905 USA.

RP van Amsterdam, WAC (通讯作者)，Univ Utrecht, Univ Med Ctr Utrecht, Dept Radiol, Heidelberglaan 100, NL-3584 CX Utrecht, Netherlands.; van Amsterdam, WAC (通讯作者)，Babylon Hlth, 1 Knightsbridge Green, London SW1X 7QA, England.; van Amsterdam, WAC (通讯作者)，Univ Utrecht, Univ Med Ctr Utrecht, Dept Radiat Oncol, Heidelberglaan 100, NL-3584 CX Utrecht, Netherlands.

EM w.a.c.vanamsterdam@gmail.com; n.i.harlianto@umcutrecht.nl;

j.j.c.verhoeff-10@umcutrecht.nl; p.moeskops@quantib.com;

p.dejong-8@umcutrecht.nl; timleiner@gmail.com

RI Harlianto, Netanja I./ABI-2241-2020

OI Harlianto, Netanja I./0000-0001-8196-3949

CR Abbass T, 2020, CLIN NUTR ESPEN, V40, P349, DOI 10.1016/j.clnesp.2020.08.003

Altman DG, 2012, BMC MED, V10, DOI 10.1371/journal.pmed.1001216

[Anonymous], NVALT NIET KLEINCELL

[Anonymous], TNM CLASSIFICATION M, V6th

Baracos V, 2013, INT J BIOCHEM CELL B, V45, P2302, DOI 10.1016/j.biocel.2013.06.016

Bartlett JW, 2015, STAT METHODS MED RES, V24, P462, DOI 10.1177/0962280214521348

Bowden JCS, 2017, CLIN ONCOL-UK, V29, P576, DOI 10.1016/j.clon.2017.06.005

Cortellini A, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-58498-2

Dolan RD, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-77269-7

Dolan RD, 2020, CLIN NUTR, V39, P2889, DOI 10.1016/j.clnu.2019.12.024

Ettinger DS, 2020, NCCN NONSMALL CELL L

Forrest LM, 2003, BRIT J CANCER, V89, P1028, DOI 10.1038/sj.bjc.6601242

Kay FU, 2017, WORLD J RADIOL, V9, P269, DOI 10.4329/wjr.v9.i6.269

LI KH, 1991, J AM STAT ASSOC, V86, P1065, DOI 10.2307/2290525

Little R.J.A., 2014, STAT ANAL MISSING DA, P41, DOI 10.1002/9781119013563.ch3

Little RJ., 2019, STAT ANAL MISSING DA, V793

McShane LM, 2005, BRIT J CANCER, V93, P387, DOI 10.1038/sj.bjc.6602678

Moons KGM, 2015, ANN INTERN MED, V162, pW1, DOI 10.7326/M14-0698

Mourtzakis M, 2008, APPL PHYSIOL NUTR ME, V33, P997, DOI 10.1139/H08-075

Nattenmuller J, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169136

Nishioka N, 2021, CANCER MED-US, V10, P247, DOI 10.1002/cam4.3631

OKEN MM, 1982, AM J CLIN ONCOL-CANC, V5, P649, DOI 10.1097/00000421-198212000-00014

Portal D, 2019, CANCER MANAG RES, V11, P2579, DOI 10.2147/CMAR.S195869

Rowell NP, 2001, COCHRANE DB SYST REV

Ryan AM, 2019, NUTRITION, V67-68, DOI 10.1016/j.nut.2019.06.020

Schomaker M, 2018, STAT MED, V37, P2252, DOI 10.1002/sim.7654

Shachar SS, 2016, EUR J CANCER, V57, P58, DOI 10.1016/j.ejca.2015.12.030

Shoji F, 2017, ANTICANCER RES, V37, P6997, DOI 10.21873/anticanres.12168

Simmons CP, 2015, LUNG CANCER, V88, P304, DOI 10.1016/j.lungcan.2015.03.020

Sjoblom B, 2016, CLIN NUTR, V35, P1386, DOI 10.1016/j.clnu.2016.03.010

Srdic D, 2016, SUPPORT CARE CANCER, V24, P4495, DOI 10.1007/s00520-016-3287-y

Stene GB, 2015, ACTA ONCOL, V54, P340, DOI 10.3109/0284186X.2014.953259

Suzuki Y, 2016, LUNG CANCER, V101, P92, DOI 10.1016/j.lungcan.2016.08.007

Takada K, 2020, J CANCER RES CLIN, V146, P1217, DOI 10.1007/s00432-020-03146-5

Takenaka Y, 2021, J CACHEXIA SARCOPENI, V12, P1122, DOI 10.1002/jcsm.12755

Topkan E, 2012, BMC CANCER, V12, DOI 10.1186/1471-2407-12-502

van Amsterdam WAC, 2022, SCI REP-UK, V12, DOI 10.1038/s41598-022-09775-9

Van Erck D, 2022, FRONT NUTR, V9, DOI 10.3389/fnut.2022.781860

von Hippel PT, 2020, SOCIOL METHOD RES, V49, P699, DOI 10.1177/0049124117747303

Yerokun BA, 2017, J THORAC CARDIOV SUR, V154, P675, DOI 10.1016/j.jtcvs.2017.02.065

NR 40

TC 0

Z9 0

U1 0

U2 0

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2075-4426

J9 J PERS MED

JI J. Pers. Med.

PD JUL

PY 2022

VL 12

IS 7

AR 1191

DI 10.3390/jpm12071191

PG 13

WC Health Care Sciences & Services; Medicine, General & Internal

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Health Care Sciences & Services; General & Internal Medicine

GA 3J3UJ

UT WOS:000833323200001

PM 35887688

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Mahon, RN

Hugo, GD

Weiss, E

AF Mahon, R. N.

Hugo, G. D.

Weiss, E.

TI Repeatability of texture features derived from magnetic resonance and

computed tomography imaging and use in predictive models for non-small

cell lung cancer outcome

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE radiomics; magnetic resonance imaging; computed tomography; texture

features; repeatability; predictive modelling; lung cancer

ID RADIOMICS FEATURES; FDG-PET; IMAGES; THERAPY

AB To evaluate the repeatability of MRI and CT derived texture features and to investigate the feasibility of use in predictive single and multi-modality models for radiotherapy of non-small cell lung cancer, 59 texture features were extracted from unfiltered and wavelet filtered images. Repeatability of test-retest features from helical 4D CT scans, true fast MRI with steady state precession (TRUFISP), and volumetric interpolation breath-hold examination (VIBE) was determined by the concordance correlation coefficient (CCC). A workflow was developed to predict overall survival at 12, 18, and 24 months and tumour response at end of treatment for tumour features, and normal muscle tissue features as a control. Texture features were reduced to repeatable and stable features before clustering. Cluster representative feature selection was performed by univariate or medoid analysis before model selection. P-values were corrected for false discovery rate.

Repeatable (CCC >= 0.9) features were found for both tumour and normal muscle tissue: CT: 54.4% for tumour and 78.5% for normal tissue, TRUFISP: 64.4% for tumour and 67.8% for normal tissue, and VIBE: 52.6% for tumour and 72.9% for normal muscle tissue. Muscle tissue control analysis found seven significant models with six of seven models utilizing the univariate representative feature selection technique. Tumour analysis revealed 12 significant models for overall survival and none for tumour response at end of treatment. The accuracy of significant single modality was about the same for MR and CT. Multi-modality tumour models had comparable performance to single modality models.

MR derived texture features may add value to predictive models and should be investigated in a larger cohort. Control analysis demonstrated that the medoid representative feature selection method may result in more robust models.

C1 [Mahon, R. N.; Hugo, G. D.; Weiss, E.] Virginia Commonwealth Univ, Dept Radiat Oncol, Richmond, VA 23284 USA.

[Hugo, G. D.] Washington Univ, Dept Radiat Oncol, St Louis, MO 63110 USA.

RP Mahon, RN (通讯作者)，Virginia Commonwealth Univ, Dept Radiat Oncol, Richmond, VA 23284 USA.

EM mahonrn@vcu.edu

OI Mahon, Rebecca/0000-0003-0466-2282

FU NIH; NIH Cancer Center Support Grant [P30 CA016059]

FX We would like to thank Dr. Julian Rosenman for valuable discussions

related to the use of muscle tissue controls. We disclose the following

potential conflicts of interest in the manuscript: Virginia Commonwealth

University has a research agreement with Varian Medical Systems. EW and

GD receive funding from NIH. EW receives royalties from UpToDate. This

work was supported in part through NIH Cancer Center Support Grant P30

CA016059.

CR Aerts HJWL, 2016, SCI REP-UK, V6, DOI 10.1038/srep33860

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

[Anonymous], THESIS

Anthony GJ, 2017, MED PHYS, V44, P3686, DOI 10.1002/mp.12282

Benjamini Y, 2001, ANN STAT, V29, P1165

Carvalho S, 2016, RADIOTHER ONCOL, V118, pS20, DOI DOI 10.1016/S0167-8140(16)30042-1

Cha MJ, 2014, J THORAC CARDIOV SUR, V147, P921, DOI 10.1016/j.jtcvs.2013.09.045

Collewet G, 2004, MAGN RESON IMAGING, V22, P81, DOI 10.1016/j.mri.2003.09.001

CONNERS RW, 1984, COMPUT VISION GRAPH, V25, P273, DOI 10.1016/0734-189X(84)90197-X

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Fave X, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-00665-z

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

FIRTH D, 1993, BIOMETRIKA, V80, P27, DOI 10.1093/biomet/80.1.27

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Fruehwald-Pallamar J, 2016, ROFO-FORTSCHR RONTG, V188, P195, DOI 10.1055/s-0041-106066

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Gourtsoyianni S, 2017, RADIOLOGY, V284, P552, DOI 10.1148/radiol.2017161375

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Harrison LCV, 2010, ACAD RADIOL, V17, P696, DOI 10.1016/j.acra.2010.01.005

Herlidou-Meme S, 2003, MAGN RESON IMAGING, V21, P989, DOI 10.1016/S0730-725X(03)00212-1

Hunter LA, 2016, COMPUT MED IMAG GRAP, V49, P29, DOI 10.1016/j.compmedimag.2015.11.004

Jirak D, 2004, MED PHYS, V31, P616, DOI 10.1118/1.1646231

Larue RTHM, 2017, RADIOTHER ONCOL, V125, P147, DOI 10.1016/j.radonc.2017.07.023

Lian CF, 2016, MED IMAGE ANAL, V32, P257, DOI 10.1016/j.media.2016.05.007

LIN LI, 1989, BIOMETRICS, V45, P255, DOI 10.2307/2532051

Mayerhoefer ME, 2009, MED PHYS, V36, P1236, DOI 10.1118/1.3081408

McBride G, 2005, HAM20050614 NAT I WA

Panth KM, 2015, RADIOTHER ONCOL, V116, P462, DOI 10.1016/j.radonc.2015.06.013

Parekh VS, 2017, NPJ BREAST CANCER, V3, DOI 10.1038/s41523-017-0045-3

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Peng YH, 2013, PROC SPIE, V8670, DOI 10.1117/12.2007979

Peulen H, 2016, INT J RADIAT ONCOL, V96, P134, DOI 10.1016/j.ijrobp.2016.04.003

Robin X, 2011, BMC BIOINFORMATICS, V12, DOI 10.1186/1471-2105-12-77

Savio SJ, 2010, BIOMED ENG ONLINE, V9, DOI 10.1186/1475-925X-9-60

Scrivener M, 2016, TRANSL CANCER RES, V5, P398, DOI 10.21037/tcr.2016.06.18

Thibault G., 2009, INT J PATTERN RECOGN, V27, P140

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

van Velden FHP, 2016, MOL IMAGING BIOL, V18, P788, DOI 10.1007/s11307-016-0940-2

Wilkerson MD, 2010, BIOINFORMATICS, V26, P1572, DOI 10.1093/bioinformatics/btq170

Wong AJ, 2016, TRANSL CANCER RES, V5, P371, DOI 10.21037/tcr.2016.07.18

Wu J, 2012, IEEE NUCL SCI CONF R, P2788

Wu WM, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00071

Yip SSF, 2016, PHYS MED BIOL, V61, pR150, DOI 10.1088/0031-9155/61/13/R150

Zhi-Cheng Li, 2016, Medical Imaging and Augmented Reality. 7th International Conference, MIAR 2016. Proceedings: LNCS 9805, P311, DOI 10.1007/978-3-319-43775-0\_28

NR 47

TC 20

Z9 20

U1 1

U2 14

PU IOP PUBLISHING LTD

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD JUL

PY 2019

VL 64

IS 14

AR 145007

DI 10.1088/1361-6560/ab18d3

PG 14

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA II7NN

UT WOS:000475378800007

PM 30978707

DA 2022-08-24

ER

PT J

AU Hershman, M

Yousefi, B

Serletti, L

Galperin-Aizenberg, M

Roshkovan, L

Luna, JM

Thompson, JC

Aggarwal, C

Carpenter, EL

Kontos, D

Katz, SI

AF Hershman, Michelle

Yousefi, Bardia

Serletti, Lacey

Galperin-Aizenberg, Maya

Roshkovan, Leonid

Luna, Jose Marcio

Thompson, Jeffrey C.

Aggarwal, Charu

Carpenter, Erica L.

Kontos, Despina

Katz, Sharyn I.

TI Impact of Interobserver Variability in Manual Segmentation of Non-Small

Cell Lung Cancer (NSCLC) Applying Low-Rank Radiomic Representation on

Computed Tomography

SO CANCERS

LA English

DT Article

DE radiomics; interobserver variability; non-small cell lung cancer;

computed tomography (CT)

ID GROSS TUMOR VOLUME; TARGET VOLUME; CONFORMAL RADIOTHERAPY; PULMONARY

NODULES; TEXTURE FEATURES; TEST-RETEST; DELINEATION; IMAGES;

REPRODUCIBILITY; INFORMATION

AB Simple Summary Discovery of predictive and prognostic radiomic features in cancer is currently of great interest to the radiologic and oncologic community. Tumor phenotypic and prognostic information can be obtained by extracting features on tumor segmentations, and it is typically imaging analysts, physician trainees, and attending physicians who provide these labeled datasets for analysis. The potential impact of level and type of specialty training on interobserver variability in manual segmentation of NSCLC was examined. Although there was some variability in segmentation between readers, the subsequently extracted radiomic features were overall well correlated. High fidelity radiomic feature extraction relies on accurate feature extraction from imaging that produce robust prognostic and predictive radiomic NSCLC biomarkers. This study concludes that this goal can be obtained using segmenters of different levels of training and clinical experience. This study tackles interobserver variability with respect to specialty training in manual segmentation of non-small cell lung cancer (NSCLC). Four readers included for segmentation are: a data scientist (BY), a medical student (LS), a radiology trainee (MH), and a specialty-trained radiologist (SK) for a total of 293 patients from two publicly available databases. Sorensen-Dice (SD) coefficients and low rank Pearson correlation coefficients (CC) of 429 radiomics were calculated to assess interobserver variability. Cox proportional hazard (CPH) models and Kaplan-Meier (KM) curves of overall survival (OS) prediction for each dataset were also generated. SD and CC for segmentations demonstrated high similarities, yielding, SD: 0.79 and CC: 0.92 (BY-SK), SD: 0.81 and CC: 0.83 (LS-SK), and SD: 0.84 and CC: 0.91 (MH-SK) in average for both databases, respectively. OS through the maximal CPH model for the two datasets yielded c-statistics of 0.7 (95% CI) and 0.69 (95% CI), while adding radiomic and clinical variables (sex, stage/morphological status, and histology) together. KM curves also showed significant discrimination between high- and low-risk patients (p-value < 0.005). This supports that readers' level of training and clinical experience may not significantly influence the ability to extract accurate radiomic features for NSCLC on CT. This potentially allows flexibility in the training required to produce robust prognostic imaging biomarkers for potential clinical translation.

C1 [Hershman, Michelle; Yousefi, Bardia; Galperin-Aizenberg, Maya; Roshkovan, Leonid; Luna, Jose Marcio; Kontos, Despina; Katz, Sharyn I.] Univ Penn, Dept Radiol, Philadelphia, PA 19104 USA.

[Yousefi, Bardia; Luna, Jose Marcio; Kontos, Despina] Univ Penn, Ctr Biomed Image Comp & Analyt, Philadelphia, PA 19104 USA.

[Serletti, Lacey] Univ Penn, Perelman Sch Med, Philadelphia, PA 19104 USA.

[Thompson, Jeffrey C.] Univ Penn, Dept Med, Sect Intervent Pulmonol, Philadelphia, PA 19104 USA.

[Aggarwal, Charu; Carpenter, Erica L.] Univ Penn, Dept Med, Div Hematol & Oncol, Philadelphia, PA 19104 USA.

RP Hershman, M; Katz, SI (通讯作者)，Univ Penn, Dept Radiol, Philadelphia, PA 19104 USA.

EM Michelle.hershman@pennmedicine.upenn.edu; bardia.yousefi@gmail.com;

lacey.serletti@pennmedicine.upenn.edu;

maya.galperin-aizenberg@pennmedicine.upenn.edu;

Leonid.roshkovan@pennmedicine.upenn.edu;

jose.luna@pennmedicine.upenn.edu;

Jeffrey.thompson@pennmedicine.upenn.edu;

charu.aggarwal@pennmedicine.upenn.edu; erical@upenn.edu;

despina.kontos@pennmedicine.upenn.edu;

Sharyn.katz@pennmedicine.upenn.edu

OI Yousefi, Bardia/0000-0003-3121-4573; Luna, Jose/0000-0002-5513-022X

CR Aberle DR, 2011, NEW ENGL J MED, V365, P395, DOI 10.1056/NEJMoa1102873

Aerts H.J.W.L., 2015, \*\*DATA OBJECT\*\*, DOI 10.7937/K9/TCIA.2015.L4FRET6Z

Aerts HJWL, 2016, SCI REP-UK, V6, DOI 10.1038/srep33860

Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Bakr S., 2017, \*\*DATA OBJECT\*\*, DOI [10.7937/K9/TCIA.2017.7hs46erv, DOI 10.7937/K9/TCIA.2017.7HS46ERV]

Bakr S, 2018, SCI DATA, V5, DOI 10.1038/sdata.2018.202

Balagurunathan Y, 2014, J DIGIT IMAGING, V27, P805, DOI 10.1007/s10278-014-9716-x

Basu S, 2011, EUR J NUCL MED MOL I, V38, P987, DOI 10.1007/s00259-011-1787-z

Buch K, 2017, AM J NEURORADIOL, V38, P981, DOI 10.3174/ajnr.A5139

Cazzaniga LF, 1998, RADIOTHER ONCOL, V47, P293, DOI 10.1016/S0167-8140(98)00028-0

Chaddad A, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00374

Chen BJ, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0885-x

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Dalal V, 2020, CANCER LETT, V469, P228, DOI 10.1016/j.canlet.2019.10.023

Desseroit MC, 2016, EUR J NUCL MED MOL I, V43, P1477, DOI 10.1007/s00259-016-3325-5

DICE LR, 1945, ECOLOGY, V26, P297, DOI 10.2307/1932409

El Naqa I, 2009, PATTERN RECOGN, V42, P1162, DOI 10.1016/j.patcog.2008.08.011

Emaminejad N, 2016, IEEE T BIO-MED ENG, V63, P1034, DOI 10.1109/TBME.2015.2477688

Fave X, 2015, COMPUT MED IMAG GRAP, V44, P54, DOI 10.1016/j.compmedimag.2015.04.006

Forgacs A, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0164113

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Ganeshan B, 2010, CANCER IMAGING, V10, P137, DOI 10.1102/1470-7330.2010.0021

Gevaert O, 2012, RADIOLOGY, V264, P387, DOI 10.1148/radiol.12111607

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

Giraud P, 2002, RADIOTHER ONCOL, V62, P27, DOI 10.1016/S0167-8140(01)00444-3

Graham MV, 1995, INT J RADIAT ONCOL, V33, P993, DOI 10.1016/0360-3016(95)02016-0

GRAHAM MV, 1994, INT J RADIAT ONCOL, V29, P1105, DOI 10.1016/0360-3016(94)90407-3

Haga A, 2018, RADIOL PHYS TECHNOL, V11, P27, DOI 10.1007/s12194-017-0433-2

Hamilton C S, 1992, Clin Oncol (R Coll Radiol), V4, P141, DOI 10.1016/S0936-6555(05)81075-1

HARRIS KM, 1993, CLIN RADIOL, V47, P241, DOI 10.1016/S0009-9260(05)81130-4

Henriksson E, 2007, ANTICANCER RES, V27, P2155

Hotelling H, 1933, J EDUC PSYCHOL, V24, P417, DOI 10.1037/h0071325

Huang Q, 2018, J MED IMAGING, V5, DOI 10.1117/1.JMI.5.1.011005

Huynh E, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169172

Jolliffe I. T., 2002, PRINCIPLE COMPONENT

Kalpathy-Cramer J, 2016, TOMOGRAPHY, V2, P430, DOI 10.18383/j.tom.2016.00235

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2017, NAT REV CLIN ONCOL, V14, P749, DOI 10.1038/nrclinonc.2017.141

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

LEUNENS G, 1993, RADIOTHER ONCOL, V29, P169, DOI 10.1016/0167-8140(93)90243-2

Liu ZY, 2019, THERANOSTICS, V9, P1303, DOI 10.7150/thno.30309

Logue JP, 1998, INT J RADIAT ONCOL, V41, P929, DOI 10.1016/S0360-3016(98)00148-5

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Meng YM, 2019, CANCER MANAG RES, V11, P10851, DOI 10.2147/CMAR.S232473

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Pearson K., 1895, PROC R SOCLOND, V58, P240, DOI 10.1098/rspl.1895.0041

Pearson K, 1901, PHILOS MAG, V2, P559, DOI 10.1080/14786440109462720

Rizzo Stefania, 2018, Eur Radiol Exp, V2, P36, DOI 10.1186/s41747-018-0068-z

Senan S, 1999, RADIOTHER ONCOL, V53, P247, DOI 10.1016/S0167-8140(99)00143-7

Sorensen T.A., 1948, BIOL SKAR, V5, P1, DOI DOI 10.1007/978-3-319-20816-9\_60

Tai P, 1998, INT J RADIAT ONCOL, V42, P277, DOI 10.1016/S0360-3016(98)00216-8

Traverso A, 2018, INT J RADIAT ONCOL, V102, P1143, DOI 10.1016/j.ijrobp.2018.05.053

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

VALLEY JF, 1993, RADIOTHER ONCOL, V28, P168, DOI 10.1016/0167-8140(93)90010-6

van Baardwijk A, 2010, J CLIN ONCOL, V28, P1380, DOI 10.1200/JCO.2009.24.7221

Van de Steene J, 2002, RADIOTHER ONCOL, V62, P37, DOI 10.1016/S0167-8140(01)00453-4

Waninger JJ, 2019, Q J NUCL MED MOL IM, V63, P339, DOI 10.23736/S1824-4785.19.03217-5

Weltens C, 2001, RADIOTHER ONCOL, V60, P49, DOI 10.1016/S0167-8140(01)00371-1

Wilson R, 2017, TRANSL LUNG CANCER R, V6, P86, DOI 10.21037/tlcr.2017.01.04

Wu WM, 2016, FRONT ONCOL, V6, DOI 10.3389/fonc.2016.00071

Yang XY, 2011, J BIOMED BIOTECHNOL, DOI 10.1155/2011/732848

Yip SSF, 2016, PHYS MED BIOL, V61, pR150, DOI 10.1088/0031-9155/61/13/R150

Yousefi B, 2021, SCI REP-UK, V11, DOI 10.1038/s41598-021-88239-y

Yushkevich PA, 2006, NEUROIMAGE, V31, P1116, DOI 10.1016/j.neuroimage.2006.01.015

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

Zhao BS, 2014, TRANSL ONCOL, V7, P88, DOI 10.1593/tlo.13865

NR 70

TC 0

Z9 0

U1 0

U2 2

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2072-6694

J9 CANCERS

JI Cancers

PD DEC

PY 2021

VL 13

IS 23

AR 5985

DI 10.3390/cancers13235985

PG 17

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA XU9BF

UT WOS:000734550400001

PM 34885094

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Bogowicz, M

Riesterer, O

Bundschuh, RA

Veit-Haibach, P

Hullner, M

Studer, G

Stieb, S

Glatz, S

Pruschy, M

Guckenberger, M

Tanadini-Lang, S

AF Bogowicz, M.

Riesterer, O.

Bundschuh, R. A.

Veit-Haibach, P.

Huellner, M.

Studer, G.

Stieb, S.

Glatz, S.

Pruschy, M.

Guckenberger, M.

Tanadini-Lang, S.

TI Stability of radiomic features in CT perfusion maps

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE radiomics; CT perfusion; radiomic features stability

ID FDG-PET RADIOMICS; CELL LUNG-CANCER; TEXTURAL FEATURES; MICROVESSEL

DENSITY; TUMOR PHENOTYPE; HETEROGENEITY; PARAMETERS; IMPACT; HEAD;

RECONSTRUCTION

AB This study aimed to identify a set of stable radiomic parameters in CT perfusion (CTP) maps with respect to CTP calculation factors and image discretization, as an input for future prognostic models for local tumor response to chemo-radiotherapy.

Pre-treatment CTP images of eleven patients with oropharyngeal carcinoma and eleven patients with non-small cell lung cancer (NSCLC) were analyzed. 315 radiomic parameters were studied per perfusion map (blood volume, blood flow and mean transit time). Radiomics robustness was investigated regarding the potentially standardizable (image discretization method, Hounsfield unit (HU) threshold, voxel size and temporal resolution) and non-standardizable (artery contouring and noise threshold) perfusion calculation factors using the intraclass correlation (ICC). To gain added value for our model radiomic parameters correlated with tumor volume, a well-known predictive factor for local tumor response to chemo-radiotherapy, were excluded from the analysis. The remaining stable radiomic parameters were grouped according to inter-parameter Spearman correlations and for each group the parameter with the highest ICC was included in the final set. The acceptance level was 0.9 and 0.7 for the ICC and correlation, respectively.

The image discretization method using fixed number of bins or fixed intervals gave a similar number of stable radiomic parameters (around 40%). The potentially standardizable factors introduced more variability into radiomic parameters than the non-standardizable ones with 56-98% and 43-58% instability rates, respectively. The highest variability was observed for voxel size (instability rate >97% for both patient cohorts). Without standardization of CTP calculation factors none of the studied radiomic parameters were stable. After standardization with respect to non-standardizable factors ten radiomic parameters were stable for both patient cohorts after correction for inter-parameter correlations.

Voxel size, image discretization, HU threshold and temporal resolution have to be standardized to build a reliable predictive model based on CTP radiomics analysis.

C1 [Bogowicz, M.; Riesterer, O.; Studer, G.; Stieb, S.; Glatz, S.; Pruschy, M.; Guckenberger, M.; Tanadini-Lang, S.] Univ Zurich, Univ Zurich Hosp, Dept Radiat Oncol, Ramistr 100, CH-8091 Zurich, Switzerland.

[Veit-Haibach, P.; Huellner, M.] Univ Zurich, Univ Zurich Hosp, Dept Nucl Med, Ramistr 100, CH-8091 Zurich, Switzerland.

[Veit-Haibach, P.] Univ Zurich, Univ Zurich Hosp, Dept Diagnost & Intervent Radiol, Ramistr 100, CH-8091 Zurich, Switzerland.

[Bundschuh, R. A.] Univ Hosp Bonn, Dept Nucl Med, Sigmund Freud Str 25, D-53127 Bonn, Germany.

RP Bogowicz, M (通讯作者)，Univ Zurich, Univ Zurich Hosp, Dept Radiat Oncol, Ramistr 100, CH-8091 Zurich, Switzerland.

EM marta.nesteruk@usz.ch

RI Bogowicz, Marta/AAM-6142-2020; Guckenberger, Matthias/AAX-4994-2020;

Studer, Gabriela/A-3013-2017; Guckenberger, Matthias/M-5114-2019

OI Bogowicz, Marta/0000-0002-4747-5375; Guckenberger,

Matthias/0000-0002-7146-9071; Tanadini-Lang,

Stephanie/0000-0002-4387-1522; Pruschy, Martin/0000-0002-3124-9015;

Riesterer, Oliver/0000-0002-9508-0546

FU Clinical Research Priority Program Tumor Oxygenation of University of

Zurich; Center for Clinical Research, University and University Hospital

Zurich; Merck (Schweiz) AG

FX The project was supported by the Clinical Research Priority Program

Tumor Oxygenation of the University of Zurich, by a grant of the Center

for Clinical Research, University and University Hospital Zurich and by

a research grant from Merck (Schweiz) AG. The authors declared no

potential conflict of interest with respect to the research, authorship,

and/or publication of this paper.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

Brooks FJ, 2014, J NUCL MED, V55, P37, DOI 10.2967/jnumed.112.116715

Cunliffe AR, 2012, MED PHYS, V39, P4679, DOI 10.1118/1.4730505

Duda D, 2013, LECT NOTES COMPUT SC, V8104, P96, DOI 10.1007/978-3-642-40925-7\_10

Fieselmann A, 2011, INT J BIOMED IMAGING, V2011, DOI 10.1155/2011/467563

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Goh V, 2008, RADIOLOGY, V249, P510, DOI 10.1148/radiol.2492071365

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Hatt M, 2015, J NUCL MED, V56, P38, DOI 10.2967/jnumed.114.144055

Itakura H, 2015, SCI TRANSL MED, V7, DOI 10.1126/scitranslmed.aaa7582

Kao YH, 2014, COMPUT BIOL MED, V51, P51, DOI 10.1016/j.compbiomed.2014.04.015

KARSTENS JH, 1990, ONKOLOGIE, V13, P144

Kudo K, 2010, RADIOLOGY, V254, P200, DOI 10.1148/radiol.254082000

Kumar M., 2011, TEXTURE BASED TUMOR, V2, P855

Lamlertthon W, 2011, CANCER J, V17, P451, DOI 10.1097/PPO.0b013e31823bd1f8

Lee TY, 2003, Q J NUCL MED, V47, P171

Leijenaar RTH, 2015, SCI REP-UK, V5, DOI 10.1038/srep11075

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Lin L, 2016, IEEE T CYBERNETICS, V46, P2796, DOI 10.1109/TCYB.2015.2489719

Ling SJ, 2014, CELL BIOCHEM BIOPHYS, V70, P629, DOI 10.1007/s12013-014-9966-8

Lu LJ, 2016, MOL IMAGING BIOL, V18, P935, DOI 10.1007/s11307-016-0973-6

Luczynska E, 2014, POL J PATHOL, V65, P229, DOI 10.5114/PJP.2014.45787

Maani R, 2013, PATTERN RECOGN, V46, P2103, DOI 10.1016/j.patcog.2013.01.014

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Materka Andrzej, 2004, Dialogues Clin Neurosci, V6, P243

Mayerhoefer ME, 2009, MED PHYS, V36, P1236, DOI 10.1118/1.3081408

Napolitano A., 2012, MATLAB A FUNDAMENTAL, V161, P178

Nesteruk M, 2015, RADIOTHER ONCOL, V117, P125, DOI 10.1016/j.radonc.2015.09.026

Niesten JM, 2014, EUR RADIOL, V24, P484, DOI 10.1007/s00330-013-3042-4

Orlhac F, 2014, J NUCL MED, V55, P414, DOI 10.2967/jnumed.113.129858

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Preda L, 2014, BIOMED RES INT, V2014, DOI 10.1155/2014/917150

Ramirez-Giraldo JC, 2013, AM J ROENTGENOL, V200, pW621, DOI 10.2214/AJR.12.9413

RAO AR, 1993, CVGIP-GRAPH MODEL IM, V55, P218

Studer G, 2013, STRAHLENTHER ONKOL, V189, P867, DOI 10.1007/s00066-013-0413-3

Tixier F, 2012, J NUCL MED, V53, P693, DOI 10.2967/jnumed.111.099127

van Elmpt W, 2013, RADIOTHER ONCOL, V109, P65, DOI 10.1016/j.radonc.2013.08.032

van Velden FHP, 2016, MOL IMAGING BIOL, V18, P788, DOI 10.1007/s11307-016-0940-2

Vaupel P, 2007, CANCER METAST REV, V26, P225, DOI 10.1007/s10555-007-9055-1

Veit-Haibach P, 2013, EUR RADIOL, V23, P163, DOI 10.1007/s00330-012-2564-5

Walter SD, 1998, STAT MED, V17, P101, DOI 10.1002/(SICI)1097-0258(19980115)17:1<101::AID-SIM727>3.0.CO;2-E

Wintermark M, 2004, AM J NEURORADIOL, V25, P720

Yan JH, 2015, J NUCL MED, V56, P1667, DOI 10.2967/jnumed.115.156927

Yang DL, 2015, MED PHYS, V42, P6725, DOI 10.1118/1.4934373

Yeung TPC, 2015, J NEURO-ONCOL, V123, P93, DOI 10.1007/s11060-015-1766-5

Yip SSF, 2016, PHYS MED BIOL, V61, pR150, DOI 10.1088/0031-9155/61/13/R150

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

NR 50

TC 42

Z9 43

U1 0

U2 18

PU IOP PUBLISHING LTD

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD DEC 21

PY 2016

VL 61

IS 24

BP 8736

EP 8749

DI 10.1088/1361-6560/61/24/8736

PG 14

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA FB3JQ

UT WOS:000406039200002

PM 27893446

DA 2022-08-24

ER

PT J

AU Hoover, DA

Capaldi, DPI

Sheikh, K

Palma, DA

Rodrigues, GB

Dar, AR

Yu, E

Dingle, B

Landis, M

Kocha, W

Sanatani, M

Vincent, M

Younus, J

Kuruvilla, S

Gaede, S

Parraga, G

Yaremko, BP

AF Hoover, Douglas A.

Capaldi, Dante P. I.

Sheikh, Khadija

Palma, David A.

Rodrigues, George B.

Dar, A. Rashid

Yu, Edward

Dingle, Brian

Landis, Mark

Kocha, Walter

Sanatani, Michael

Vincent, Mark

Younus, Jawaid

Kuruvilla, Sara

Gaede, Stewart

Parraga, Grace

Yaremko, Brian P.

TI Functional lung avoidance for individualized radiotherapy (FLAIR): study

protocol for a randomized, double-blind clinical trial

SO BMC CANCER

LA English

DT Article

DE Functional imaging; Radiotherapy; Non-small cell lung cancer; Helium-3

MRI; Quality of life

ID VOLUME HISTOGRAM PARAMETERS; CONCURRENT CHEMORADIATION; RADIATION

PNEUMONITIS; CANCER PATIENTS; STANDARDIZATION; CHEMOTHERAPY; PERFUSION;

RESECTION; THERAPY; ECOG

AB Background: Although radiotherapy is a key component of curative-intent treatment for locally advanced, unresectable non-small cell lung cancer (NSCLC), it can be associated with substantial pulmonary toxicity in some patients. Current radiotherapy planning techniques aim to minimize the radiation dose to the lungs, without accounting for regional variations in lung function. Many patients, particularly smokers, can have substantial regional differences in pulmonary ventilation patterns, and it has been hypothesized that preferential avoidance of functional lung during radiotherapy may reduce toxicity. Although several investigators have shown that functional lung can be identified using advanced imaging techniques and/or demonstrated the feasibility and theoretical advantages of avoiding functional lung during radiotherapy, to our knowledge this premise has never been tested via a prospective randomized clinical trial.

Methods/Design: Eligible patients will have Stage III NSCLC with intent to receive concurrent chemoradiotherapy (CRT). Every patient will undergo a pre-treatment functional lung imaging study using hyperpolarized He-3 MRI in order to identify the spatial distribution of normally-ventilated lung. Before randomization, two clinically-approved radiotherapy plans will be devised for all patients on trial, termed standard and avoidance. The standard plan will be designed without reference to the functional state of the lung, while the avoidance plan will be optimized such that dose to functional lung is as low as reasonably achievable. Patients will then be randomized in a 1:1 ratio to receive either the standard or the avoidance plan, with both the physician and the patient blinded to the randomization results. This study aims to accrue a total of 64 patients within two years. The primary endpoint will be a pulmonary quality of life (QOL) assessment at 3 months post-treatment, measured using the functional assessment of cancer therapy-lung cancer subscale. Secondary endpoints include: pulmonary QOL at other time-points, provider-reported toxicity, overall survival, progression-free survival, and quality-adjusted survival.

Discussion: This randomized, double-blind trial will comprehensively assess the impact of functional lung avoidance on pulmonary toxicity and quality of life in patients receiving concurrent CRT for locally advanced NSCLC.

C1 [Hoover, Douglas A.; Palma, David A.; Rodrigues, George B.; Dar, A. Rashid; Yu, Edward; Dingle, Brian; Gaede, Stewart; Yaremko, Brian P.] London Reg Canc Program, Dept Radiat Oncol, London, ON N6A 4L6, Canada.

[Hoover, Douglas A.; Palma, David A.; Rodrigues, George B.; Kocha, Walter; Sanatani, Michael; Vincent, Mark; Younus, Jawaid; Kuruvilla, Sara; Gaede, Stewart; Parraga, Grace; Yaremko, Brian P.] Univ Western Ontario, Dept Oncol, London, ON, Canada.

[Hoover, Douglas A.; Capaldi, Dante P. I.; Sheikh, Khadija; Gaede, Stewart; Parraga, Grace] Univ Western Ontario, Dept Med Biophys, London, ON, Canada.

[Capaldi, Dante P. I.; Sheikh, Khadija; Parraga, Grace] Robarts Res Inst, Imaging Res Labs, London, ON N6A 5B7, Canada.

[Landis, Mark] Univ Western Ontario, Dept Med Imaging, London, ON, Canada.

RP Yaremko, BP (通讯作者)，London Reg Canc Program, Dept Radiat Oncol, 790 Commissioners Rd E, London, ON N6A 4L6, Canada.

EM brian.yaremko@lhsc.on.ca

RI Parraga, Grace/K-6465-2013

OI Sheikh, Khadija/0000-0002-1168-1783

FU Ontario Thoracic Society/Canadian Lung Association; Ontario Institute

for Cancer Research by the Government of Ontario

FX We wish to thank Andrew Wheatley, BSc, and Sandra Blamires, CCRC, for

clinical coordination, pulmonary function tests, dispensing of gas doses

and data archival. We are also grateful to Trevor Szekeres, RMRT, for

MRI of research subjects. This study is funded by a Grant-in Aid from

the Ontario Thoracic Society/Canadian Lung Association (D.H., B.Y.),

along with funding from the Ontario Institute for Cancer Research

through funding provided by the Government of Ontario (D.A.P.). The

granting bodies are not involved in data collection or analysis.

CR Albain KS, 2009, LANCET, V374, P379, DOI 10.1016/S0140-6736(09)60737-6

Auchter RM, 2001, INT J RADIAT ONCOL, V50, P1199, DOI 10.1016/S0360-3016(01)01604-2

Bauman G, 2009, MAGN RESON MED, V62, P656, DOI 10.1002/mrm.22031

Cella D, 2002, J CLIN EPIDEMIOL, V55, P285, DOI 10.1016/S0895-4356(01)00477-2

Crapo RO, 2002, AM J RESP CRIT CARE, V166, P111, DOI 10.1164/rccm.166/1/111

Curran WJ, 2011, J NATL CANCER I, V103, P1452, DOI 10.1093/jnci/djr325

Ding K, 2010, MED PHYS, V37, P1261, DOI 10.1118/1.3312210

Fain S, 2010, J MAGN RESON IMAGING, V32, P1398, DOI 10.1002/jmri.22375

Hodge CW, 2010, MED DOSIM, V35, P297, DOI 10.1016/j.meddos.2009.09.004

Ireland RH, 2007, INT J RADIAT ONCOL, V68, P273, DOI 10.1016/j.ijrobp.2006.12.068

Jogi J, 2010, J NUCL MED, V51, P735, DOI 10.2967/jnumed.109.073957

Lavrenkov K, 2009, RADIOTHER ONCOL, V91, P349, DOI 10.1016/j.radonc.2008.10.005

MacIntyre N, 2005, EUR RESPIR J, V26, P720, DOI 10.1183/09031936.05.00034905

Mathew L, 2012, ACAD RADIOL, V19, P1546, DOI 10.1016/j.acra.2012.08.007

Mathew L, 2010, MED PHYS, V37, P22, DOI 10.1118/1.3263616

Miller MR, 2005, EUR RESPIR J, V26, P319, DOI 10.1183/09031936.05.00034805

Movsas B, 2013, INT J RADIAT ONCOL, V87, pS1, DOI 10.1016/j.ijrobp.2013.06.012

O'Rourke N, 2010, COCHRANE DB SYST REV, DOI 10.1002/14651858.CD002140.pub3

Palma DA, 2011, INT J RADIAT ONCOL, V85, P444

Parraga G, 2007, INVEST RADIOL, V42, P384, DOI 10.1097/01.rli.0000262571.81771.66

Patz S, 2008, ACAD RADIOL, V15, P713, DOI 10.1016/j.acra.2008.01.008

Pellegrino R, 2005, EUR RESPIR J, V26, P948, DOI 10.1183/09031936.05.00035205

Rodrigues G, 2004, RADIOTHER ONCOL, V71, P127, DOI 10.1016/j.radonc.2004.02.015

Shioyama Y, 2007, INT J RADIAT ONCOL, V68, P1349, DOI 10.1016/j.ijrobp.2007.02.015

SIEGL P, 1984, Zeitschrift fuer die Gesamte Hygiene und ihre Grenzgebiete, V30, P383

Soerjomataram I., 2013, GLOBOCAN

Tsujino K, 2003, INT J RADIAT ONCOL, V55, P110, DOI 10.1016/S0360-3016(02)03807-5

van Meerbeeck JP, 2007, JNCI-J NATL CANCER I, V99, P442, DOI 10.1093/jnci/djk093

Vinogradskiy YY, 2012, MED PHYS, V39, P289, DOI 10.1118/1.3668056

Wanger J, 2005, EUR RESPIR J, V26, P511, DOI 10.1183/09031936.05.00035005

Yaremko BP, 2007, INT J RADIAT ONCOL, V68, P562, DOI 10.1016/j.ijrobp.2007.01.044

NR 31

TC 35

Z9 36

U1 4

U2 13

PU BMC

PI LONDON

PA CAMPUS, 4 CRINAN ST, LONDON N1 9XW, ENGLAND

SN 1471-2407

J9 BMC CANCER

JI BMC Cancer

PD DEC 11

PY 2014

VL 14

AR 934

DI 10.1186/1471-2407-14-934

PG 10

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA AZ2OO

UT WOS:000348072900001

PM 25496482

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Tanaka, S

Kadoya, N

Kajikawa, T

Matsuda, S

Dobashi, S

Takeda, K

Jingu, K

AF Tanaka, Shohei

Kadoya, Noriyuki

Kajikawa, Tomohiro

Matsuda, Shohei

Dobashi, Suguru

Takeda, Ken

Jingu, Keiichi

TI Investigation of thoracic four-dimensional CT-based dimension reduction

technique for extracting the robust radiomic features

SO PHYSICA MEDICA-EUROPEAN JOURNAL OF MEDICAL PHYSICS

LA English

DT Article

DE Radiotherapy; Radiomics; 4D-CT; Lung cancer

ID CELL LUNG-CANCER; COMPUTED-TOMOGRAPHY; TEXTURAL FEATURES; TUMOR

PHENOTYPE; VARIABILITY; IMAGES; INFORMATION; IMPACT; MOTION

AB Robust feature selection in radiomic analysis is often implemented using the RIDER test-retest datasets. However, the CT Protocol between the facility and test-retest datasets are different. Therefore, we investigated possibility to select robust features using thoracic four-dimensional CT (4D-CT) scans that are available from patients receiving radiation therapy.

In 4D-CT datasets of 14 lung cancer patients who underwent stereotactic body radiotherapy (SBRT) and 14 test-retest datasets of non-small cell lung cancer (NSCLC), 1170 radiomic features (shape: n = 16, statistics: n = 32, texture: n = 1122) were extracted. A concordance correlation coefficient (CCC) > 0.85 was used to select robust features. We compared the robust features in various 4D-CT group with those in test-retest.

The total number of robust features was a range between 846/1170 (72%) and 970/1170 (83%) in all 4D-CT groups with three breathing phases (40%-60%); however, that was a range between 44/1170 (4%) and 476/ 1170 (41%) in all 4D-CT groups with 10 breathing phases. In test-retest, the total number of robust features was 967/1170 (83%); thus, the number of robust features in 4D-CT was almost equal to that in test-retest by using 40-60% breathing phases.

In 4D-CT, respiratory motion is a factor that greatly affects the robustness of features, thus by using only 40-60% breathing phases, excessive dimension reduction will be able to be prevented in any 4D-CT datasets, and select robust features suitable for CT protocol of your own facility.

C1 [Tanaka, Shohei; Kadoya, Noriyuki; Kajikawa, Tomohiro; Matsuda, Shohei; Jingu, Keiichi] Tohoku Univ, Dept Radiat Oncol, Grad Sch Med, Sendai, Miyagi, Japan.

[Dobashi, Suguru; Takeda, Ken] Tohoku Univ, Fac Med, Sch Hlth Sci, Dept Radiol Technol, Sendai, Miyagi, Japan.

RP Kadoya, N (通讯作者)，Tohoku Univ, Dept Radiat Oncol, Grad Sch Med, Aoba Ku, 1-1 Seiryo Machi, Sendai, Miyagi 9808574, Japan.

EM kadoya.n@rad.med.tohoku.ac.jp

RI Takeda, Ken/L-1914-2019

OI Tanaka, Shohei/0000-0002-4257-5342

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

Apte AP, 2018, MED PHYS

Castillo SJ, 2014, J APPL CLIN MED PHYS, V15, P190, DOI 10.1120/jacmp.v15i3.4718

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Coroller TP, 2016, RADIOTHER ONCOL, V119, P480, DOI 10.1016/j.radonc.2016.04.004

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

Ferreira JR, 2018, COMPUT METH PROG BIO, V159, P23, DOI 10.1016/j.cmpb.2018.02.015

Galloway MM., 1974, 75 NASA STI REC, P75, DOI DOI 10.1016/S0146-664X(75)80008-6

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Hatt M, 2018, J NUCL MED, V59

Huynh E, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169172

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Jensen GL, 2017, RADIOTHER ONCOL

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Larue RTHM, 2017, RADIOTHER ONCOL, V125, P147, DOI 10.1016/j.radonc.2017.07.023

Li Q, 2017, MED PHYS, V44, P4341, DOI 10.1002/mp.12309

LIN LI, 1989, BIOMETRICS, V45, P255, DOI 10.2307/2532051

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Mexner V, 2009, INT J RADIAT ONCOL, V74, P1266, DOI 10.1016/j.ijrobp.2009.02.073

Minohara S, 2000, INT J RADIAT ONCOL, V47, P1097, DOI 10.1016/S0360-3016(00)00524-1

Mutaf YD, 2007, MED PHYS, V34, P1615, DOI 10.1118/1.2717404

Oliver JA, 2015, TRANSL ONCOL, V8, P524, DOI 10.1016/j.tranon.2015.11.013

Ouyang FS, 2017, ONCOTARGET, V8, P74869, DOI 10.18632/oncotarget.20423

Pan T, 2004, MED PHYS, V31, P333, DOI 10.1118/1.1639993

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Rietzel E, 2005, MED PHYS, V32, P874, DOI 10.1118/1.1869852

Shafiq-ul-Hassan M, 2017, MED PHYS, V44, P1050, DOI 10.1002/mp.12123

STOECKER WV, 1992, COMPUT MED IMAG GRAP, V16, P179, DOI 10.1016/0895-6111(92)90072-H

Thibault G, 2014, IEEE T BIO-MED ENG, V61, P630, DOI 10.1109/TBME.2013.2284600

Tixier F, 2011, J NUCL MED, V52, P369, DOI 10.2967/jnumed.110.082404

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

van Velden FHP, 2016, MOL IMAGING BIOL, V18, P788, DOI 10.1007/s11307-016-0940-2

Watkins WT, 2010, MED PHYS, V37, P2855, DOI 10.1118/1.3432615

Yang JZ, 2016, COMPUT MED IMAG GRAP, V48, P1, DOI 10.1016/j.compmedimag.2015.12.001

Yip S, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0115510

Zhang B, 2017, CANCER LETT, V403, P21, DOI 10.1016/j.canlet.2017.06.004

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

Zhao BS, 2014, TRANSL ONCOL, V7, P88, DOI 10.1593/tlo.13865

Zhao BS, 2009, RADIOLOGY, V252, P263, DOI 10.1148/radiol.2522081593

Zwanenburg A, 2016, RADOLOGY, DOI DOI 10.1148/RADIOL.2020191145

NR 42

TC 11

Z9 11

U1 0

U2 2

PU ELSEVIER SCI LTD

PI OXFORD

PA THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

SN 1120-1797

EI 1724-191X

J9 PHYS MEDICA

JI Phys. Medica

PD FEB

PY 2019

VL 58

BP 141

EP 148

DI 10.1016/j.ejmp.2019.02.009

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA HN1CY

UT WOS:000459925900018

PM 30824145

OA Bronze

DA 2022-08-24

ER

PT J

AU El Naqa, I

Deasy, JO

Mu, Y

Huang, E

Hope, AJ

Lindsay, PE

Apte, A

Alaly, J

Bradley, JD

AF El Naqa, Issam

Deasy, Joseph O.

Mu, Yi

Huang, Ellen

Hope, Andrew J.

Lindsay, Patricia E.

Apte, Aditya

Alaly, James

Bradley, Jeffrey D.

TI Datamining approaches for modeling tumor control probability

SO ACTA ONCOLOGICA

LA English

DT Article

ID CELL LUNG-CANCER; LINEAR-QUADRATIC MODEL; DOSE-VOLUME;

RADIATION-THERAPY; RADIOTHERAPY; DISTRIBUTIONS; PREDICTIONS; CARCINOMA;

KINETICS; RISK

AB Background. Tumor control probability (TCP) to radiotherapy is determined by complex interactions between tumor biology, tumor microenvironment, radiation dosimetry, and patient-related variables. The complexity of these heterogeneous variable interactions constitutes a challenge for building predictive models for routine clinical practice. We describe a datamining framework that can unravel the higher order relationships among dosimetric dose-volume prognostic variables, interrogate various radiobiological processes, and generalize to unseen data before when applied prospectively. Material and methods. Several datamining approaches are discussed that include dose-volume metrics, equivalent uniform dose, mechanistic Poisson model, and model building methods using statistical regression and machine learning techniques. Institutional datasets of non-small cell lung cancer (NSCLC) patients are used to demonstrate these methods. The performance of the different methods was evaluated using bivariate Spearman rank correlations (rs). Over-fitting was controlled via resampling methods. Results. Using a dataset of 56 patients with primary NCSLC tumors and 23 candidate variables, we estimated GTV volume and V75 to be the best model parameters for predicting TCP using statistical resampling and a logistic model. Using these variables, the support vector machine (SVM) kernel method provided superior performance for TCP prediction with an rs=0.68 on leave-one-out testing compared to logistic regression (rs=0.4), Poisson-based TCP (rs=0.33), and cell kill equivalent uniform dose model (rs=0.17). Conclusions. The prediction of treatment response can be improved by utilizing datamining approaches, which are able to unravel important non-linear complex interactions among model variables and have the capacity to predict on unseen data for prospective clinical applications.

C1 [El Naqa, Issam; Deasy, Joseph O.; Mu, Yi; Huang, Ellen; Apte, Aditya; Alaly, James; Bradley, Jeffrey D.] Washington Univ, Sch Med, Dept Radiat Oncol, St Louis, MO 63110 USA.

[Hope, Andrew J.; Lindsay, Patricia E.] Princess Margaret Hosp, Dept Radiat Oncol, Toronto, ON M4X 1K9, Canada.

RP El Naqa, I (通讯作者)，Washington Univ, Sch Med, Dept Radiat Oncol, Campus Box 8224, St Louis, MO 63110 USA.

EM elnaqa@wustl.edu

RI Naqa, Issam El/T-3066-2019

OI Naqa, Issam El/0000-0001-6023-1132; Deasy, Joseph/0000-0002-9437-266X

FU NIH [K25 CA128809, R01 CA85181]; Varian Medical Systems and Tomotherapy,

Inc.; NATIONAL CANCER INSTITUTE [R01CA085181, K25CA128809] Funding

Source: NIH RePORTER

FX This work was supported in part by NIH grants K25 CA128809 and R01

CA85181. IEN and JOD receive financial support from Varian Medical

Systems and Tomotherapy, Inc.

CR Armstrong K, 2005, J CLIN ONCOL, V23, P9319, DOI 10.1200/JCO.2005.06.119

Brahme A, 1999, SEMIN RADIAT ONCOL, V9, P35, DOI 10.1016/S1053-4296(99)80053-8

Brenner DJ, 1998, RADIAT RES, V150, P83, DOI 10.2307/3579648

BRODIN O, 1991, ACTA ONCOL, V30, P967, DOI 10.3109/02841869109088251

Chen YY, 2005, INT J RADIAT ONCOL, V62, P260, DOI 10.1016/j.ijrobp.2005.01.041

Choi N, 2001, LUNG CANCER, V31, P43, DOI 10.1016/S0169-5002(00)00156-2

Dawson LA, 2005, INT J RADIAT ONCOL, V62, P829, DOI 10.1016/j.ijrobp.2004.11.013

De Crevoisier R, 2005, INT J RADIAT ONCOL, V62, P965, DOI 10.1016/j.ijrobp.2004.11.032

Deasy JO, 2003, MED PHYS, V30, P979, DOI 10.1118/1.1568978

Deasy JO, 2002, MED PHYS, V29, P2109, DOI 10.1118/1.1501473

DEASY JO, 2007, RAD ONCOLOGY ADV

Dewhirst MW, 2008, NAT REV CANCER, V8, P425, DOI 10.1038/nrc2397

El Naqa I, 2006, PHYS MED BIOL, V51, P5719, DOI 10.1088/0031-9155/51/22/001

El Naqa I, 2006, INT J RADIAT ONCOL, V64, P1275, DOI 10.1016/j.ijrobp.2005.11.022

ELNAQA I, 2008, INT C MACH LEARN APP

Elshaikh M, 2006, ANNU REV MED, V57, P19, DOI 10.1146/annurev.med.57.121304.131431

Good PI, 2006, RESAMPLING METHODS P

Guyon Isabelle, 2003, J MACH LEARN RES, V3, P1157, DOI DOI 10.1162/153244303322753616

Hall EJ, 2006, RADIOBIOLOGY RADIOLO

HANLEY JA, 1982, RADIOLOGY, V143, P29, DOI 10.1148/radiology.143.1.7063747

Hardle W., 2003, APPL MULTIVARIATE ST

Hastie T., 2009, ELEMENTS STAT LEARNI

Haykin S, 1999, NEURAL NETWORKS COMP

HOPE AJ, 2005, ASTR 47 ANN M DENV C, pS231

KALLMAN P, 1992, INT J RADIAT BIOL, V62, P249, DOI 10.1080/09553009214552071

Kennedy R. L., SOLVING DATA MINING, P199

Kirkpatrick JP, 2008, SEMIN RADIAT ONCOL, V18, P240, DOI 10.1016/j.semradonc.2008.04.005

Kirkpatrick JP, 2004, INT J RADIAT ONCOL, V58, P641, DOI 10.1016/j.ijrobp.2003.09.035

Kupelian PA, 1996, INT J RADIAT ONCOL, V36, P607, DOI 10.1016/S0360-3016(96)00364-1

Lea D E, 1946, ACTIONS RAD LIVING C

Levegrun S, 2000, INT J RADIAT ONCOL, V47, P1245, DOI 10.1016/S0360-3016(00)00572-1

Lindsay PE, 2007, MED PHYS, V34, P334, DOI 10.1118/1.2400826

Lori M, 2008, RADIOTHER ONCOL, V88, P34, DOI 10.1016/j.radonc.2008.03.003

Martel MK, 1999, LUNG CANCER-J IASLC, V24, P31, DOI 10.1016/S0169-5002(99)00019-7

MATTHEWS BW, 1975, BIOCHIM BIOPHYS ACTA, V405, P442, DOI 10.1016/0005-2795(75)90109-9

Mehta M, 2001, INT J RADIAT ONCOL, V49, P23, DOI 10.1016/S0360-3016(00)01374-2

Mendelsohn J., 2008, MOL BASIS CANC

MOISEENKO V, 2004, P 14 INT C US COMP R

Mu Y, 2008, INT J RADIAT ONCOL, V72, pS448, DOI 10.1016/j.ijrobp.2008.06.1829

MU Y, 2008, ASTRO 50 ANN M 2008, pS231

NIEMIERKO A, 1993, RADIOTHER ONCOL, V29, P140, DOI 10.1016/0167-8140(93)90239-5

Niemierko A, 1997, MED PHYS, V24, P103, DOI 10.1118/1.598063

OROURKE SF, 2008, J MATH BIOL

Park C, 2008, INT J RADIAT ONCOL, V70, P847, DOI 10.1016/j.ijrobp.2007.10.059

Pollack A, 2003, CANCER-AM CANCER SOC, V97, P1630, DOI 10.1002/cncr.11230

Sachs RK, 1997, INT J RADIAT BIOL, V72, P351

SCHEOLKOPF B, 2002, LEARNING KERNELS SUP

Schinkel C, 2007, INT J RADIAT ONCOL, V69, P1323, DOI 10.1016/j.ijrobp.2007.07.2355

Shawe-Taylor J., 2004, KERNEL METHODS PATTE, DOI 10.1017/CBO9780511809682

Sprent P, 2001, APPL NONPARAMETRIC S

Vapnik V., 1998, STAT LEARNING THEORY, V1, P2

WEBB S, 1993, PHYS MED BIOL, V38, P653, DOI 10.1088/0031-9155/38/6/001

WEBB S, 1997, ADV TECHNOLOGY

Weinstein M C, 2001, Value Health, V4, P348, DOI 10.1046/j.1524-4733.2001.45061.x

Werner-Wasik M, 2001, INT J RADIAT ONCOL, V51, P56, DOI 10.1016/S0360-3016(01)01615-7

Willner J, 2002, INT J RADIAT ONCOL, V52, P382, DOI 10.1016/S0360-3016(01)01823-5

Zaider M, 2000, PHYS MED BIOL, V45, P279, DOI 10.1088/0031-9155/45/2/303

Zhao LJ, 2007, INT J RADIAT ONCOL, V68, P103, DOI 10.1016/j.ijrobp.2006.11.051

NR 58

TC 30

Z9 32

U1 0

U2 26

PU TAYLOR & FRANCIS LTD

PI ABINGDON

PA 2-4 PARK SQUARE, MILTON PARK, ABINGDON OR14 4RN, OXON, ENGLAND

SN 0284-186X

EI 1651-226X

J9 ACTA ONCOL

JI Acta Oncol.

PD NOV

PY 2010

VL 49

IS 8

BP 1363

EP 1373

DI 10.3109/02841861003649224

PG 11

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA 665WA

UT WOS:000283065400020

PM 20192878

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Kishi, N

Matsuo, Y

Menju, T

Hamaji, M

Nakakura, A

Hanazawa, H

Takehana, K

Date, H

Mizowaki, T

AF Kishi, Noriko

Matsuo, Yukinori

Menju, Toshi

Hamaji, Masatsugu

Nakakura, Akiyoshi

Hanazawa, Hideki

Takehana, Keiichi

Date, Hiroshi

Mizowaki, Takashi

TI Propensity score-based analysis of stereotactic body radiotherapy,

lobectomy and sublobar resection for stage I non-small cell lung cancer

SO JOURNAL OF RADIATION RESEARCH

LA English

DT Article; Early Access

DE Overall survival (OS); local recurrence (LR); distant recurrence (DR);

non-lung cancer death; shared decision-making

ID ADJUVANT CHEMOTHERAPY; MULTIPLE TREATMENTS; DISTANT METASTASES; THORACIC

SURGEONS; LOCAL RECURRENCE; HIGH-RISK; SURVIVAL; SOCIETY

AB We applied two propensity score-based analyses to simultaneously compare three treatment modalities-stereotactic body radiotherapy (SBRT), lobectomy, or sublobar resection (SLR)-for stage I non-small cell lung cancer (NSCLC), with the aim of clarifying the average treatment effect (ATE) and formulating a risk-adapted approach to treatment selection. A retrospective review of 823 patients aged >= 65 years who underwent SBRT, lobectomy, or SLR for stage I NSCLC was conducted. The following two analyses using machine learning-based propensity scores were performed: (i) propensity score weighting (PSW) to assess the ATE in the entire cohort, and (ii) propensity score subclassification (PSS) to evaluate treatment effects of subgroups. PSW showed no significant difference in the 5-year overall survival (OS) between SBRT and SLR (60.0% vs 61.2%; P = 0.70) and significant difference between SBRT and lobectomy (60.0% vs 77.6%; P = 0.026). Local (LR) and distant recurrence (DR) rates were significantly lower in lobectomy than in SBRT, whereas there was no significant difference between SBRT and SLR. PSS identified four subgroups with different patient characteristics: lobectomy-oriented (5-year cumulative incidences of non-lung cancer death, 7.5%), SLR-oriented (14.2%), SBRT-oriented (23.8%) and treatment-neutral subgroups (16.1%). Each subgroup showed different survival trends regarding the three treatments. The ATE of SBRT was not significantly different from that of SLR, but it was inferior to lobectomy. Four subgroups with different risks of non-lung cancer death and different survival trends for each treatment were identified. These would help decision-making for patients with stage I NSCLC.

C1 [Kishi, Noriko; Matsuo, Yukinori; Hanazawa, Hideki; Takehana, Keiichi; Mizowaki, Takashi] Kyoto Univ, Grad Sch Med, Dept Radiat Oncol & Image Appl Therapy, Sakyo Ku, 54 Shogoin Kawahara Cho, Kyoto 6068507, Japan.

[Menju, Toshi; Hamaji, Masatsugu; Date, Hiroshi] Kyoto Univ, Grad Sch Med, Dept Thorac Surg, Sakyo Ku, 54 Shogoin Kawahara Cho, Kyoto 6068507, Japan.

[Nakakura, Akiyoshi] Kyoto Univ, Grad Sch Med, Dept Biomed Stat & Bioinformat, Sakyo Ku, 54 Shogoin Kawahara Cho, Kyoto 6068507, Japan.

RP Matsuo, Y (通讯作者)，Kyoto Univ, Grad Sch Med, Dept Radiat Oncol & Image Appl Therapy, Sakyo Ku, 54 Shogoin Kawahara Cho, Kyoto 6068507, Japan.

EM ymatsuo@kuhp.kyoto-u.ac.jp

RI Matsuo, Yukinori/O-6200-2014; Kishi, Noriko/AAV-5188-2020

OI Matsuo, Yukinori/0000-0002-4372-8259; Kishi, Noriko/0000-0001-5007-8808

FU Japan Agency for Medical Research and Development (AMED) [JP20ck0106626]

FX This work was supported by the Japan Agency for Medical Research and

Development (AMED) [grant number JP20ck0106626].

CR Auperin A, 2010, LANCET, V375, P1267, DOI 10.1016/S0140-6736(10)60059-1

Austin PC, 2011, MULTIVAR BEHAV RES, V46, P399, DOI 10.1080/00273171.2011.568786

Bray F, 2018, CA-CANCER J CLIN, V68, P394, DOI 10.3322/caac.21492

Cao C, 2019, J THORAC CARDIOV SUR, V157, P362, DOI 10.1016/j.jtcvs.2018.08.075

Chang JY, 2015, LANCET ONCOL, V16, P630, DOI 10.1016/S1470-2045(15)70168-3

CHARLSON ME, 1987, J CHRON DIS, V40, P373, DOI 10.1016/0021-9681(87)90171-8

Donington J, 2012, CHEST, V142, P1620, DOI 10.1378/chest.12-0790

Elze MC, 2017, J AM COLL CARDIOL, V69, P345, DOI 10.1016/j.jacc.2016.10.060

Franks KN, 2020, EUR RESPIR J, V56, DOI 10.1183/13993003.00118-2020

Hamaji M, 2015, ANN THORAC SURG, V99, P1122, DOI 10.1016/j.athoracsur.2014.11.009

Hong GL, 2012, PSYCHOL METHODS, V17, P44, DOI 10.1037/a0024918

Hopmans W, 2016, PATIENT EDUC COUNS, V99, P1808, DOI 10.1016/j.pec.2016.05.017

Hopmans W, 2015, RADIOTHER ONCOL, V115, P361, DOI 10.1016/j.radonc.2015.05.006

Junginger T, 2019, ANTICANCER RES, V39, P3079, DOI 10.21873/anticanres.13443

Kato H, 2004, NEW ENGL J MED, V350, P1713, DOI 10.1056/NEJMoa032792

Kimura T, 2017, JPN J CLIN ONCOL, V47, P277, DOI 10.1093/jjco/hyw198

MARTINI N, 1975, J THORAC CARDIOV SUR, V70, P606

Matsuo Y, 2014, EUR J CANCER, V50, P2932, DOI 10.1016/j.ejca.2014.09.006

Matsuo Y, 2011, INT J RADIAT ONCOL, V79, P1104, DOI 10.1016/j.ijrobp.2009.12.022

McCaffrey DF, 2013, STAT MED, V32, P3388, DOI 10.1002/sim.5753

Mokhles S, 2018, BMC CANCER, V18, DOI 10.1186/s12885-018-3986-5

Mokhles S, 2017, INTERACT CARDIOV TH, V25, P278, DOI 10.1093/icvts/ivx103

Moreno AC, 2020, J THORAC ONCOL, V15, P101, DOI 10.1016/j.jtho.2019.08.2505

National Comprehensive Cancer Network, 2021, ANN SURG

Onishi H, 2007, J THORAC ONCOL, V2, pS94, DOI 10.1097/JTO.0b013e318074de34

Postmus PE, 2017, ANN ONCOL, V28, P1, DOI 10.1093/annonc/mdx222

Saito T., 2021, J THORAC CARDIOVASC, P1311

Saji H, 2022, LANCET, V399, P1607, DOI 10.1016/S0140-6736(21)02333-3

Schemper M, 1996, CONTROL CLIN TRIALS, V17, P343, DOI 10.1016/0197-2456(96)00075-X

Schneider BJ, 2018, J CLIN ONCOL, V36, P710, DOI 10.1200/JCO.2017.74.9671

Sullivan DR, 2019, LUNG CANCER, V131, P47, DOI 10.1016/j.lungcan.2019.03.009

Suzuki K, 2002, ANN THORAC SURG, V74, P1635, DOI 10.1016/S0003-4975(02)03895-X

Takayama K, 2005, INT J RADIAT ONCOL, V61, P1565, DOI 10.1016/j.ijrobp.2004.12.066

Vicini FA, 2003, CANCER, V97, P910, DOI 10.1002/cncr.11143

Zhang BL, 2014, RADIOTHER ONCOL, V112, P250, DOI 10.1016/j.radonc.2014.08.031

Zheng XP, 2014, INT J RADIAT ONCOL, V90, P603, DOI 10.1016/j.ijrobp.2014.05.055

NR 36

TC 0

Z9 0

U1 0

U2 0

PU OXFORD UNIV PRESS

PI OXFORD

PA GREAT CLARENDON ST, OXFORD OX2 6DP, ENGLAND

SN 0449-3060

EI 1349-9157

J9 J RADIAT RES

JI J. Radiat. Res.

DI 10.1093/jrr/rrac041

EA JUL 2022

PG 14

WC Biology; Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Life Sciences & Biomedicine - Other Topics; Oncology; Radiology, Nuclear

Medicine & Medical Imaging

GA 2U2JI

UT WOS:000822986500001

PM 35818291

OA gold

DA 2022-08-24

ER

PT J

AU Kakino, R

Nakamura, M

Mitsuyoshi, T

Shintani, T

Kokubo, M

Negoro, Y

Fushiki, M

Ogura, M

Itasaka, S

Yamauchi, C

Otsu, S

Sakamoto, T

Sakamoto, M

Araki, N

Hirashima, H

Adachi, T

Matsuo, Y

Mizowaki, T

AF Kakino, Ryo

Nakamura, Mitsuhiro

Mitsuyoshi, Takamasa

Shintani, Takashi

Kokubo, Masaki

Negoro, Yoshiharu

Fushiki, Masato

Ogura, Masakazu

Itasaka, Satoshi

Yamauchi, Chikako

Otsu, Shuji

Sakamoto, Takashi

Sakamoto, Masato

Araki, Norio

Hirashima, Hideaki

Adachi, Takanori

Matsuo, Yukinori

Mizowaki, Takashi

TI Application and limitation of radiomics approach to prognostic

prediction for lung stereotactic body radiotherapy using breath-hold CT

images with random survival forest: A multi-institutional study

SO MEDICAL PHYSICS

LA English

DT Article

DE distant metastasis; NSCLC; radiomics; random survival forest; SBRT

ID RADIATION-THERAPY; STAGE-I; ABLATIVE RADIOTHERAPY; CANCER; FEATURES;

PHASE; TRIAL

AB Purpose To predict local recurrence (LR) and distant metastasis (DM) in early stage non-small cell lung cancer (NSCLC) patients after stereotactic body radiotherapy (SBRT) in multiple institutions using breath-hold computed tomography (CT)-based radiomic features with random survival forest. Methods A total of 573 primary early stage NSCLC patients who underwent SBRT between January 2006 and March 2016 and met the eligibility criteria were included in this study. Patients were divided into two datasets: training (464 patients in 10 institutions) and test (109 patients in one institution) datasets. A total of 944 radiomic features were extracted from manually segmented gross tumor volumes (GTVs). Feature selection was performed by analyzing inter-segmentation reproducibility, GTV correlation, and inter-feature redundancy. Nine clinical factors, including histology and GTV size, were also used. Three prognostic models (clinical, radiomic, and combined) for LR and DM were constructed using random survival forest (RSF) to deal with total death as a competing risk in the training dataset. Robust models with optimal hyper-parameters were determined using fivefold cross-validation. The patients were dichotomized into two groups based on the median value of the patient-specific risk scores (high- and low-risk score groups). Gray's test was used to evaluate the statistical significance between the two risk score groups. The prognostic power was evaluated by the concordance index with the 95% confidence intervals (CI) via bootstrapping (2000 iterations). Results The concordance indices at 3 yr of clinical, radiomic, and combined models for LR were 0.57 [CI: 0.39-0.75], 0.55 [CI: 0.38-0.73], and 0.61 [CI: 0.43-0.78], respectively, whereas those for DM were 0.59 [CI: 0.54-0.79], 0.67 [CI: 0.54-0.79], and 0.68 [CI: 0.55-0.81], respectively, in the test dataset. The combined DM model significantly discriminated its cumulative incidence between high- and low-risk score groups (P < 0.05). The variable importance of RSF in the combined model for DM indicated that two radiomic features were more important than other clinical factors. The feature maps generated on the basis of the most important radiomic feature had visual difference between high- and low-risk score groups. Conclusions The radiomics approach with RSF for competing risks using breath-hold CT-based radiomic features might predict DM in early stage NSCLC patients who underwent SBRT although that may not have potential to predict LR.

C1 [Kakino, Ryo; Nakamura, Mitsuhiro; Adachi, Takanori] Kyoto Univ, Div Med Phys, Dept Informat Technol & Med Engn, Human Hlth Sci,Grad Sch Med,Sakyo Ku, 53 Shogoin Kawahara Cho, Kyoto 6068507, Japan.

[Kakino, Ryo; Nakamura, Mitsuhiro; Mitsuyoshi, Takamasa; Shintani, Takashi; Hirashima, Hideaki; Adachi, Takanori; Matsuo, Yukinori; Mizowaki, Takashi] Kyoto Univ Hosp, Dept Radiat Oncol & Image Appl Therapy, Sakyo Ku, 54 Shogoin Kawahara Cho, Kyoto 6068507, Japan.

[Kakino, Ryo; Hirashima, Hideaki] Japan Soc Promot Sci, Chiyoda Ku, 5-3-1 Kojimachi, Tokyo 1020083, Japan.

[Mitsuyoshi, Takamasa; Kokubo, Masaki] Kobe City Med Ctr Gen Hosp, Dept Radiat Oncol, Chuo Ku, 2-1-1 Minatojimaminamimachi, Kobe, Hyogo 6500047, Japan.

[Shintani, Takashi; Sakamoto, Masato] Japanese Red Cross Fukui Hosp, Dept Radiol, 2-4-1 Tsukimi, Fukui 9188501, Japan.

[Negoro, Yoshiharu] Tenri Hosp, Dept Radiol, 200 Mishima Cho, Tenri, Nara 6328552, Japan.

[Fushiki, Masato] Nagahama City Hosp, Dept Radiat Oncol, 313 Oinui Cho, Nagahama, Shiga 5260043, Japan.

[Ogura, Masakazu] Kishiwada City Hosp, Dept Radiat Oncol, 1001 Gakuhara Cho, Kishiwada, Osaka 5968501, Japan.

[Itasaka, Satoshi] Kurashiki Cent Hosp, Dept Radiat Oncol, 1-1-1 Miwa, Kurashiki, Okayama 7108602, Japan.

[Yamauchi, Chikako] Shiga Gen Hosp, Dept Radiat Oncol, 5-4-30 Moriyama, Moriyama, Shiga 5248524, Japan.

[Otsu, Shuji] Kyoto City Hosp, Dept Radiat Oncol, Nakagyo Ku, 1-2 Mibuhigashitakada Cho, Kyoto 6048845, Japan.

[Sakamoto, Takashi] Kyoto Katsura Hosp, Dept Radiat Oncol, Nishikyo Ku, 17 Yamadahirao Cho, Kyoto 6158256, Japan.

[Araki, Norio] Natl Hosp Org Kyoto Med Ctr, Dept Radiat Oncol, Fushimi Ku, 1-1 Fukakusamukaihata Cho, Kyoto 6128555, Japan.

RP Nakamura, M (通讯作者)，Kyoto Univ, Div Med Phys, Dept Informat Technol & Med Engn, Human Hlth Sci,Grad Sch Med,Sakyo Ku, 53 Shogoin Kawahara Cho, Kyoto 6068507, Japan.; Nakamura, M (通讯作者)，Kyoto Univ Hosp, Dept Radiat Oncol & Image Appl Therapy, Sakyo Ku, 54 Shogoin Kawahara Cho, Kyoto 6068507, Japan.

EM m\_nkmr@kuhp.kyoto-u.ac.jp

RI Matsuo, Yukinori/O-6200-2014

OI Matsuo, Yukinori/0000-0002-4372-8259; Adachi,

Takanori/0000-0003-1356-5118; Nakamura, Mitsuhiro/0000-0002-6406-2097;

Kakino, Ryo/0000-0001-7767-9216

FU Japan Society for the Promotion of Science [19J14339, 2019-2021]; Takeda

Science Foundation

FX This study was supported by the Japan Society for the Promotion of

Science Grant-in-Aid for JSPS fellows [grant number 19J14339; 2019-2021]

and the Takeda Science Foundation. The authors are grateful to all the

members of the Kyoto Radiation Oncology Study Group (KROSG) for

providing patient data and to Nakamura Laboratory researchers

(http://medicalphysics.hs.med.kyoto-u.ac.jp/) for their valuable

comments and discussions.

CR Ackerson BG, 2018, LUNG CANCER, V125, P185, DOI 10.1016/j.lungcan.2018.09.020

Avanzo M, 2017, PHYS MEDICA, V38, P122, DOI 10.1016/j.ejmp.2017.05.071

Baker S, 2019, ACTA ONCOL, V58, P237, DOI 10.1080/0284186X.2018.1532602

Baumann P, 2009, J CLIN ONCOL, V27, P3290, DOI 10.1200/JCO.2008.21.5681

Bernstein MB, 2016, NAT REV CLIN ONCOL, V13, P516, DOI 10.1038/nrclinonc.2016.30

Cerra-Franco A, 2019, CLIN LUNG CANCER, V20, P186, DOI 10.1016/j.cllc.2018.12.016

Chen X, 2012, GENOMICS, V99, P323, DOI 10.1016/j.ygeno.2012.04.003

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Dreyer J, 2018, RADIAT ONCOL, V13, DOI 10.1186/s13014-018-1156-1

HATT M, 2018, J NUCL MED S1, V59

Horner-Rieber J, 2017, RADIOTHER ONCOL, V125, P317, DOI 10.1016/j.radonc.2017.08.029

Hof H, 2007, CANCER-AM CANCER SOC, V110, P148, DOI 10.1002/cncr.22763

Howington JA, 2013, CHEST, V143, pE278, DOI 10.1378/chest.12-2359

Huang K, 2013, RADIOTHER ONCOL, V109, P51, DOI 10.1016/j.radonc.2013.06.047

Huynh E, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169172

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Ishwaran H, 2008, ANN APPL STAT, V2, P841, DOI 10.1214/08-AOAS169

Ishwaran H, 2007, ELECTRON J STAT, V1, P519, DOI 10.1214/07-EJS039

Kakino R, 2020, PHYS MEDICA, V69, P176, DOI 10.1016/j.ejmp.2019.12.019

Lafata K, 2018, PHYS MED BIOL, V63, DOI 10.1088/1361-6560/aae56a

Lafata KJ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf5a5

Larue RTHM, 2017, BRIT J RADIOL, V90, DOI 10.1259/bjr.20160665

Li Q, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0892-y

Li SL, 2018, MED IMAGE ANAL, V50, P106, DOI 10.1016/j.media.2018.09.004

Mackin D, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-20713-6

Mitsuyoshi T, 2018, CLIN LUNG CANCER, V19, pE287, DOI 10.1016/j.cllc.2017.11.008

Molina JR, 2008, MAYO CLIN PROC, V83, P584, DOI 10.4065/83.5.584

Nagata Y, 2015, INT J RADIAT ONCOL, V93, P989, DOI 10.1016/j.ijrobp.2015.07.2278

Oliver JA, 2015, TRANSL ONCOL, V8, P524, DOI 10.1016/j.tranon.2015.11.013

Peeken JC, 2018, PHYS MEDICA, V48, P27, DOI 10.1016/j.ejmp.2018.03.012

Ricardi U, 2010, LUNG CANCER, V68, P72, DOI 10.1016/j.lungcan.2009.05.007

Scrivener M, 2016, TRANSL CANCER RES, V5, P398, DOI 10.21037/tcr.2016.06.18

Shafiq-ul-Hassan M, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-28895-9

Siegel RL, 2022, CA-CANCER J CLIN, V72, P7, DOI [10.3322/caac.21332, 10.3322/caac.21708, 10.3322/caac.21551]

Southern DA, 2006, J CLIN EPIDEMIOL, V59, P1110, DOI 10.1016/j.jclinepi.2006.07.002

Sun B, 2017, CANCER-AM CANCER SOC, V123, P3031, DOI 10.1002/cncr.30693

Takeshita J, 2015, ANTICANCER RES, V35, P3103

Thawani R, 2018, LUNG CANCER, V115, P34, DOI 10.1016/j.lungcan.2017.10.015

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Welch ML, 2019, RADIOTHER ONCOL, V130, P2, DOI 10.1016/j.radonc.2018.10.027

Wolbers M, 2014, BIOSTATISTICS, V15, P526, DOI 10.1093/biostatistics/kxt059

Yu W, 2018, INT J RADIAT ONCOL, V102, P1090, DOI 10.1016/j.ijrobp.2017.10.046

NR 43

TC 11

Z9 11

U1 1

U2 6

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD SEP

PY 2020

VL 47

IS 9

BP 4634

EP 4643

DI 10.1002/mp.14380

EA AUG 2020

PG 10

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA NT0IY

UT WOS:000554392300001

PM 32645224

OA Bronze

DA 2022-08-24

ER

PT J

AU Fave, X

Mackin, D

Yang, JZ

Zhang, J

Fried, D

Balter, P

Followill, D

Gomez, D

Jones, AK

Stingo, F

Fontenot, J

Court, L

AF Fave, Xenia

Mackin, Dennis

Yang, Jinzhong

Zhang, Joy

Fried, David

Balter, Peter

Followill, David

Gomez, Daniel

Jones, A. Kyle

Stingo, Francesco

Fontenot, Jonas

Court, Laurence

TI Can radiomics features be reproducibly measured from CBCT images for

patients with non-small cell lung cancer?

SO MEDICAL PHYSICS

LA English

DT Article

DE texture; quantitative imaging features; reproducibility; cone-beam CT

ID COMPUTED-TOMOGRAPHY; TEXTURAL FEATURES; CT TEXTURE; TUMOR HETEROGENEITY;

RADIATION-THERAPY; PROGNOSTIC VALUE; SURVIVAL; PREDICTS; MOTION; VOLUME

AB Purpose: Increasing evidence suggests radiomics features extracted from computed tomography (CT) images may be useful in prognostic models for patients with nonsmall cell lung cancer (NSCLC). This study was designed to determine whether such features can be reproducibly obtained from cone-beam CT (CBCT) images taken using medical Linac onboard-imaging systems in order to track them through treatment.

Methods: Test-retest CBCT images of ten patients previously enrolled in a clinical trial were retrospectively obtained and used to determine the concordance correlation coefficient (CCC) for 68 different texture features. The volume dependence of each feature was also measured using the Spearman rank correlation coefficient. Features with a high reproducibility (CCC > 0.9) that were not due to volume dependence in the patient test-retest set were further examined for their sensitivity to differences in imaging protocol, level of scatter, and amount of motion by using two phantoms. The first phantom was a texture phantom composed of rectangular cartridges to represent different textures. Features were measured from two cartridges, shredded rubber and dense cork, in this study. The texture phantom was scanned with 19 different CBCT imagers to establish the features' interscanner variability. The effect of scatter on these features was studied by surrounding the same texture phantom with scattering material (rice and solid water). The effect of respiratory motion on these features was studied using a dynamic-motion thoracic phantom and a specially designed tumor texture insert of the shredded rubber material. The differences between scans acquired with different Linacs and protocols, varying amounts of scatter, and with different levels of motion were compared to the mean intrapatient difference from the test-retest image set.

Results: Of the original 68 features, 37 had a CCC > 0.9 that was not due to volume dependence. When the Linac manufacturer and imaging protocol were kept consistent, 4-13 of these 37 features passed our criteria for reproducibility more than 50% of the time, depending on the manufacturer-protocol combination. Almost all of the features changed substantially when scatter material was added around the phantom. For the dense cork, 23 features passed in the thoracic scans and 11 features passed in the head scans when the differences between one and two layers of scatter were compared. Using the same test for the shredded rubber, five features passed the thoracic scans and eight features passed the head scans. Motion substantially impacted the reproducibility of the features. With 4 mm of motion, 12 features from the entire volume and 14 features from the center slice measurements were reproducible. With 6-8 mm of motion, three features (Laplacian of Gaussian filtered kurtosis, gray-level nonuniformity, and entropy), from the entire volume and seven features (coarseness, high gray-level run emphasis, gray-level nonuniformity, sum-average, information measure correlation, scaled mean, and entropy) from the center-slice measurements were considered reproducible.

Conclusions: Some radiomics features are robust to the noise and poor image quality of CBCT images when the imaging protocol is consistent, relative changes in the features are used, and patients are limited to those with less than 1 cm of motion. (C) 2015 American Association of Physicists in Medicine.

C1 [Fave, Xenia; Mackin, Dennis; Yang, Jinzhong; Zhang, Joy; Fried, David; Balter, Peter; Followill, David; Court, Laurence] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Houston, TX 77030 USA.

[Fave, Xenia; Fried, David] Univ Texas Grad Sch Biomed Sci Houston, Houston, TX 77030 USA.

[Gomez, Daniel] Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Houston, TX 77030 USA.

[Jones, A. Kyle; Court, Laurence] Univ Texas MD Anderson Canc Ctr, Dept Imaging Phys, Houston, TX 77030 USA.

[Stingo, Francesco] Univ Texas MD Anderson Canc Ctr, Dept Biostat, Houston, TX 77030 USA.

[Fontenot, Jonas] Mary Bird Perkins Canc Ctr, Baton Rouge, LA 70809 USA.

RP Fave, X (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, 1515 Holcombe Blvd, Houston, TX 77030 USA.

EM xjfave@mdanderson.org

RI Stingo, Francesco/N-6514-2019; Stingo, Francesco/D-9475-2017; Mackin,

Dennis/Y-1503-2019

OI Stingo, Francesco/0000-0001-9150-8552; Stingo,

Francesco/0000-0001-9150-8552; Ray, Xenia/0000-0003-0150-0843; Yang,

Jinzhong/0000-0002-9254-4501; Court, Laurence/0000-0002-3241-6145

FU NCI [R03CA178495-01]; AAPM RSNA; NATIONAL CANCER INSTITUTE [U24CA180803,

R03CA178495, P30CA016672] Funding Source: NIH RePORTER

FX The authors would like to acknowledge the medical physics residents at

Mary Bird Perkins Cancer Center for their help acquiring many of the

texture phantom scans; Kelly Thorp for his help shaping the texture

insert for the motion phantom; Ramesh Tailor, Ph.D. for the loan of rice

as scatter material for the scans, and Kathryn Carnes from the

Department of Scientific Publications for her help in revising this

manuscript. This project was funded in part by a grant from the NCI (No.

R03CA178495-01). Xenia Fave is a recipient of the AAPM & RSNA graduate

fellowship.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ahn SY, 2015, INVEST RADIOL, V50, P719, DOI 10.1097/RLI.0000000000000174

Al-Kadi OS, 2008, IEEE T BIO-MED ENG, V55, P1822, DOI 10.1109/TBME.2008.919735

AMADASUN M, 1989, IEEE T SYST MAN CYB, V19, P1264, DOI 10.1109/21.44046

Balagurunathan Y, 2014, TRANSL ONCOL, V7, P72, DOI 10.1593/tlo.13844

Basu S, 2011, IEEE SYS MAN CYBERN, P1306, DOI 10.1109/ICSMC.2011.6083840

Bayanati H, 2015, EUR RADIOL, V25, P480, DOI 10.1007/s00330-014-3420-6

Chao KSC, 2007, INT J RADIAT ONCOL, V68, P1512, DOI 10.1016/j.ijrobp.2007.04.037

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Fried D. V., RADIOLOGY

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Ganeshan B, 2010, CANCER IMAGING, V10, P137, DOI 10.1102/1470-7330.2010.0021

Gevaert O, 2012, RADIOLOGY, V264, P387, DOI 10.1148/radiol.12111607

Grove O, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0118261

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Hunter LA, 2013, MED PHYS, V40, DOI 10.1118/1.4829514

Jabbour SK, 2015, INT J RADIAT ONCOL, V92, P627, DOI 10.1016/j.ijrobp.2015.02.017

Jones AK, 2012, MED PHYS, V39, P4149, DOI 10.1118/1.4725711

Kishi T, 2015, INT J RADIAT ONCOL, V92, P619, DOI 10.1016/j.ijrobp.2015.02.018

Kris MG, 2014, JAMA-J AM MED ASSOC, V311, P1998, DOI 10.1001/jama.2014.3741

Liu HH, 2007, INT J RADIAT ONCOL, V68, P531, DOI 10.1016/j.ijrobp.2006.12.066

Lujan AE, 1999, MED PHYS, V26, P715, DOI 10.1118/1.598577

Machtay M, 2013, J CLIN ONCOL, V31, P3823, DOI 10.1200/JCO.2012.47.5947

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

McBride G. B., 2005, PROPOSAL STRENGTH OF

MD Anderson Cancer Center, 2000, IM GUID AD CONF PHOT

Molina JR, 2008, MAYO CLIN PROC, V83, P584, DOI 10.4065/83.5.584

Mukaka MM, 2012, MALAWI MED J, V24, P69

National Cancer Institute, 2014, SEER STAT FACT SHEET

Seppenwoolde Y, 2002, INT J RADIAT ONCOL, V53, P822, DOI 10.1016/S0360-3016(02)02803-1

Wang H, 2005, INT J RADIAT ONCOL, V61, P725, DOI 10.1016/j.ijrobp.2004.07.677

Wang H, 2010, EUR J RADIOL, V74, P124, DOI 10.1016/j.ejrad.2009.01.024

Weiss GJ, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0100244

Win T, 2013, CLIN CANCER RES, V19, P3591, DOI 10.1158/1078-0432.CCR-12-1307

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

Zou KH, 2003, RADIOLOGY, V227, P617, DOI 10.1148/radiol.2273011499

NR 41

TC 110

Z9 118

U1 0

U2 50

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD DEC

PY 2015

VL 42

IS 12

BP 6784

EP 6797

DI 10.1118/1.4934826

PG 14

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA DB1BX

UT WOS:000368244100003

PM 26632036

OA Green Published

DA 2022-08-24

ER

PT J

AU Orlhac, F

Soussan, M

Chouahnia, K

Martinod, E

Buvat, I

AF Orlhac, Fanny

Soussan, Michael

Chouahnia, Kader

Martinod, Emmanuel

Buvat, Irene

TI 18F-FDG PET-Derived Textural Indices Reflect Tissue-Specific Uptake

Pattern in Non-Small Cell Lung Cancer

SO PLOS ONE

LA English

DT Article

ID PATHOLOGICAL RESPONSE; ESOPHAGEAL CANCER; FEATURES; HETEROGENEITY;

IMAGES; RADIOTHERAPY; PARAMETERS; RADIOMICS; SURVIVAL; VOLUMES

AB Purpose

Texture indices (TI) calculated from 18F-FDG PET tumor images show promise for predicting response to therapy and survival. Their calculation involves a resampling of standardized uptake values (SUV) within the tumor. This resampling can be performed differently and significantly impacts the TI values. Our aim was to investigate how the resampling approach affects the ability of TI to reflect tissue-specific pattern of metabolic activity.

Methods

18F-FDG PET were acquired for 48 naive-treatment patients with non-small cell lung cancer and for a uniform phantom. We studied 7 TI, SUVmax and metabolic volume (MV) in the phantom, tumors and healthy tissue using the usual relative resampling (RR) method and an absolute resampling (AR) method. The differences in TI values between tissue types and cancer subtypes were investigated using Wilcoxon's tests.

Results

Most RR-based TI were highly correlated with MV for tumors less than 60 mL (Spearman correlation coefficient r between 0.74 and 1), while this correlation was reduced for ARbased TI (r between 0.06 and 0.27 except for RLNU where r = 0.91). Most AR-based TI were significantly different between tumor and healthy tissues (pvalues < 0.01 for all 7 TI) and between cancer subtypes (pvalues<0.05 for 6 TI). Healthy tissue and adenocarcinomas exhibited more homogeneous texture than tumor tissue and squamous cell carcinomas respectively.

Conclusion

TI computed using an AR method vary as a function of the tissue type and cancer subtype more than the TI involving the usual RR method. AR-based TI might be useful for tumor characterization.

C1 [Orlhac, Fanny; Soussan, Michael; Buvat, Irene] Univ Paris Saclay, Univ Paris 11, Imagerie Mol Vivo, IMIV,CEA,Inserm,CNRS,CEA,SHFJ, Orsay, France.

[Soussan, Michael] Avicenne Hosp, AP HP, Dept Nucl Med, Bobigny, France.

[Chouahnia, Kader] Avicenne Hosp, AP HP, Dept Oncol, Bobigny, France.

[Martinod, Emmanuel] Avicenne Hosp, AP HP, Dept Thorac Surg, Bobigny, France.

RP Orlhac, F (通讯作者)，Univ Paris Saclay, Univ Paris 11, Imagerie Mol Vivo, IMIV,CEA,Inserm,CNRS,CEA,SHFJ, Orsay, France.

EM orlhacf@gmail.com

RI Buvat, Irene/U-8447-2018; Orlhac, Fanny/AAC-6428-2019

OI Buvat, Irene/0000-0002-7053-6471; Orlhac, Fanny/0000-0002-5588-1867;

Soussan, Michael/0000-0002-0798-4749

CR Asamura H, 2008, J THORAC ONCOL, V3, P46, DOI 10.1097/JTO.0b013e31815e8577

Brooks FJ, 2014, J NUCL MED, V55, P37, DOI 10.2967/jnumed.112.116715

Brooks FJ, 2013, EUR J NUCL MED MOL I, V40, P1292, DOI 10.1007/s00259-013-2430-y

Buvat I, 2002, PHYS MED BIOL, V47, P1761, DOI 10.1088/0031-9155/47/10/311

Buvat I, 2015, J NUCL MED, V56, P1642, DOI 10.2967/jnumed.115.163469

Chalkidou A, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0124165

Cheng NM, 2015, EUR J NUCL MED MOL I, V42, P419, DOI 10.1007/s00259-014-2933-1

Cheng NM, 2013, J NUCL MED, V54, P1703, DOI 10.2967/jnumed.112.119289

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Dong XZ, 2013, NUCL MED COMMUN, V34, P40, DOI 10.1097/MNM.0b013e32835ae50c

El Naqa I, 2009, PATTERN RECOGN, V42, P1162, DOI 10.1016/j.patcog.2008.08.011

Galavis PE, 2010, ACTA ONCOL, V49, P1012, DOI 10.3109/0284186X.2010.498437

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Mangili E, 1998, EUR J HISTOCHEM, V42, P287

Marusyk A, 2010, BBA-REV CANCER, V1805, P105, DOI 10.1016/j.bbcan.2009.11.002

Nestle U, 2005, J NUCL MED, V46, P1342

Orlhac F, 2014, J NUCL MED, V56, P430

Orlhac F, 2014, J NUCL MED, V55, P414, DOI 10.2967/jnumed.113.129858

Soussan M, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0094017

Tan S, 2013, INT J RADIAT ONCOL, V85, P1375, DOI 10.1016/j.ijrobp.2012.10.017

Tixier F, 2011, J NUCL MED, V52, P369, DOI 10.2967/jnumed.110.082404

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

Willaime JMY, 2013, PHYS MED BIOL, V58, P187, DOI 10.1088/0031-9155/58/2/187

Xu R, 2014, ANN NUCL MED, V28, P926, DOI 10.1007/s12149-014-0895-9

Yang F, 2013, EUR J NUCL MED MOL I, V40, P716, DOI 10.1007/s00259-012-2332-4

Zhang H, 2014, INT J RADIAT ONCOL, V88, P195, DOI 10.1016/j.ijrobp.2013.09.037

NR 27

TC 95

Z9 95

U1 1

U2 9

PU PUBLIC LIBRARY SCIENCE

PI SAN FRANCISCO

PA 1160 BATTERY STREET, STE 100, SAN FRANCISCO, CA 94111 USA

SN 1932-6203

J9 PLOS ONE

JI PLoS One

PD DEC 15

PY 2015

VL 10

IS 12

AR e0145063

DI 10.1371/journal.pone.0145063

PG 16

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA CY9HZ

UT WOS:000366719300043

PM 26669541

OA Green Published, Green Submitted, gold

DA 2022-08-24

ER

PT J

AU Luna, JM

Barsky, AR

Shinohara, RT

Roshkovan, L

Hershman, M

Dreyfuss, AD

Horng, H

Lou, CRY

Noel, PB

Cengel, KA

Katz, S

Diffenderfer, ES

Kontos, D

AF Luna, Jose Marcio

Barsky, Andrew R.

Shinohara, Russell T.

Roshkovan, Leonid

Hershman, Michelle

Dreyfuss, Alexandra D.

Horng, Hannah

Lou, Carolyn

Noel, Peter B.

Cengel, Keith A.

Katz, Sharyn

Diffenderfer, Eric S.

Kontos, Despina

TI Radiomic Phenotypes for Improving Early Prediction of Survival in Stage

III Non-Small Cell Lung Cancer Adenocarcinoma after Chemoradiation

SO CANCERS

LA English

DT Article

DE overall survival; ComBat; radiomics; non-small cell lung cancer;

computed tomography

ID RADIATION-THERAPY; PHASE-III; AMERICAN SOCIETY; 4-YEAR SURVIVAL; TUMOR

NECROSIS; ONCOLOGY; CHEMORADIOTHERAPY; CONCURRENT; RADIOTHERAPY;

CARBOPLATIN

AB Simple Summary: Personalized therapy of non-small cell lung cancer (NSCLC) relies heavily on histopathological analyses that require invasive biopsies that have relatively high costs, provide limited assessment of tumor heterogeneity and are associated with potentially life-threatening complications. This retrospective study is aimed at evaluating the potential benefit of using predictive models that integrate radiomic features extracted from computed tomography (CT) images and commonly assessed clinical predictors to characterize the overall survival (OS) of stage III NSCLC adenocarcinoma patients receiving chemoradiation. Different than previous studies, our proposed approach explicitly accounts for CT parameter heterogeneity, such as presence or lack of intravenous contrast material and differences in CT scanner vendors through feature harmonization. Using a relatively homogeneous population of 110 patients, our results demonstrate that radiomic biomarkers derived using feature harmonization significantly improved the prediction of OS in our cohort when combined with Eastern Cooperative Oncology Group (ECOG) status and age at diagnosis, suggesting their potential in assisting clinical decision making.) upon the baseline model (C-(score) = 0.65, CI = (0.57, 0.73)). Our results suggest that harmonized radiomic phenotypes can significantly improve OS prediction in stage III NSCLC after chemoradiation.We evaluate radiomic phenotypes derived from CT scans as early predictors of overall survival (OS) after chemoradiation in stage III primary lung adenocarcinoma. We retrospectively analyzed 110 thoracic CT scans acquired between April 2012-October 2018. Patients received a median radiation dose of 66.6 Gy at 1.8 Gy/fraction delivered with proton (55.5%) and photon (44.5%) beam treatment, as well as concurrent chemotherapy (89%) with carboplatin-based (55.5%) and cisplatin-based (36.4%) doublets. A total of 56 death events were recorded. Using manual tumor segmentations, 107 radiomic features were extracted. Feature harmonization using ComBat was performed to mitigate image heterogeneity due to the presence or lack of intravenous contrast material and variability in CT scanner vendors. A binary radiomic phenotype to predict OS was derived through the unsupervised hierarchical clustering of the first principal components explaining 85% of the variance of the radiomic features. C-scores and likelihood ratio tests (LRT) were used to compare the performance of a baseline Cox model based on ECOG status and age, with a model integrating the radiomic phenotype with such clinical predictors. The model integrating the radiomic phenotype (C-score = 0.69, 95% CI = (0.62, 0.77)) significantly improved (p < 0.005) upon the baseline model (C-score = 0.65, CI = (0.57, 0.73)). Our results suggest that harmonized radiomic phenotypes can significantly improve OS prediction in stage III NSCLC after chemoradiation.

C1 [Luna, Jose Marcio; Shinohara, Russell T.; Kontos, Despina] Univ Penn, Ctr Biomed Image Comp & Analyt, Philadelphia, PA 19104 USA.

[Luna, Jose Marcio; Roshkovan, Leonid; Hershman, Michelle; Noel, Peter B.; Katz, Sharyn; Kontos, Despina] Univ Penn, Dept Radiol, Philadelphia, PA 19103 USA.

[Luna, Jose Marcio] Washington Univ, Mallinckrodt Inst Radiol, St Louis, MO 63110 USA.

[Barsky, Andrew R.; Dreyfuss, Alexandra D.; Cengel, Keith A.] Univ Penn, Dept Radiat Oncol, Philadelphia, PA 19104 USA.

[Shinohara, Russell T.] Univ Penn, Dept Biostat Epidemiol & Informat, Penn Stat Imaging & Visualizat Ctr, Philadelphia, PA 19104 USA.

[Horng, Hannah] Univ Penn, Dept Bioengn, Philadelphia, PA 19104 USA.

RP Kontos, D (通讯作者)，Univ Penn, Ctr Biomed Image Comp & Analyt, Philadelphia, PA 19104 USA.; Kontos, D (通讯作者)，Univ Penn, Dept Radiol, Philadelphia, PA 19103 USA.

EM jose.luna@wustl.edu; andrew.barsky@baptisthealth.net;

rshi@mail.med.upenn.edu; leonid.roshkovan@pennmedicine.upenn.edu;

michelle.hershman@pennmedicine.upenn.edu; dreyfusa@mskcc.org;

hhorng@seas.upenn.edu; louc@pennmedicine.upenn.edu;

peter.noel@pennmedicine.upenn.edu; keith.cengel@pennmedicine.upenn.edu;

sharyn.katz@pennmedicine.upenn.edu;

eric.diffenderfer@pennmedicine.upenn.edu;

despina.kontos@pennmedicine.upenn.edu

OI Diffenderfer, Eric/0000-0002-4869-6575; Luna, Jose/0000-0002-5513-022X;

KONTOS, DESPINA/0000-0001-9031-5126; Noel, Peter/0000-0002-9671-6171

FU Emerson Collective; Abramson Cancer Center; Penn Center for Precision

Medicine

FX This work was partially supported by an award granted by the Emerson

Collective, the Marlene Shlomchik Fellowship granted by the Abramson

Cancer Center and pilot funding granted by the Penn Center for Precision

Medicine.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Ahn HK, 2019, CLIN RADIOL, V74, P467, DOI 10.1016/j.crad.2019.02.008

ALBAIN KS, 1995, J CLIN ONCOL, V13, P1880, DOI 10.1200/JCO.1995.13.8.1880

Alfons A., 2013, P R US C USER U CAST, P86

Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Arshad MA, 2019, EUR J NUCL MED MOL I, V46, P455, DOI 10.1007/s00259-018-4139-4

Beare R, 2018, J STAT SOFTW, V86, P1, DOI 10.18637/jss.v086.i08

Belani CP, 2005, J CLIN ONCOL, V23, P5883, DOI 10.1200/JCO.2005.55.405

Botticelli A, 2019, J TRANSL MED, V17, DOI 10.1186/s12967-019-1847-x

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Bredholt G, 2015, ONCOTARGET, V6, P39676, DOI 10.18632/oncotarget.5344

Caruso R, 2012, ONCOL LETT, V3, P16, DOI 10.3892/ol.2011.420

Chun SG, 2017, J CLIN ONCOL, V35, P56, DOI 10.1200/JCO.2016.69.1378

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

Crombe A, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-72535-0

Davidson-Pilon C., 2019, J OPEN SOURCE SOFTW, V4, P1317

Dercle L, 2020, CLIN CANCER RES, V26, P2151, DOI 10.1158/1078-0432.CCR-19-2942

Dissaux G, 2020, J NUCL MED, V61, P814, DOI 10.2967/jnumed.119.228106

Ettinger D., 2020, CONTINUE NCCN GUIDEL

Faivre-Finn C, 2020, ANN ONCOL, V31, pS1178, DOI 10.1016/j.annonc.2020.08.2281

Faivre-Finn C, 2021, J THORAC ONCOL, V16, P860, DOI 10.1016/j.jtho.2020.12.015

Fortin J.P., NEUROCOMBAT

Gandara David R, 2003, J Clin Oncol, V21, P2004, DOI 10.1200/JCO.2003.04.197

Garau N, 2020, MED PHYS, V47, P4125, DOI 10.1002/mp.14308

Hanna N, 2008, J CLIN ONCOL, V26, P5755, DOI 10.1200/JCO.2008.17.7840

Higgins KA, 2017, INT J RADIAT ONCOL, V97, P128, DOI 10.1016/j.ijrobp.2016.10.001

Horng H., GEN COMBAT

Hotta M, 2021, ANN NUCL MED, V35, P843, DOI 10.1007/s12149-021-01622-7

Howlader N, 2015, SEER CANC STAT REV 1

Huan G.H., 2015, STAT SIGNIFICANCE CL

Hui RN, 2019, LANCET ONCOL, V20, P1670, DOI 10.1016/S1470-2045(19)30519-4

Johnson WE, 2007, BIOSTATISTICS, V8, P118, DOI 10.1093/biostatistics/kxj037

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lee G, 2018, ONCOLOGIST, V23, P806, DOI 10.1634/theoncologist.2017-0538

Liang J, 2017, ANN ONCOL, V28, P777, DOI 10.1093/annonc/mdx009

Lucia F, 2019, EUR J NUCL MED MOL I, V46, P864, DOI 10.1007/s00259-018-4231-9

Masson I, 2021, MED PHYS, V48, P4099, DOI 10.1002/mp.14948

Nakajo M, 2021, MOL IMAGING BIOL, V23, P756, DOI 10.1007/s11307-021-01599-9

Okada N, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-70743-2

Park SY, 2011, ANN THORAC SURG, V91, P1668, DOI 10.1016/j.athoracsur.2010.12.028

Paz-Ares L, 2020, ANN ONCOL, V31, P798, DOI 10.1016/j.annonc.2020.03.287

Pedregosa F, 2011, J MACH LEARN RES, V12, P2825

R Core Team, 2019, R LANG ENV STAT COMP

Richards TB, 2017, CANCER-AM CANCER SOC, V123, P5079, DOI 10.1002/cncr.31029

Rodrigues G, 2015, PRACT RADIAT ONCOL, V5, P141, DOI 10.1016/j.prro.2015.02.012

Rodrigues G, 2015, PRACT RADIAT ONCOL, V5, P149, DOI 10.1016/j.prro.2015.02.013

Scrivener M, 2016, TRANSL CANCER RES, V5, P398, DOI 10.21037/tcr.2016.06.18

Senan S, 2016, J CLIN ONCOL, V34, P953, DOI 10.1200/JCO.2015.64.8824

Shayesteh S, 2021, MED PHYS, V48, P3691, DOI 10.1002/mp.14896

Siegel R, 2012, CA-CANCER J CLIN, V62, P10, DOI 10.3322/caac.20138

Siegel RL., 2020, CA-CANCER J CLIN, V70, P7, DOI [DOI 10.3322/caac.21551, 10.3322/caac.21590]

Travis WD, 2011, J THORAC ONCOL, V6, P244, DOI 10.1097/JTO.0b013e318206a221

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Van Rossum G., 1995, PYTHON REFERENCE MAN

van Timmeren JE, 2020, INSIGHTS IMAGING, V11, DOI 10.1186/s13244-020-00887-2

van Timmeren JE, 2019, RADIOTHER ONCOL, V136, P78, DOI 10.1016/j.radonc.2019.03.032

Virtanen P, 2020, NAT METHODS, V17, P261, DOI 10.1038/s41592-019-0686-2

Wang SC, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-01571-0

Wang TT, 2020, ANN THORAC SURG, V109, P1741, DOI 10.1016/j.athoracsur.2020.01.010

Warnes M.G.R., 2020, VARIOUS R PROGRAMMIN

Whitney HM, 2020, J MED IMAGING, V7, DOI 10.1117/1.JMI.7.1.012707

Yoon S, 2016, INT J RADIAT ONCOL, V96, pE477, DOI 10.1016/j.ijrobp.2016.06.1829

Yu DX, 2018, JNCI-J NATL CANCER I, V110, P831, DOI 10.1093/jnci/djx286

Zhu XR, 2020, RADIAT ONCOL, V15, DOI 10.1186/s13014-020-1467-x

NR 65

TC 0

Z9 0

U1 0

U2 0

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2072-6694

J9 CANCERS

JI Cancers

PD FEB

PY 2022

VL 14

IS 3

AR 700

DI 10.3390/cancers14030700

PG 16

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA ZH3WA

UT WOS:000760871300001

PM 35158971

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Li, RQ

Roy, A

Bice, N

Kirby, N

Fakhreddine, M

Papanikolaou, N

AF Li, Ruiqi

Roy, Arkajyoti

Bice, Noah

Kirby, Neil

Fakhreddine, Mohamad

Papanikolaou, Niko

TI Managing tumor changes during radiotherapy using a deep learning model

SO MEDICAL PHYSICS

LA English

DT Article

DE deep learning; treatment planning; tumor shrinkage

ID CELL LUNG-CANCER; RADIATION-THERAPY; MOTION; SHRINKAGE; HEAD;

QUANTIFICATION; MANAGEMENT; REGRESSION

AB PurposeWe propose a treatment planning framework that accounts for weekly lung tumor shrinkage using cone beam computed tomography (CBCT) images with a deep learning-based model.

MethodsSixteen patients with non-small-cell lung cancer (NSCLC) were selected with one planning CT and six weekly CBCTs each. A deep learning-based model was applied to predict the weekly deformation of the primary tumor based on the spatial and temporal features extracted from previous weekly CBCTs. Starting from Week 3, the tumor contour at Week N was predicted by the model based on the input from all the previous weeks (1, 2 ... N - 1), and was evaluated against the manually contoured tumor using Dice coefficient (DSC), precision, average surface distance (ASD), and Hausdorff distance (HD). Information about the predicted tumor was then entered into the treatment planning system and the plan was re-optimized every week. The objectives were to maximize the dose coverage in the target region while minimizing the toxicity to the surrounding healthy tissue. Dosimetric evaluation of the target and organs at risk (heart, lung, esophagus, and spinal cord) was performed on four cases, comparing between a conventional plan (ignoring tumor shrinkage) and the shrinkage-based plan.

Resultshe primary tumor volumes decreased on average by 38% 26% during six weeks of treatment. DSCs and ASD between the predicted tumor and the actual tumor for Weeks 3, 4, 5, 6 were 0.81, 0.82, 0.79, 0.78 and 1.49, 1.59, 1.92, 2.12 mm, respectively, which were significantly superior to the score of 0.70, 0.68, 0.66, 0.63 and 2.81, 3.22, 3.69, 3.63 mm between the rigidly transferred tumors ignoring shrinkage and the actual tumor. While target coverage metrics were maintained for the re-optimized plans, lung mean dose dropped by 2.85, 0.46, 2.39, and 1.48 Gy for four sample cases when compared to the original plan. Doses in other organs such as esophagus were also reduced for some cases.

ConclusionWe developed a deep learning-based model for tumor shrinkage prediction. This model used CBCTs and contours from previous weeks as input and produced reasonable tumor contours with a high prediction accuracy (DSC, precision, HD, and ASD). The proposed framework maintained target coverage while reducing dose in the lungs and esophagus.

C1 [Li, Ruiqi; Bice, Noah; Kirby, Neil; Fakhreddine, Mohamad; Papanikolaou, Niko] Univ Texas Hlth Sci Ctr San Antonio, Dept Radiat Oncol, San Antonio, TX 78229 USA.

[Roy, Arkajyoti] Univ Texas San Antonio, Dept Management Sci & Stat, San Antonio, TX USA.

RP Papanikolaou, N (通讯作者)，Univ Texas Hlth Sci Ctr San Antonio, Dept Radiat Oncol, San Antonio, TX 78229 USA.

EM papanikolaou@uthscsa.edu

RI Bice, Noah/AAZ-8603-2021; Roy, Arkajyoti/M-1634-2018

OI Roy, Arkajyoti/0000-0003-0348-9297

CR Barker JL, 2004, INT J RADIAT ONCOL, V59, P960, DOI 10.1016/j.ijrobp.2003.12.024

Britton KR, 2007, INT J RADIAT ONCOL, V68, P1036, DOI 10.1016/j.ijrobp.2007.01.021

Chao M, 2010, MED PHYS, V37, P2351, DOI 10.1118/1.3399872

Chen LY, 2020, MED PHYS, V47, P1115, DOI 10.1002/mp.13978

Chu M, 2005, PHYS MED BIOL, V50, P5463, DOI 10.1088/0031-9155/50/23/003

Dial C, 2016, MED PHYS, V43, P1787, DOI 10.1118/1.4943564

Erridge SC, 2003, RADIOTHER ONCOL, V66, P75, DOI 10.1016/S0167-8140(02)00287-6

Fox J, 2009, INT J RADIAT ONCOL, V74, P341, DOI 10.1016/j.ijrobp.2008.07.063

Gal Y, 2016, PR MACH LEARN RES, V48

Huang ZH, 2015, COMPUT INTEL NEUROSC, V2015, DOI 10.1155/2015/685404

Kingma D, 2014, ARXIV

Krizhevsky A., 2012, ADV NEURAL INFORM PR, V25, DOI DOI 10.1145/3065386

Kupelian PA, 2005, INT J RADIAT ONCOL, V63, P1024, DOI 10.1016/j.ijrobp.2005.04.046

Liang X, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/ab22f9

Lim GJ, 2020, EUR J OPER RES, V280, P266, DOI 10.1016/j.ejor.2019.06.041

Litzenberg DW, 2006, INT J RADIAT ONCOL, V65, P548, DOI 10.1016/j.ijrobp.2005.12.033

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Nabavi S, 2020, J MED SIGNALS SENS, V10, P69, DOI 10.4103/jmss.JMSS\_38\_19

Nohadani O., 2017, IISE T HEALTHC SYST, V7, P81, DOI [10.1080/24725579.2017.1296907, DOI 10.1080/24725579.2017.1296907]

Nohadani O, 2010, PHYS MED BIOL, V55, P5189, DOI 10.1088/0031-9155/55/17/019

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

Roy A, 2013, MED PHYS, V40, DOI 10.1118/1.4815072

Shahzadi I, 2018, IEEE EMBS CONF BIO, P633, DOI 10.1109/IECBES.2018.8626704

Wang C, 2019, MED PHYS, V46, P4699, DOI 10.1002/mp.13765

Wang JY, 2012, INT J RADIAT ONCOL, V83, pE273, DOI 10.1016/j.ijrobp.2011.12.048

Woo, 2015, CONVOLUTIONAL LSTM N

Wu QW, 2009, INT J RADIAT ONCOL, V75, P924, DOI 10.1016/j.ijrobp.2009.04.047

Xing L, 2006, MED DOSIM, V31, P91, DOI 10.1016/j.meddos.2005.12.004

Xu YW, 2019, CLIN CANCER RES, V25, P3266, DOI 10.1158/1078-0432.CCR-18-2495

Zhang L, 2020, IEEE T MED IMAGING, V39, P1114, DOI 10.1109/TMI.2019.2943841

Zhang L, 2018, IEEE T MED IMAGING, V37, P638, DOI 10.1109/TMI.2017.2774044

Zhang PP, 2018, INT J RADIAT ONCOL, V102, P978, DOI 10.1016/j.ijrobp.2018.05.056

Zhang PP, 2017, PHYS MED BIOL, V62, P702, DOI 10.1088/1361-6560/aa54f9

Zhang PP, 2014, INT J RADIAT ONCOL, V88, P446, DOI 10.1016/j.ijrobp.2013.10.038

NR 34

TC 0

Z9 0

U1 3

U2 14

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD SEP

PY 2021

VL 48

IS 9

BP 5152

EP 5164

DI 10.1002/mp.14925

EA AUG 2021

PG 13

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA WG2RF

UT WOS:000683900900001

PM 33959978

DA 2022-08-24

ER

PT J

AU Della Seta, M

Collettini, F

Chapiro, J

Angelidis, A

Engeling, F

Hamm, B

Kaul, D

AF Della Seta, Marta

Collettini, Federico

Chapiro, Julius

Angelidis, Alexander

Engeling, Fidelis

Hamm, Bernd

Kaul, David

TI A 3D quantitative imaging biomarker in pre-treatment MRI predicts

overall survival after stereotactic radiation therapy of patients with a

singular brain metastasis

SO ACTA RADIOLOGICA

LA English

DT Article

DE Brain metastases; radiomics; prognostic indices

ID HEPATOCELLULAR-CARCINOMA; TUMOR RESPONSE; TRANSARTERIAL

CHEMOEMBOLIZATION; DIAGNOSTIC-ACCURACY; RADIOSURGERY; LIVER; TACE;

SEGMENTATION; RADIOTHERAPY; INDEXES

AB Background Brain metastases (BM) are the most frequent intracranial malignant tumor. Various prognostic factors facilitate the prediction of survival; however, few have become tools for clinical use. Purpose To investigate the role of three-dimensional (3D) quantitative tissue enhancement in pre-treatment cranial magnetic resonance imaging (MRI) as a radiomic biomarker for survival (OS) in patients with singular BM treated with stereotactic radiation therapy (SRT). Material and Methods In this retrospective study, 48 patients (27 non-small cell lung cancer and 21 melanoma) with singular BM treated with SRT, were analyzed. Contrast-enhanced MRI scans of the neurocranium were used for quantitative image analyses. Segmentation-based 3D quantification was performed to measure the enhancing tumor volume. A cut-off value of 68.61% of enhancing volume was used to stratify the cohort into two groups (<= 68.61% and > 68.61%). Univariable and multivariable cox regressions were used to analyze the prognostic factors of OS and intracranial progression-free survival (iPFS). Results The level of enhancing tumor volume achieved statistical significance in univariable and multivariable analysis for OS (univariable: P = 0.005, hazard ratio [HR] = 0.375, 95% confidence interval [CI] = 0.168-0.744; multivariable: P = 0.006, HR = 0.376, 95% CI = 0.186-0.757). Patients with high-level enhancement (>68.61% enhancing lesion volume) survived significantly longer (4.9 vs. 10.2 months) and showed significantly longer iPFS rates (univariable: P < 0.001, HR = 0.046, 95% CI = 0.009-0.245). Conclusions Patients with lesions that show a higher percentage of enhancement in pre-treatment MRI demonstrated improved iPFS and OS compared to those with mainly hypo-enhancing lesions. Lesion enhancement may be a radiomic marker, useful in prognostic indices for survival prediction, in patients with singular BM.

C1 [Della Seta, Marta; Collettini, Federico; Hamm, Bernd] Charite, Dept Radiol, Berlin, Germany.

[Collettini, Federico] BIH, Berlin, Germany.

[Chapiro, Julius] Yale Univ, Dept Radiol, New Haven, CT USA.

[Angelidis, Alexander; Engeling, Fidelis; Kaul, David] Charite, Dept Radiat Oncol, Berlin, Germany.

RP Della Seta, M (通讯作者)，Charite Univ Med Berlin, Dept Radiol, Augustenburger Pl 1, D-13353 Berlin, Germany.

EM marta.della-seta@charite.de

CR Arrieta O, 2011, RADIAT ONCOL, V6, DOI 10.1186/1748-717X-6-166

Budczies J, 2012, PLOS ONE, V7, DOI 10.1371/journal.pone.0051862

Chamberlain MC, 2010, EXPERT REV NEUROTHER, V10, P563, DOI [10.1586/ern.10.30, 10.1586/ERN.10.30]

Chapiro J, 2015, EUR RADIOL, V25, P1993, DOI 10.1007/s00330-015-3595-5

Chapiro J, 2015, J VASC INTERV RADIOL, V26, P670, DOI 10.1016/j.jvir.2014.11.020

Chapiro J, 2015, EUR J RADIOL, V84, P424, DOI 10.1016/j.ejrad.2014.11.034

Chapiro J, 2015, EXPERT REV ANTICANC, V15, P199, DOI 10.1586/14737140.2015.978861

Chapiro J, 2014, RADIOLOGY, V273, P746, DOI 10.1148/radiol.14140033

CONGER AD, 1956, RADIOLOGY, V66, P63, DOI 10.1148/66.1.63

DAVIS PC, 1991, AM J NEURORADIOL, V12, P293

DEUTSCH M, 1974, CANCER-AM CANCER SOC, V34, P1607, DOI 10.1002/1097-0142(197411)34:5<1607::AID-CNCR2820340508>3.0.CO;2-N

Donaldson SB, 2010, BRIT J CANCER, V102, P23, DOI 10.1038/sj.bjc.6605415

Duran R, 2014, TRANSL ONCOL, V7, P447, DOI 10.1016/j.tranon.2014.05.004

Fife KM, 2004, J CLIN ONCOL, V22, P1293, DOI 10.1200/JCO.2004.08.140

Flanigan JC, 2011, CURR PROB CANCER, V35, P200, DOI 10.1016/j.currproblcancer.2011.07.003

Fleckenstein FN, 2016, EUR RADIOL, V26, P3243, DOI 10.1007/s00330-015-4168-3

Golden DW, 2008, J NEUROSURG, V109, P77, DOI 10.3171/JNS/2008/109/12/S13

HELLMAN S, 1995, J CLIN ONCOL, V13, P8, DOI 10.1200/JCO.1995.13.1.8

Jenkinson MD, 2011, EUR J CANCER, V47, P649, DOI 10.1016/j.ejca.2010.11.033

Kaul D, 2015, RADIAT ONCOL, V10, DOI 10.1186/s13014-015-0550-1

Khademalhosseini Z, 2017, STRAHLENTHER ONKOL, V193, P347, DOI 10.1007/s00066-017-1112-2

Linskey ME, 2010, J NEURO-ONCOL, V96, P45, DOI 10.1007/s11060-009-0073-4

Nayak L, 2012, CURR ONCOL REP, V14, P48, DOI 10.1007/s11912-011-0203-y

NEWMAN SJ, 1974, CANCER, V33, P492, DOI 10.1002/1097-0142(197402)33:2<492::AID-CNCR2820330225>3.0.CO;2-O

Nieder C, 2008, STRAHLENTHER ONKOL, V184, P488, DOI 10.1007/s00066-008-9831-z

Peeken JC, 2017, STRAHLENTHER ONKOL, V193, P767, DOI 10.1007/s00066-017-1175-0

Pellerin O, 2013, ACAD RADIOL, V20, P115, DOI 10.1016/j.acra.2012.07.011

Rades D, 2013, STRAHLENTHER ONKOL, V189, P996, DOI 10.1007/s00066-013-0442-y

Rades D, 2013, STRAHLENTHER ONKOL, V189, P777, DOI 10.1007/s00066-013-0362-x

RC Team, 2008, R LANG ENV STAT COMP

Schellinger PD, 1999, J NEURO-ONCOL, V44, P275, DOI 10.1023/A:1006308808769

Schneider T, 2016, EUR RADIOL, V26, P849, DOI 10.1007/s00330-015-3895-9

Schouten LJ, 2002, CANCER, V94, P2698, DOI 10.1002/cncr.10541

Sperduto PW, 2008, INT J RADIAT ONCOL, V70, P510, DOI 10.1016/j.ijrobp.2007.06.074

Sperduto PW, 2010, INT J RADIAT ONCOL, V77, P655, DOI 10.1016/j.ijrobp.2009.08.025

Tacher V, 2016, RADIOLOGY, V278, P275, DOI 10.1148/radiol.2015142951

Tacher V, 2013, ACAD RADIOL, V20, P446, DOI 10.1016/j.acra.2012.11.009

Torre LA, 2015, CA-CANCER J CLIN, V65, P87, DOI 10.3322/caac.21262

Weltman E, 2000, INT J RADIAT ONCOL, V46, P1155, DOI 10.1016/S0360-3016(99)00549-0

NR 39

TC 7

Z9 7

U1 0

U2 8

PU SAGE PUBLICATIONS LTD

PI LONDON

PA 1 OLIVERS YARD, 55 CITY ROAD, LONDON EC1Y 1SP, ENGLAND

SN 0284-1851

EI 1600-0455

J9 ACTA RADIOL

JI Acta Radiol.

PD NOV

PY 2019

VL 60

IS 11

BP 1496

EP 1503

DI 10.1177/0284185119831692

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA JI8UL

UT WOS:000493738700015

PM 30841703

DA 2022-08-24

ER

PT J

AU Ahn, SY

Park, CM

Park, SJ

Kim, HJ

Song, C

Lee, SM

McAdams, HP

Goo, JM

AF Ahn, Su Yeon

Park, Chang Min

Park, Sang Joon

Kim, Hak Jae

Song, Changhoon

Lee, Sang Min

McAdams, Holman Page

Goo, Jin Mo

TI Prognostic Value of Computed Tomography Texture Features in Non-Small

Cell Lung Cancers Treated With Definitive Concomitant Chemoradiotherapy

SO INVESTIGATIVE RADIOLOGY

LA English

DT Article

DE CT; texture; non-small cell lung cancer; chemoradiotherapy;

computer-assisted diagnosis; survival; biomarker

ID GROUND-GLASS NODULES; TUMOR HETEROGENEITY; CT TEXTURE;

RADIATION-THERAPY; PREDICT SURVIVAL; POTENTIAL MARKER; STAGE;

ADENOCARCINOMAS; CHEMOTHERAPY; METABOLISM

AB Objectives The aim of this study was to investigate whether the computed tomography (CT) texture features of primary tumors are associated with the overall survival (OS) of non-small cell lung cancer (NSCLC) patients undergoing definitive concomitant chemoradiotherapy (CCRT).

Materials and Methods In this retrospective study, 98 patients (83 men and 15 women; mean age, 61.9 8.0 years) with unresectable NSCLCs (stage IIIA, 45; stage IIIB, 53) underwent definitive CCRT at our institution from January 2006 to December 2011. Patients were followed up for 3 years or until death. The CT texture parameters of primary tumors were extracted from contrast-enhanced CT images taken before CCRT using an in-house software program. Each texture parameter was dichotomized based on their optimal cutoff values obtained from receiver operating characteristics curve analysis. Three-year OS was compared between the dichotomized subgroups using Kaplan-Meier analysis and the log-rank test. Multivariate Cox regression analysis was performed to determine significant prognostic factors.

Results The 3-year cumulative survival rate was 0.51. The mean 3-year OS was 24.0 months (95% confidence interval, 21.5-26.6 months). There were no significant differences in 3-year OS according to tumor stage or histologic subtypes. However, entropy (P = 0.030), skewness (P = 0.021), and mean attenuation (P = 0.030) were shown to be significantly associated with 3-year OS. Multivariate Cox regression analysis revealed that higher entropy (adjusted hazard ratio [HR],2.31; P = 0.040), higher skewness (adjusted HR,1.92; P = 0.046), and higher mean attenuation (adjusted HR,1.93; P = 0.028) were independent predictors of decreased 3-year OS.

Conclusions Computed tomography texture features have the potential to be used as prognostic biomarkers in unresectable NSCLC patients undergoing definitive CCRT.

C1 [Ahn, Su Yeon; Park, Chang Min; Park, Sang Joon; Lee, Sang Min; Goo, Jin Mo] Seoul Natl Univ, Dept Radiol, Coll Med, Seoul 110744, South Korea.

[Ahn, Su Yeon; Park, Chang Min; Park, Sang Joon; Lee, Sang Min; Goo, Jin Mo] Seoul Natl Univ, Inst Radiat Med, Med Res Ctr, Seoul 110744, South Korea.

[Park, Chang Min; Park, Sang Joon; Kim, Hak Jae; Goo, Jin Mo] Seoul Natl Univ, Canc Res Inst, Seoul 110744, South Korea.

[Park, Chang Min; McAdams, Holman Page] Duke Univ, Med Ctr, Dept Radiol, Durham, NC 27710 USA.

[Kim, Hak Jae; Song, Changhoon] Seoul Natl Univ, Dept Radiat Oncol, Coll Med, Seoul 110744, South Korea.

RP Park, CM (通讯作者)，Seoul Natl Univ, Dept Radiol, Coll Med, 101 Daehak Ro, Seoul 110744, South Korea.

EM cmpark@radiol.snu.ac.kr

RI McAdams, Holman P/N-8218-2015

OI McAdams, Holman P/0000-0002-7044-3320; Song,

Changhoon/0000-0002-0714-8775

FU Korean Foundation for Cancer Research [CB-2011-02-01]; Basic Science

Research Program through the National Research Foundation of Korea -

Ministry of Education, Science and Technology [2011-0022379]

FX This study was supported by the Research Grant of the Korean Foundation

for Cancer Research (grant number CB-2011-02-01) and the Basic Science

Research Program through the National Research Foundation of Korea

funded by the Ministry of Education, Science and Technology (grant

number 2011-0022379).

CR Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

Ball D, 2002, INT J RADIAT ONCOL, V54, P1007, DOI 10.1016/S0360-3016(02)03046-8

Berghmans Thierry, 2011, Ther Adv Med Oncol, V3, P127, DOI 10.1177/1758834011401951

Castellano G, 2004, CLIN RADIOL, V59, P1061, DOI 10.1016/j.crad.2004.07.008

Chae HD, 2014, RADIOLOGY, V273, P285, DOI 10.1148/radiol.14132187

Davnall F, 2012, INSIGHTS IMAGING, V3, P573, DOI 10.1007/s13244-012-0196-6

Dehing-Oberije C, 2008, INT J RADIAT ONCOL, V70, P1039, DOI 10.1016/j.ijrobp.2007.07.2323

Dilling TJ, 2014, INT J RADIAT ONCOL, V90, P828, DOI 10.1016/j.ijrobp.2014.07.023

Feddock J, 2013, INT J RADIAT ONCOL, V85, P1325, DOI 10.1016/j.ijrobp.2012.11.011

Fritz A, 2010, AJCC CANC STAGING MA, V7th

Ganeshan B, 2007, CLIN RADIOL, V62, P761, DOI 10.1016/j.crad.2007.03.004

Ganeshan B, 2012, CLIN RADIOL, V67, P157, DOI 10.1016/j.crad.2011.08.012

Ganeshan B, 2013, CANCER IMAGING, V13, P140, DOI 10.1102/1470-7330.2013.0015

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Ganeshan B, 2011, INVEST RADIOL, V46, P160, DOI 10.1097/RLI.0b013e3181f8e8a2

Ganeshan B, 2010, CANCER IMAGING, V10, P137, DOI 10.1102/1470-7330.2010.0021

Goh V, 2011, RADIOLOGY, V261, P165, DOI 10.1148/radiol.11110264

Govindan R, 2008, J THORAC ONCOL, V3, P917, DOI 10.1097/JTO.0b013e318180270b

HANLEY JA, 1982, RADIOLOGY, V143, P29, DOI 10.1148/radiology.143.1.7063747

Lee KH, 2014, J THORAC ONCOL, V9, P74, DOI 10.1097/JTO.0000000000000019

Michor F, 2010, CANCER PREV RES, V3, P1361, DOI 10.1158/1940-6207.CAPR-10-0234

Miles KA, 2009, RADIOLOGY, V250, P444, DOI 10.1148/radiol.2502071879

Ng F, 2013, EUR J RADIOL, V82, P342, DOI 10.1016/j.ejrad.2012.10.023

Ng F, 2013, RADIOLOGY, V266, P177, DOI 10.1148/radiol.12120254

Song YS, 2014, RADIOLOGY, V273, P276, DOI 10.1148/radiol.14132324

Vaupel P, 2007, CANCER METAST REV, V26, P225, DOI 10.1007/s10555-007-9055-1

Win T, 2013, CLIN CANCER RES, V19, P3591, DOI 10.1158/1078-0432.CCR-12-1307

Yi CA, 2004, RADIOLOGY, V233, P191, DOI 10.1148/radiol.2331031535

Zhang HW, 2013, RADIOLOGY, V269, P801, DOI 10.1148/radiol.13130110

NR 30

TC 66

Z9 67

U1 0

U2 13

PU LIPPINCOTT WILLIAMS & WILKINS

PI PHILADELPHIA

PA TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA, PA 19103 USA

SN 0020-9996

EI 1536-0210

J9 INVEST RADIOL

JI Invest. Radiol.

PD OCT

PY 2015

VL 50

IS 10

BP 719

EP 725

DI 10.1097/RLI.0000000000000174

PG 7

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA CS5AC

UT WOS:000362086700006

PM 26020832

DA 2022-08-24

ER

PT J

AU Hinton, T

Karnak, D

Tang, M

Jiang, R

Luo, Y

Boonstra, P

Sun, YL

Nancarrow, DJ

Sandford, E

Ray, P

Maurino, C

Matuszak, M

Schipper, MJ

Green, MD

Yanik, GA

Tewari, M

El Naqa, I

Schonewolf, CA

Ten Haken, R

Jolly, S

Lawrence, TS

Ray, D

AF Hinton, Tonaye

Karnak, David

Tang, Ming

Jiang, Ralph

Luo, Yi

Boonstra, Philip

Sun, Yilun

Nancarrow, Derek J.

Sandford, Erin

Ray, Paramita

Maurino, Christopher

Matuszak, Martha

Schipper, Matthew J.

Green, Michael D.

Yanik, Gregory A.

Tewari, Muneesh

El Naqa, Issam

Schonewolf, Caitlin A.

Ten Haken, Randall

Jolly, Shruti

Lawrence, Theodore S.

Ray, Dipankar

TI Improved prediction of radiation pneumonitis by combining biological and

radiobiological parameters using a data-driven Bayesian network analysis

SO TRANSLATIONAL ONCOLOGY

LA English

DT Article

DE Radiation pneumonitis; Inflammatory cytokines; MicroRNA (miRNA); Tumor

necrosis factor alpha (TNF alpha) signaling, nuclear factor kappa B (NF

kappa B); Data-driven Bayesian network (DD-BN) analysis

ID TUMOR-NECROSIS-FACTOR; CELL LUNG-CANCER; PULMONARY-FIBROSIS;

FACTOR-ALPHA; KAPPA-B; EXPRESSION; ADAM17; TNF; TOXICITY; SURVIVAL

AB Grade 2 and higher radiation pneumonitis (RP2) is a potentially fatal toxicity that limits efficacy of radiation therapy (RT). We wished to identify a combined biomarker signature of circulating miRNAs and cytokines which, along with radiobiological and clinical parameters, may better predict a targetable RP2 pathway. In a prospective clinical trial of response-adapted RT for patients (n = 39) with locally advanced non-small cell lung cancer, we analyzed patients' plasma, collected pre- and during RT, for microRNAs (miRNAs) and cytokines using array and multiplex enzyme linked immunosorbent assay (ELISA), respectively. Interactions between candidate biomarkers, radiobiological, and clinical parameters were analyzed using data-driven Bayesian network (DD-BN) analysis. We identified alterations in specific miRNAs (miR-532, -99b and -495, let-7c, -451 and -139-3p) correlating with lung toxicity. High levels of soluble tumor necrosis factor alpha receptor 1 (sTNFR1) were detected in a majority of lung cancer patients. However, among RP patients, within 2 weeks of RT initiation, we noted a trend of temporary decline in sTNFR1 (a physiological scavenger of TNF alpha) and ADAM17 (a shedding protease that cleaves both membrane-bound TNF alpha and TNFR1) levels. Cytokine signature identified activation of inflammatory pathway. Using DD-BN we combined miRNA and cytokine data along with generalized equivalent uniform dose (gEUD) to identify pathways with better accuracy of predicting RP2 as compared to either miRNA or cytokines alone. This signature suggests that activation of the TNF alpha-NF kappa B inflammatory pathway plays a key role in RP which could be specifically ameliorated by etanercept rather than current therapy of non-specific leukotoxic corticosteroids.

C1 [Hinton, Tonaye; Karnak, David; Tang, Ming; Luo, Yi; Sun, Yilun; Ray, Paramita; Maurino, Christopher; Matuszak, Martha; Schipper, Matthew J.; Green, Michael D.; Tewari, Muneesh; El Naqa, Issam; Schonewolf, Caitlin A.; Ten Haken, Randall; Jolly, Shruti; Lawrence, Theodore S.; Ray, Dipankar] Univ Michigan, Med Sch, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

[Tang, Ming; Jiang, Ralph; Boonstra, Philip; Sun, Yilun; Schipper, Matthew J.] Univ Michigan, Sch Publ Hlth, Dept Biostat, Ann Arbor, MI 48109 USA.

[Nancarrow, Derek J.] Univ Michigan, Med Sch, Dept Surg, Div Hematol Oncol,Dept Internal Med, Ann Arbor, MI 48109 USA.

[Sandford, Erin; Yanik, Gregory A.] Henry Ford Hosp, Henry Ford Canc Inst, Dept Internal Med, Div Hematol & Oncol, Detroit, MI 48202 USA.

[Luo, Yi; Tewari, Muneesh] H Lee Moffitt Canc Ctr & Res Inst, Dept Machine Learning, Tampa, FL USA.

RP Ray, D (通讯作者)，Univ Michigan, Med Sch, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

EM dipray@umich.edu

OI Nancarrow, Derek/0000-0002-7470-7194

FU National Institutes of Health [P01 CA059827]

FX This work is supported in part by grants from the National Institutes of

Health P01 CA059827 (to RTH and TSL). We also thank Dr. Mary Davis for

editorial and Steven Kronenberg for graphic assistance.

CR Abernathy LM, 2017, FRONT ONCOL, V7, DOI 10.3389/fonc.2017.00007

Abratt RP, 2002, LUNG CANCER, V35, P103, DOI 10.1016/S0169-5002(01)00334-8

ADERKA D, 1991, CANCER RES, V51, P5602

Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Arpin D, 2005, J CLIN ONCOL, V23, P8748, DOI 10.1200/JCO.2005.01.7145

Buttner C, 1997, AM J RESP CELL MOL, V17, P315

Chen HL, 2017, ONCOL LETT, V13, P2021, DOI 10.3892/ol.2017.5727

Chen YY, 2001, INT J RADIAT ONCOL, V49, P641, DOI 10.1016/S0360-3016(00)01445-0

Chen YY, 2002, SEMIN RADIAT ONCOL, V12, P26, DOI 10.1053/srao.2002.31360

Cui PF, 2017, THER CLIN RISK MANAG, V13, P1259, DOI 10.2147/TCRM.S143939

Dalal Sushila R, 2010, Gastroenterol Hepatol (N Y), V6, P714

Dinh TKT, 2016, RADIAT ONCOL, V11, DOI 10.1186/s13014-016-0636-4

Franko AJ, 1997, RADIAT RES, V147, P245, DOI 10.2307/3579426

Giraldez MD, 2018, NAT BIOTECHNOL, V36, P746, DOI 10.1038/nbt.4183

Grotzinger J, 2017, BBA-MOL CELL RES, V1864, P2088, DOI 10.1016/j.bbamcr.2017.05.024

Han JH, 2019, ONCOGENE, V38, P406, DOI 10.1038/s41388-018-0440-8

Herskind C, 1998, STRAHLENTHER ONKOL, V174, P12

Huang X, 2019, J CELL BIOCHEM, V120, P4485, DOI 10.1002/jcb.27736

Johnston CJ, 2002, RADIAT RES, V157, P256, DOI 10.1667/0033-7587(2002)157[0256:RIPFEO]2.0.CO;2

Kong FM, 2005, INT J RADIAT ONCOL, V63, P324, DOI 10.1016/j.ijrobp.2005.02.010

Kong FM, 2005, SEMIN ONCOL, V32, pS42, DOI 10.1053/j.seminoncol.2005.03.009

Kowaliuk J, 2020, INT J RADIAT ONCOL, V107, P377, DOI 10.1016/j.ijrobp.2020.01.028

Krishnamurthy PM, 2017, ONCOTARGET, V8, P47767, DOI 10.18632/oncotarget.17770

Kwa SLS, 1998, RADIOTHER ONCOL, V48, P61, DOI 10.1016/S0167-8140(98)00020-6

Li HP, 2013, CARCINOGENESIS, V34, P2443, DOI 10.1093/carcin/bgt206

Lierova A, 2018, J RADIAT RES, V59, P709, DOI 10.1093/jrr/rry067

Liu J, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0121256

Lorenzen I, 2016, SCI REP-UK, V6, DOI 10.1038/srep35067

Luo Y, 2018, MED PHYS, V45, P3980, DOI 10.1002/mp.13029

Luo Y, 2017, RADIOTHER ONCOL, V123, P85, DOI 10.1016/j.radonc.2017.02.004

Maeda S, 2005, SCIENCE, V307, P734, DOI 10.1126/science.1103685

Mahata B, 2020, NAT COMMUN, V11, DOI 10.1038/s41467-020-17339-6

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Mehta V, 2005, INT J RADIAT ONCOL, V63, P5, DOI 10.1016/j.ijrobp.2005.03.047

Mohan MJ, 2002, BIOCHEMISTRY-US, V41, P9462, DOI 10.1021/bi0260132

Moss ML, 2017, MEDIAT INFLAMM, V2017, DOI 10.1155/2017/9673537

Pan EY, 2020, J ONCOL PHARM PRACT, V26, P814, DOI 10.1177/1078155219872786

Perez-Ruiz E, 2019, NATURE, V569, P428, DOI 10.1038/s41586-019-1162-y

Quan HY, 2018, MOL MED REP, V18, P4079, DOI 10.3892/mmr.2018.9406

Ray D, 2013, PLOS ONE, V8, DOI 10.1371/journal.pone.0057290

Sakimoto T, 2014, INVEST OPHTH VIS SCI, V55, P2419, DOI 10.1167/iovs.13-13265

Sankar K, 2022, CANCERS, V14, DOI 10.3390/cancers14030614

Schoenfeld JD, 2019, J IMMUNOTHER CANCER, V7, DOI 10.1186/s40425-019-0583-3

Sharma A, 2016, CLIN CANCER RES, V22, P4428, DOI 10.1158/1078-0432.CCR-15-2449

Shaverdian N, 2020, CANCER MED-US, V9, P4622, DOI 10.1002/cam4.3113

Simone CB, 2017, SEMIN RADIAT ONCOL, V27, P370, DOI 10.1016/j.semradonc.2017.04.009

Singh Y, 2013, J BIOL CHEM, V288, P5056, DOI 10.1074/jbc.C112.439778

Siva S, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0109560

Tang Y, 2019, RADIOTHER ONCOL, V141, P86, DOI 10.1016/j.radonc.2019.09.002

Torres JL, 2018, WORLD J GASTROENTERO, V24, P4104, DOI 10.3748/wjg.v24.i36.4104

Van Pottelberge GR, 2011, AM J RESP CRIT CARE, V183, P898, DOI 10.1164/rccm.201002-0304OC

Verheijden RJ, 2020, CLIN CANCER RES, V26, P2268, DOI 10.1158/1078-0432.CCR-19-3322

Weber JS, 2020, CLIN CANCER RES, V26, P2085, DOI 10.1158/1078-0432.CCR-20-0387

Wu JE, 2018, FRONT IMMUNOL, V9, DOI 10.3389/fimmu.2018.00546

Yanik GA, 2015, BIOL BLOOD MARROW TR, V21, P67, DOI 10.1016/j.bbmt.2014.09.019

Yirmibesoglu E, 2012, LUNG CANCER, V76, P350, DOI 10.1016/j.lungcan.2011.11.025

Yu JH, 2016, ASIAN PAC J TROP MED, V9, P69, DOI 10.1016/j.apjtm.2015.12.015

Zhang JX, 2018, ONCOGENE, V37, P2660, DOI 10.1038/s41388-018-0162-y

Zhang M, 2008, CLIN CANCER RES, V14, P1868, DOI 10.1158/1078-0432.CCR-07-1894

Zhu MM, 2019, EXP THER MED, V18, P4049, DOI 10.3892/etm.2019.8032

NR 60

TC 0

Z9 0

U1 1

U2 1

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 1936-5233

J9 TRANSL ONCOL

JI Transl. Oncol.

PD JUL

PY 2022

VL 21

AR 101428

DI 10.1016/j.tranon.2022.101428

PG 10

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA 2S1CP

UT WOS:000821538000001

PM 35460942

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Shoji, F

Yamashita, T

Kinoshita, F

Takamori, S

Fujishita, T

Toyozawa, R

Ito, K

Yamazaki, K

Nakashima, N

Okamoto, T

AF Shoji, Fumihiro

Yamashita, Takanori

Kinoshita, Fumihiko

Takamori, Shinkichi

Fujishita, Takatoshi

Toyozawa, Ryo

Ito, Kensaku

Yamazaki, Koji

Nakashima, Naoki

Okamoto, Tatsuro

TI Artificial intelligence-derived gut microbiome as a predictive biomarker

for therapeutic response to immunotherapy in lung cancer: protocol for a

multicentre, prospective, observational study

SO BMJ OPEN

LA English

DT Article

DE respiratory tract tumours; respiratory medicine (see thoracic medicine);

respiratory tract tumours

ID CHEMOTHERAPY; NIVOLUMAB

AB Introduction Immunotherapy is the fourth leading therapy for lung cancer following surgery, chemotherapy and radiotherapy. Recently, several studies have reported about the potential association between the gut microbiome and therapeutic response to immunotherapy. Nevertheless, the specific composition of the gut microbiome or combination of gut microbes that truly predict the efficacy of immunotherapy is not definitive. Methods and analysis The present multicentre, prospective, observational study aims to discover the specific composition of the gut microbiome or combination of gut microbes predicting the therapeutic response to immunotherapy in lung cancer using artificial intelligence. The main inclusion criteria are as follows: (1) pathologically or cytologically confirmed metastatic or postoperative recurrent lung cancer including non-small cell lung cancer and small cell lung cancer; (2) age >= 20 years at the time of informed consent; (3) planned treatment with immunotherapy including combination therapy and monotherapy, as the first-line immunotherapy; and (4) ability to provide faecal samples. In total, 400 patients will be enrolled prospectively. Enrolment will begin in 2021, and the final analyses will be completed by 2024. Ethics and dissemination The study protocol was approved by the institutional review board of each participating centre in 2021 (Kyushu Cancer Center, IRB approved No. 2021-13, 8 June 2021 and Kyushu Medical Center, IRB approved No. 21-076, 31 August 2021). Study results will be disseminated through peer-reviewed journals and national and international conferences.

C1 [Shoji, Fumihiro; Kinoshita, Fumihiko; Takamori, Shinkichi; Fujishita, Takatoshi; Toyozawa, Ryo; Ito, Kensaku; Okamoto, Tatsuro] Natl Kyushu Canc Ctr, Dept Thorac Oncol, Fukuoka, Japan.

[Yamashita, Takanori; Nakashima, Naoki] Kyushu Univ, Med Informat Ctr, Fukuoka, Japan.

[Yamazaki, Koji] Natl Hosp Org Kyushu Med Ctr, Dept Thorac Surg, Fukuoka, Japan.

RP Shoji, F (通讯作者)，Natl Kyushu Canc Ctr, Dept Thorac Oncol, Fukuoka, Japan.

EM fumshojifumshoji@gmail.com

FU Uehara Memorial Foundation; KAKENHI [20K09188]; Suzuken Memorial

Foundation; J-milk Foundation

FX This work was supported by Uehara Memorial Foundation, KAKENHI (No.

20K09188), Suzuken Memorial Foundation, and J-milk Foundation.

CR AITCHISON J, 1982, J ROY STAT SOC B MET, V44, P139

Appelhans T, 2016, INT J CLIMATOL, V36, P3245, DOI 10.1002/joc.4552

Bolyen E, 2019, NAT BIOTECHNOL, V37, P852, DOI 10.1038/s41587-019-0209-9

Borghaei H, 2021, J CLIN ONCOL, V39, P723, DOI 10.1200/JCO.20.01605

Callahan BJ, 2016, NAT METHODS, V13, P581, DOI [10.1038/NMETH.3869, 10.1038/nmeth.3869]

Dagliati A, 2018, J AM MED INFORM ASSN, V25, P538, DOI 10.1093/jamia/ocx159

Davar D, 2021, SCIENCE, V371, P595, DOI 10.1126/science.abf3363

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Fehrenbacher L, 2018, J THORAC ONCOL, V13, P1156, DOI 10.1016/j.jtho.2018.04.039

Friedman JH, 2001, ANN STAT, V29, P1189, DOI 10.1214/aos/1013203451

Gandhi L, 2018, NEW ENGL J MED, V378, P2078, DOI 10.1056/NEJMoa1801005

Goldstraw P, 2016, J THORAC ONCOL, V11, P39, DOI 10.1016/j.jtho.2015.09.009

Gopalakrishnan V, 2018, SCIENCE, V359, P97, DOI 10.1126/science.aan4236

Gori S, 2019, CRIT REV ONCOL HEMAT, V143, P139, DOI 10.1016/j.critrevonc.2019.09.003

Hell K, 2013, ISME J, V7, P1814, DOI 10.1038/ismej.2013.51

Hellmann MD, 2019, NEW ENGL J MED, V381, P2020, DOI 10.1056/NEJMoa1910231

Herbst RS, 2020, NEW ENGL J MED, V383, P1328, DOI 10.1056/NEJMoa1917346

Hisada T, 2015, ARCH MICROBIOL, V197, P919, DOI 10.1007/s00203-015-1125-0

Hooper LV, 2012, SCIENCE, V336, P1268, DOI 10.1126/science.1223490

Horn L, 2018, NEW ENGL J MED, V379, P2220, DOI 10.1056/NEJMoa1809064

Matson V, 2018, SCIENCE, V359, P104, DOI 10.1126/science.aao3290

Matsumoto K, 2020, STROKE, V51, P1477, DOI 10.1161/STROKEAHA.119.027300

Mok TSK, 2019, LANCET, V393, P1819, DOI 10.1016/S0140-6736(18)32409-7

Nishijima S, 2016, DNA RES, V23, P125, DOI 10.1093/dnares/dsw002

Nishio M, 2021, J THORAC ONCOL, V16, P653, DOI 10.1016/j.jtho.2020.11.025

Nohara Y, 2022, COMPUT METH PROG BIO, V214, DOI 10.1016/j.cmpb.2021.106584

Paz-Ares L, 2018, NEW ENGL J MED, V379, P2040, DOI 10.1056/NEJMoa1810865

Paz-Ares L, 2021, LANCET ONCOL, V22, P198, DOI 10.1016/S1470-2045(20)30641-0

Paz-Ares L, 2019, LANCET, V394, P1929, DOI 10.1016/S0140-6736(19)32222-6

Reck M, 2019, LANCET RESP MED, V7, P387, DOI 10.1016/S2213-2600(19)30084-0

Reck M, 2019, J CLIN ONCOL, V37, P537, DOI 10.1200/JCO.18.00149

Reck M, 2016, NEW ENGL J MED, V375, P1823, DOI 10.1056/NEJMoa1606774

Routy B, 2018, SCIENCE, V359, P91, DOI 10.1126/science.aan3706

Shoji F, 2019, LUNG CANCER, V136, P45, DOI 10.1016/j.lungcan.2019.08.006

Sivan A, 2015, SCIENCE, V350, P1084, DOI 10.1126/science.aac4255

Takahashi S, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0105592

Varlotto JM, 2009, CANCER-AM CANCER SOC, V115, P1059, DOI 10.1002/cncr.24133

Vetizou M, 2015, SCIENCE, V350, P1079, DOI 10.1126/science.aad1329

West H, 2019, LANCET ONCOL, V20, P924, DOI 10.1016/S1470-2045(19)30167-6

Wolk K, 2010, SEMIN IMMUNOPATHOL, V32, P17, DOI 10.1007/s00281-009-0188-x

Wu ST, 2012, PLOS ONE, V7, DOI 10.1371/journal.pone.0035470

Yamashita T, 2022, COMPUT METH PROG BIO, V214, DOI 10.1016/j.cmpb.2021.106583

NR 42

TC 0

Z9 0

U1 0

U2 0

PU BMJ PUBLISHING GROUP

PI LONDON

PA BRITISH MED ASSOC HOUSE, TAVISTOCK SQUARE, LONDON WC1H 9JR, ENGLAND

SN 2044-6055

J9 BMJ OPEN

JI BMJ Open

PD JUN

PY 2022

VL 12

IS 6

AR e061674

DI 10.1136/bmjopen-2022-061674

PG 6

WC Medicine, General & Internal

WE Science Citation Index Expanded (SCI-EXPANDED)

SC General & Internal Medicine

GA 2B2QI

UT WOS:000810036900022

PM 35676015

DA 2022-08-24

ER

PT J

AU Amini, A

Yang, JZ

Williamson, R

McBurney, ML

Erasmus, J

Allen, PK

Karhade, M

Komaki, R

Liao, ZX

Gomez, D

Cox, J

Dong, L

Welsh, J

AF Amini, Arya

Yang, Jinzhong

Williamson, Ryan

McBurney, Michelle L.

Erasmus, Jeremy, Jr.

Allen, Pamela K.

Karhade, Mandar

Komaki, Ritsuko

Liao, Zhongxing

Gomez, Daniel

Cox, James

Dong, Lei

Welsh, James

TI Dose Constraints to Prevent Radiation-Induced Brachial Plexopathy in

Patients Treated for Lung Cancer

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

DE Brachial plexopathy; Deformable image registration; Dose escalation;

Normal tissue toxicity; Superior sulcus tumor

ID BREAST-CANCER; VALIDATION; IRRADIATION; ALGORITHM

AB Purpose: As the recommended radiation dose for non-small-cell lung cancer (NSCLC) increases, meeting dose constraints for critical structures like the brachial plexus becomes increasingly challenging, particularly for tumors in the superior sulcus. In this retrospective analysis, we compared dose-volume histogram information with the incidence of plexopathy to establish the maximum dose tolerated by the brachial plexus.

Methods and Materials: We identified 90 patients with NSCLC treated with definitive chemoradiation from March 2007 through September 2010, who had received >55 Gy to the brachial plexus. We used a multiatlas segmentation method combined with deformable image registration to delineate the brachial plexus on the original planning CT scans and scored plexopathy according to Common Terminology Criteria for Adverse Events version 4.03.

Results: Median radiation dose to the brachial plexus was 70 Gy (range, 56-87.5 Gy; 1.5-2.5 Gy/fraction). At a median follow-up time of 14.0 months, 14 patients (16%) had brachial plexopathy (8 patients [9%] had Grade 1, and 6 patients [7%] had Grade >= 2); median time to symptom onset was 6.5 months (range, 1.4-37.4 months). On multivariate analysis, receipt of a median brachial plexus dose of >69 Gy (odds ratio [OR] 10.091; 95% confidence interval [CI], 1.512-67.331; p = 0.005), a maximum dose of >75 Gy to 2 cm 3 of the brachial plexus (OR, 4.909; 95% CI, 0.966-24.952; p = 0.038), and the presence of plexopathy before irradiation (OR, 4.722; 95% CI, 1.267-17.606; p = 0.021) were independent predictors of brachial plexopathy.

Conclusions: For lung cancers near the apical region, brachial plexopathy is a major concern for high-dose radiation therapy. We developed a computer-assisted image segmentation method that allows us to rapidly and consistently contour the brachial plexus and establish the dose limits to minimize the risk of brachial plexopathy. Our results could be used as a guideline in future prospective trials with high-dose radiation therapy for unresectable lung cancer. (C) 2012 Elsevier Inc.

C1 [Amini, Arya; McBurney, Michelle L.; Allen, Pamela K.; Karhade, Mandar; Komaki, Ritsuko; Liao, Zhongxing; Gomez, Daniel; Cox, James; Welsh, James] Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Houston, TX 77030 USA.

[Amini, Arya] Univ Calif Irvine, Sch Med, Irvine, CA 92717 USA.

[Yang, Jinzhong; Williamson, Ryan; Dong, Lei] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Houston, TX 77030 USA.

[Erasmus, Jeremy, Jr.] Univ Texas MD Anderson Canc Ctr, Dept Diagnost Imaging, Houston, TX 77030 USA.

RP Welsh, J (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Unit 97,1515 Holcombe Blvd, Houston, TX 77030 USA.

EM jwelsh@mdanderson.org

RI Dong, Lei/Q-5967-2019

OI Dong, Lei/0000-0003-2623-3198; Yang, Jinzhong/0000-0002-9254-4501

FU Cancer Center Support [CA016672]; NATIONAL CANCER INSTITUTE

[P30CA016672, K12CA088084] Funding Source: NIH RePORTER

FX This work was made possible through the generosity of the family of M.

Adnan Hamed to the M. D. Anderson Cancer Center Thoracic Radiation

Oncology program and was supported in part by Cancer Center Support

grant CA016672.

CR Bradley JD, 2010, J CLIN ONCOL, V28, P2475, DOI 10.1200/JCO.2009.27.1205

Curran W, 2003, P AN M AM SOC CLIN, V22, P621

CURRAN WJ, 2000, P AN M AM SOC CLIN, V19, pA1891

EMAMI B, 1991, INT J RADIAT ONCOL, V21, P109, DOI 10.1016/0360-3016(91)90171-Y

Ferrante MA, 2004, MUSCLE NERVE, V30, P547, DOI 10.1002/mus.20131

Galecki J, 2006, ACTA ONCOL, V45, P280, DOI 10.1080/02841860500371907

Hall WH, 2008, INT J RADIAT ONCOL, V72, P1362, DOI 10.1016/j.ijrobp.2008.03.004

Jemal A, 2010, CA-CANCER J CLIN, V60, P277, DOI [10.3322/caac.20073, 10.3322/caac.20115, 10.3322/caac.20107]

Kong FM, 2010, INT J RAD ONCOL BIOL

KORI SH, 1981, NEUROLOGY, V31, P45, DOI 10.1212/WNL.31.1.45

LECHEVALIER T, 1992, J NATL CANCER I, V84, P58

Netter FH, 2006, ATLAS HUMAN ANATOMY, P548

OLSEN NK, 1990, ACTA ONCOL, V29, P885, DOI 10.3109/02841869009096384

PEREZ CA, 1980, CANCER, V45, P2744, DOI 10.1002/1097-0142(19800601)45:11<2744::AID-CNCR2820451108>3.0.CO;2-U

Schierle C, 2004, J RECONSTR MICROSURG, V20, P149

Wang H, 2005, INT J RADIAT ONCOL, V61, P725, DOI 10.1016/j.ijrobp.2004.07.677

Warfield SK, 2004, IEEE T MED IMAGING, V23, P903, DOI 10.1109/TMI.2004.828354

NR 17

TC 40

Z9 41

U1 0

U2 4

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD MAR 1

PY 2012

VL 82

IS 3

BP E391

EP E398

DI 10.1016/j.ijrobp.2011.06.1961

PG 8

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA 894JR

UT WOS:000300423500008

PM 22284035

OA Green Accepted

DA 2022-08-24

ER

PT J

AU Belhassen, S

Zaidi, H

AF Belhassen, Saoussen

Zaidi, Habib

TI A novel fuzzy C-means algorithm for unsupervised heterogeneous tumor

quantification in PET

SO MEDICAL PHYSICS

LA English

DT Article

DE cancer; cellular biophysics; discrete wavelet transforms; fuzzy logic;

image segmentation; lung; medical image processing; phantoms; positron

emission tomography; tumours

ID POSITRON-EMISSION-TOMOGRAPHY; FDG-PET; IMAGE SEGMENTATION; AUTOMATIC

SEGMENTATION; VOLUME DEFINITION; RADIOTHERAPY; DELINEATION; MRI;

STRATEGIES; PATHOLOGY

AB Methods: To overcome this limitation, a new fuzzy segmentation technique adapted to typical noisy and low resolution oncological PET data is proposed. PET images smoothed using a nonlinear anisotropic diffusion filter are added as a second input to the proposed FCM algorithm to incorporate spatial information (FCM-S). In addition, a methodology was developed to integrate the agrave trous wavelet transform in the standard FCM algorithm (FCM-SW) to allow handling of heterogeneous lesions' uptake. The algorithm was applied to the simulated data of the NCAT phantom, incorporating heterogeneous lesions in the lung and clinical PET/CT images of 21 patients presenting with histologically proven nonsmall-cell lung cancer (NSCLC) and 7 patients presenting with laryngeal squamous cell carcinoma (LSCC) to assess its performance for segmenting tumors with arbitrary size, shape, and tracer uptake. For NSCLC patients, the maximal tumor diameters measured from the macroscopic examination of the surgical specimen served as the ground truth for comparison with the maximum diameter estimated by the segmentation technique, whereas for LSCC patients, the 3D macroscopic tumor volume was considered as the ground truth for comparison with the corresponding PET-based volume. The proposed algorithm was also compared to the classical FCM segmentation technique.

Results: There is a good correlation (R-2=0.942) between the actual maximal diameter of primary NSCLC tumors estimated using the proposed PET segmentation procedure and those measured from the macroscopic examination, and the regression line agreed well with the line of identity (slope=1.08) for the group analysis of the clinical data. The standard FCM algorithm seems to underestimate actual maximal diameters of the clinical data, resulting in a mean error of -4.6 mm (relative error of -10.8 +/- 23.1%) for all data sets. The mean error of maximal diameter estimation was reduced to 0.1 mm (0.9 +/- 14.4%) using the proposed FCM-SW algorithm. Likewise, the mean relative error on the estimated volume for LSCC patients was reduced from 21.7 +/- 22.0% for FCM to 8.6 +/- 28.3% using the proposed FCM-SW technique.

Conclusions: A novel unsupervised PET image segmentation technique that allows the quantification of lesions in the presence of heterogeneity of tracer uptake was developed and evaluated. The technique is being further refined and assessed in clinical setting to delineate treatment volumes for the purpose of PET-guided radiation therapy treatment planning but could find other applications in clinical oncology such as the assessment of response to treatment.

C1 [Belhassen, Saoussen; Zaidi, Habib] Univ Hosp Geneva, Div Nucl Med, CH-1211 Geneva, Switzerland.

[Zaidi, Habib] Univ Geneva, Geneva Neurosci Ctr, CH-1205 Geneva, Switzerland.

RP Zaidi, H (通讯作者)，Univ Hosp Geneva, Div Nucl Med, CH-1211 Geneva, Switzerland.

EM habib.zaidi@hcuge.ch

RI Zaidi, Habib/I-4669-2017

OI Zaidi, Habib/0000-0001-7559-5297

FU Swiss National Science Foundation [SNSF 3152A0-102143]

FX This work was supported by the Swiss National Science Foundation under

Grant No. SNSF 3152A0-102143. The authors would like to thank Dr. El

Naqa and Dr. Demirkaya for their help and advice, Professor Dekker and

Professor De Ruysscher (MAASTRO clinic, Maastricht) and Dr. Lee

(Universite catholique de Louvain, Brussels) for providing the clinical

PET data sets.

CR Acton PD, 1999, EUR J NUCL MED, V26, P581, DOI 10.1007/s002590050425

Ahmed MN, 2002, IEEE T MED IMAGING, V21, P193, DOI 10.1109/42.996338

Aristophanous M, 2008, MED PHYS, V35, P3331, DOI 10.1118/1.2938518

Aristophanous M, 2007, MED PHYS, V34, P4223, DOI 10.1118/1.2791035

Basu S, 2007, SEMIN NUCL MED, V37, P223, DOI 10.1053/j.semnuclmed.2007.01.005

BELHASSEN S, 2009, J NUCL MED, V50, pP29

BEZDEK JC, 1987, IEEE T SYST MAN CYB, V17, P873, DOI 10.1109/TSMC.1987.6499296

BEZDEK JC, 1980, IEEE T PATTERN ANAL, V2, P1, DOI 10.1109/TPAMI.1980.4766964

Boucek JA, 2008, PHYS MED BIOL, V53, P4213, DOI 10.1088/0031-9155/53/16/001

Boudraa AEO, 1996, COMPUT MED IMAG GRAP, V20, P31, DOI 10.1016/0895-6111(96)00025-0

CANNY J, 1986, IEEE T PATTERN ANAL, V8, P679, DOI 10.1109/TPAMI.1986.4767851

Chen SC, 2004, IEEE T SYST MAN CY B, V34, P1907, DOI 10.1109/TSMCB.2004.831165

Chen SS, 1998, INT CONF ACOUST SPEE, P645, DOI 10.1109/ICASSP.1998.675347

Chen WJ, 2006, ACAD RADIOL, V13, P63, DOI 10.1016/j.acra.2005.08.035

Chuang KS, 2006, COMPUT MED IMAG GRAP, V30, P9, DOI 10.1016/j.compmedimag.2005.10.001

CLARK MC, 1994, IEEE ENG MED BIOL, V13, P730, DOI 10.1109/51.334636

CONGDON P, 2007, BAYESIAN STAT MODELL

Czernin J, 2007, J NUCL MED, V48, p78S

Daisne JF, 2004, RADIOLOGY, V233, P93, DOI 10.1148/radiol.2331030660

Daisne JF, 2003, RADIOTHER ONCOL, V69, P237, DOI 10.1016/j.radonc.2003.10.009

Daisne JF, 2003, RADIOTHER ONCOL, V69, P247, DOI 10.1016/S0167-8140(03)00270-6

Demirkaya O, 2004, ACAD RADIOL, V11, P1105, DOI 10.1016/j.acra.2004.07.012

Dunn JC, 1973, J CYBERNETICS, V3, P32, DOI [DOI 10.1080/01969727308546046, 10.1080/01969727308546046]

El Naqa I, 2007, MED PHYS, V34, P4738, DOI 10.1118/1.2799886

Geets X, 2007, EUR J NUCL MED MOL I, V34, P1427, DOI 10.1007/s00259-006-0363-4

Greco C, 2007, LUNG CANCER, V57, P125, DOI 10.1016/j.lungcan.2007.03.020

Gregoire V, 2007, J NUCL MED, V48, p68S

Hatt M, 2009, IEEE T MED IMAGING, V28, P881, DOI 10.1109/TMI.2008.2012036

Holschneider M., 1990, WAVELETS TIME FREQUE, P286, DOI [10.1007/978-3-642-97177-8\_28, DOI 10.1007/978-3-642-75988-8\_28]

Janssen MHM, 2009, INT J RADIAT ONCOL, V73, P456, DOI 10.1016/j.ijrobp.2008.04.019

Juweid ME, 2006, NEW ENGL J MED, V354, P496, DOI 10.1056/NEJMra050276

Kang JY, 2009, DIGIT SIGNAL PROCESS, V19, P309, DOI 10.1016/j.dsp.2007.11.005

Kannan SR, 2008, APPL SOFT COMPUT, V8, P1599, DOI 10.1016/j.asoc.2007.10.025

Kim J, 2007, IEEE NUCL SCI CONF R, P4242, DOI 10.1109/NSSMIC.2007.4437054

Liew AWC, 2000, IEE P-VIS IMAGE SIGN, V147, P185, DOI 10.1049/ip-vis:20000218

Liew AWC, 2003, IEEE T MED IMAGING, V22, P1063, DOI 10.1109/TMI.2003.816956

Ling CC, 2000, INT J RADIAT ONCOL, V47, P551, DOI 10.1016/S0360-3016(00)00467-3

Masulli F, 1999, ARTIF INTELL MED, V16, P129, DOI 10.1016/S0933-3657(98)00069-4

Montgomery DWG, 2007, MED PHYS, V34, P722, DOI 10.1118/1.2432404

Montgomery DWG, 2005, IEEE INT SYMP CIRC S, P3789, DOI 10.1109/ISCAS.2005.1465455

PERONA P, 1990, IEEE T PATTERN ANAL, V12, P629, DOI 10.1109/34.56205

Pham DL, 2001, COMPUT VIS IMAGE UND, V84, P285, DOI 10.1006/cviu.2001.0951

Pham DL, 1999, IEEE T MED IMAGING, V18, P737, DOI 10.1109/42.802752

Rahmim A, 2009, MED PHYS, V36, P3654, DOI 10.1118/1.3160108

Segars WP, 2001, IEEE T NUCL SCI, V48, P89, DOI 10.1109/23.910837

SHENSA MJ, 1992, IEEE T SIGNAL PROCES, V40, P2464, DOI 10.1109/78.157290

Soret M, 2007, J NUCL MED, V48, P932, DOI 10.2967/jnumed.106.035774

Starck J.-L., 1994, TRAITCMCNT SIGNAL, V11, P229

Starck J.-L, 1998, IMAGE PROCESSING DAT

STARCK JL, 1994, SIGNAL PROCESS, V35, P195, DOI 10.1016/0165-1684(94)90211-9

Stroom J, 2007, INT J RADIAT ONCOL, V69, P267, DOI 10.1016/j.ijrobp.2007.04.065

Tan LTH, 2004, ANN ACAD MED SINGAP, V33, P183

Udupa JK, 2003, P IEEE, V91, P1649, DOI 10.1109/JPROC.2003.817883

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

van Baardwijk A, 2006, CANCER TREAT REV, V32, P245, DOI 10.1016/j.ctrv.2006.02.002

Vees H, 2009, EUR J NUCL MED MOL I, V36, P182, DOI 10.1007/s00259-008-0943-6

Wang JZ, 2008, COMPUT MED IMAG GRAP, V32, P685, DOI 10.1016/j.compmedimag.2008.08.004

Weickert J., 1998, ANISOTROPIC DIFFUSIO

Yu JH, 2007, INT J BIOMED IMAGING, V2007, DOI 10.1155/2007/25182

Zaidi H, 2002, PHYS MED BIOL, V47, P1143, DOI 10.1088/0031-9155/47/7/310

ZAIDI H, EUR J NUCL IN PRESS

Zaidi H, 2009, ACAD RADIOL, V16, P1108, DOI 10.1016/j.acra.2009.02.014

Zhu WL, 2004, IEEE NUCL SCI CONF R, P2627, DOI 10.1109/NSSMIC.2003.1352428

NR 63

TC 135

Z9 136

U1 1

U2 23

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD MAR

PY 2010

VL 37

IS 3

BP 1309

EP 1324

DI 10.1118/1.3301610

PG 16

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 563UL

UT WOS:000275160300038

PM 20384268

DA 2022-08-24

ER

PT J

AU Penarrubia, L

Pinon, N

Roux, E

Serrano, EED

Richard, JC

Orkisz, M

Sarrut, D

AF Penarrubia, Ludmilla

Pinon, Nicolas

Roux, Emmanuel

Serrano, Eduardo Enrique Davila

Richard, Jean-Christophe

Orkisz, Maciej

Sarrut, David

TI Improving motion-mask segmentation in thoracic CT with multiplanar

U-nets

SO MEDICAL PHYSICS

LA English

DT Article

DE deep learning; segmentation; thoracic CT

ID IMAGE REGISTRATION; DEFORMABLE REGISTRATION; OBJECTS

AB Purpose. Motion-mask segmentation from thoracic computed tomography (CT) images is the process of extracting the region that encompasses lungs and viscera, where large displacements occur during breathing. It has been shown to help image registration between different respiratory phases. This registration step is, for example, useful for radiotherapy planning or calculating local lung ventilation. Knowing the location of motion discontinuity, that is, sliding motion near the pleura, allows a better control of the registration preventing unrealistic estimates. Nevertheless, existing methods for motion-mask segmentation are not robust enough to be used in clinical routine. This article shows that it is feasible to overcome this lack of robustness by using a lightweight deep-learning approach usable on a standard computer, and this even without data augmentation or advanced model design. Methods. A convolutional neural-network architecture with three 2D U-nets for the three main orientations (sagittal, coronal, axial) was proposed. Predictions generated by the three U-nets were combined by majority voting to provide a single 3D segmentation of the motion mask. The networks were trained on a database of nonsmall cell lung cancer 4D CT images of 43 patients. Training and evaluation were done with a K-fold cross-validation strategy. Evaluation was based on a visual grading by two experts according to the appropriateness of the segmented motion mask for the registration task, and on a comparison with motion masks obtained by a baseline method using level sets. A second database (76 CT images of patients with early-stage COVID-19), unseen during training, was used to assess the generalizability of the trained neural network. Results. The proposed approach outperformed the baseline method in terms of quality and robustness: the success rate increased from 53% to 79% without producing any failure. It also achieved a speed-up factor of 60 with GPU, or 17 with CPU. The memory footprint was low: less than 5 GB GPU RAM for training and less than 1 GB GPU RAM for inference. When evaluated on a dataset with images differing by several characteristics (CT device, pathology, and field of view), the proposed method improved the success rate from 53% to 83%. Conclusion. With 5-s processing time on a mid-range GPU and success rates around 80%, the proposed approach seems fast and robust enough to be routinely used in clinical practice. The success rate can be further improved by incorporating more diversity in training data via data augmentation and additional annotated images from different scanners and diseases. The code and trained model are publicly available.

C1 [Penarrubia, Ludmilla; Pinon, Nicolas; Roux, Emmanuel; Serrano, Eduardo Enrique Davila; Richard, Jean-Christophe; Orkisz, Maciej; Sarrut, David] Univ Claude Bernard Lyon 1, Univ Lyon, U1294, INSERM,INSA Lyon,CNRS,CREATIS UMR 5220, F-69621 Lyon, France.

[Richard, Jean-Christophe] Hosp Civils Lyon, Serv Reanimat Med, Hop Croix Rousse, Lyon, France.

RP Penarrubia, L (通讯作者)，Univ Claude Bernard Lyon 1, Univ Lyon, U1294, INSERM,INSA Lyon,CNRS,CREATIS UMR 5220, F-69621 Lyon, France.

EM ludmilla.penarrubia@creatis.insa-lyon.fr

RI RICHARD, Jean-Christophe/A-4097-2009

OI RICHARD, Jean-Christophe/0000-0003-1503-3035; Roux,

Emmanuel/0000-0001-8168-5643

FU Universite de Lyon [ANR-11-LABX-0063, ANR-11-IDEX-0007]; SIRIC LYriCAN

Grant [INCa-INSERM-DGOS-12563]; GENCI (Jean Zay computing center)

[2019-101203]

FX This work was performed within the framework of the LABEX PRIMES

(ANR-11-LABX-0063) of Universite de Lyon, within the program

"Investissements d'Avenir" (ANR-11-IDEX-0007) operated by the French

National Research Agency (ANR), and the SIRIC LYriCAN Grant

INCa-INSERM-DGOS-12563. This work was granted access to the HPC

resources of IDRIS under the allocation 2019-101203 made by GENCI (Jean

Zay computing center).

CR [Anonymous], 2017, ARXIVABS170407239

Ayadi M, 2020, BRIT J RADIOL, V93, DOI 10.1259/bjr.20190692

Chae KJ, 2020, ACAD RADIOL, V27, P1540, DOI 10.1016/j.acra.2019.12.004

Delmon V, 2013, PHYS MED BIOL, V58, P1303, DOI 10.1088/0031-9155/58/5/1303

Derksen A, 2015, BILDVERARBEITUNG FUR DIE MEDIZIN 2015: ALGORITHMEN - SYSTEME - ANWENDUNGEN, P335, DOI 10.1007/978-3-662-46224-9\_58

Gerard SE, 2020, MED IMAGE ANAL, V60, DOI 10.1016/j.media.2019.101592

Guy CL, 2018, MED PHYS, V45, P2498, DOI 10.1002/mp.12891

Hua R, 2017, MED IMAGE ANAL, V36, P113, DOI 10.1016/j.media.2016.10.008

Isensee F, 2018, ARXIV180910486

Kingma D, 2014, ARXIV

Li XM, 2018, IEEE T MED IMAGING, V37, P2663, DOI 10.1109/TMI.2018.2845918

Litjens G, 2017, MED IMAGE ANAL, V42, P60, DOI 10.1016/j.media.2017.07.005

Lyksborg Mark, 2015, Image Analysis. 19th Scandinavian Conference, SCIA 2015. Proceedings: LNCS 9127, P201, DOI 10.1007/978-3-319-19665-7\_17

McClelland JR, 2017, PHYS MED BIOL, V62, P4273, DOI 10.1088/1361-6560/aa6070

McHugh ML, 2012, BIOCHEM MEDICA, V22, P276, DOI 10.11613/bm.2012.031

Milletari F, 2016, INT CONF 3D VISION, P565, DOI 10.1109/3DV.2016.79

Moeskops Pim, 2016, Medical Image Computing and Computer-Assisted Intervention - MICCAI 2016. 19th International Conference. Proceedings: LNCS 9901, P478, DOI 10.1007/978-3-319-46723-8\_55

Pinzon AM, 2017, IRBM, V38, P266, DOI 10.1016/j.irbm.2017.07.003

Orkisz M, 2019, INT J COMPUT ASS RAD, V14, P1945, DOI 10.1007/s11548-019-02064-3

Perslev M, 2019, LECT NOTES COMPUT SC, V11765, P30, DOI 10.1007/978-3-030-32245-8\_4

Prasoon A, 2013, LECT NOTES COMPUT SC, V8150, P246, DOI 10.1007/978-3-642-40763-5\_31

Ronneberger O., 2016, INT C MED IM COMP CO, P424, DOI [10.1007/978-3-319-46723-8\_49, DOI 10.1007/978-3-319-46723-8\_49]

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

Roth HR, 2014, LECT NOTES COMPUT SC, V8673, P520, DOI 10.1007/978-3-319-10404-1\_65

Sarrut D, 2017, PHYS MEDICA, V44, P108, DOI 10.1016/j.ejmp.2017.09.121

Schmidt-Richberg A, 2009, LECT NOTES COMPUT SC, V5761, P755

Sotiras A, 2013, IEEE T MED IMAGING, V32, P1153, DOI 10.1109/TMI.2013.2265603

Taha AA, 2015, BMC MED IMAGING, V15, DOI 10.1186/s12880-015-0068-x

Vandemeulebroucke J, 2012, MED PHYS, V39, P1006, DOI 10.1118/1.3679009

Wardhana G, 2021, INT J COMPUT ASS RAD, V16, P41, DOI 10.1007/s11548-020-02292-y

Wu ZJ, 2008, MED PHYS, V35, P775, DOI 10.1118/1.2828378

NR 31

TC 0

Z9 0

U1 4

U2 4

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD JAN

PY 2022

VL 49

IS 1

BP 420

EP 431

DI 10.1002/mp.15347

EA DEC 2021

PG 12

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA YG0CF

UT WOS:000724982600001

PM 34778978

OA Green Submitted

DA 2022-08-24

ER

PT J

AU Katsuta, Y

Kadoya, N

Mouri, S

Tanaka, S

Kanai, T

Takeda, K

Yamamoto, T

Ito, K

Kajikawa, T

Nakajima, Y

Jingu, K

AF Katsuta, Yoshiyuki

Kadoya, Noriyuki

Mouri, Shina

Tanaka, Shohei

Kanai, Takayuki

Takeda, Kazuya

Yamamoto, Takaya

Ito, Kengo

Kajikawa, Tomohiro

Nakajima, Yujiro

Jingu, Keiichi

TI Prediction of radiation pneumonitis with machine learning using 4D-CT

based dose-function features

SO JOURNAL OF RADIATION RESEARCH

LA English

DT Article

ID COMPUTED-TOMOGRAPHY VENTILATION; DEFORMABLE IMAGE REGISTRATION;

LUNG-CANCER; STATISTICAL VALIDATION; IMPROVES PREDICTION; THERAPY

AB In this article, we highlight the fundamental importance of the simultaneous use of dose-volume histogram (DVH) and dose-function histogram (DFH) features based on functional images calculated from 4-dimensional computed tomography (4D-CT) and deformable image registration (DIR) in developing a multivariate radiation pneumonitis (RP) prediction model. The patient characteristics, DVH features and DFH features were calculated from functional images by Hounsfield unit (HU) and Jacobian metrics, for an RP grade >= 2 multivariate prediction models were computed from 85 non-small cell lung cancer patients. The prediction model is developed using machine learning via a kernel-based support vector machine (SVM) machine. In the patient cohort, 21 of the 85 patients (24.7%) presented with RP grade >= 2. The median area under curve (AUC) was 0.58 for the generated 50 prediction models with patient clinical features and DVH features. When HU metric and Jacobian metric DFH features were added, the AUC improved to 0.73 and 0.68, respectively. We conclude that predictive RP models that incorporate DFH features were successfully developed via kernel-based SVM. These results demonstrate that effectiveness of the simultaneous use of DVH features and DFH features calculated from 4D -CT and DIR on functional image-guided radiotherapy.

C1 [Katsuta, Yoshiyuki; Kadoya, Noriyuki; Mouri, Shina; Tanaka, Shohei; Takeda, Kazuya; Yamamoto, Takaya; Ito, Kengo; Jingu, Keiichi] Tohoku Univ, Dept Radiat Oncol, Grad Sch Med, Sendai, Miyagi 9808574, Japan.

[Kanai, Takayuki] Yamagata Univ, Dept Radiat Oncol, Grad Sch Med, Yamagata 9902331, Japan.

[Kajikawa, Tomohiro] Kyoto Prefectural Univ Med, Dept Radiol, Kyoto 6028566, Japan.

[Nakajima, Yujiro] Komazawa Univ, Dept Radiol Sci, Tokyo 1548525, Japan.

RP Katsuta, Y (通讯作者)，Tohoku Univ, Dept Radiat Oncol, Grad Sch Med, Aoba Ku, 1-1 Seiryo Machi, Sendai, Miyagi 9808574, Japan.

EM yoshiyuki.katsuta.a7@tohoku.ac.jp

RI Nakajima, Yujiro/ABB-8666-2020

OI Nakajima, Yujiro/0000-0001-9317-6299; Tanaka, Shohei/0000-0002-4257-5342

FU JSPS KAKENHI [20 K16815]

FX This work was supported by the JSPS KAKENHI 20 K16815.

CR Borst GR, 2010, INT J RADIAT ONCOL, V77, P1596, DOI 10.1016/j.ijrobp.2009.10.015

Brennan D, 2015, INT J RADIAT ONCOL, V92, P423, DOI 10.1016/j.ijrobp.2015.01.019

Dean JA, 2016, RADIOTHER ONCOL, V120, P21, DOI 10.1016/j.radonc.2016.05.015

Fuld MK, 2008, J APPL PHYSIOL, V104, P1177, DOI 10.1152/japplphysiol.00212.2007

Graham MV, 1999, INT J RADIAT ONCOL, V45, P323, DOI 10.1016/S0360-3016(99)00183-2

Kanai T, 2014, J RADIAT RES, V55, P1163, DOI 10.1093/jrr/rru062

Kang J, 2015, INT J RADIAT ONCOL, V93, P1127, DOI 10.1016/j.ijrobp.2015.07.2286

Katsui K, 2019, BMC CANCER, V19, DOI 10.1186/s12885-019-6359-9

Klein S, 2010, IEEE T MED IMAGING, V29, P196, DOI 10.1109/TMI.2009.2035616

Krafft SP, 2018, MED PHYS, V45, P5317, DOI 10.1002/mp.13150

Luna JM, 2019, RADIOTHER ONCOL, V133, P106, DOI 10.1016/j.radonc.2019.01.003

Marks LB, 1999, MED PHYS, V26, P196, DOI 10.1118/1.598503

Mathew L, 2012, ACAD RADIOL, V19, P1546, DOI 10.1016/j.acra.2012.08.007

Menze BH, 2009, BMC BIOINFORMATICS, V10, DOI 10.1186/1471-2105-10-213

O'Reilly S, 2020, INT J RADIAT ONCOL, V107, P79, DOI 10.1016/j.ijrobp.2020.01.014

Palma DA, 2013, INT J RADIAT ONCOL, V85, P444, DOI 10.1016/j.ijrobp.2012.04.043

Pelikan M, 1999, GECCO-99: PROCEEDINGS OF THE GENETIC AND EVOLUTIONARY COMPUTATION CONFERENCE, P525

Pella A, 2011, MED PHYS, V38, P2859, DOI 10.1118/1.3582947

Petersson J, 2007, J APPL PHYSIOL, V102, P468, DOI 10.1152/japplphysiol.00732.2006

Reinhardt JM, 2008, MED IMAGE ANAL, V12, P752, DOI 10.1016/j.media.2008.03.007

Rubingh CM, 2006, METABOLOMICS, V2, P53, DOI 10.1007/s11306-006-0022-6

Sidiroglou-Douskos S., 2011, P 19 ACM SIGSOFT S 1, P124, DOI DOI 10.1145/2025113.2025133

Smola AJ, 1998, NEURAL NETWORKS, V11, P637, DOI 10.1016/S0893-6080(98)00032-X

Steyerberg EW, 2003, J CLIN EPIDEMIOL, V56, P441, DOI 10.1016/S0895-4356(03)00047-7

Tsujino K, 2014, J THORAC ONCOL, V9, P983, DOI 10.1097/JTO.0000000000000187

Videtic GMM, 2015, INT J RADIAT ONCOL, V93, P757, DOI 10.1016/j.ijrobp.2015.07.2260

Vinogradskiy Y, 2013, INT J RADIAT ONCOL, V86, P366, DOI 10.1016/j.ijrobp.2013.01.004

Vinogradskiy Y, 2012, INT J RADIAT ONCOL, V82, P1650, DOI 10.1016/j.ijrobp.2011.02.009

Vinogradskiy YY, 2012, MED PHYS, V39, P289, DOI 10.1118/1.3668056

Xu CJ, 2012, INT J RADIAT ONCOL, V84, pE123, DOI 10.1016/j.ijrobp.2012.02.022

Yamamoto T, 2016, RADIOTHER ONCOL, V118, P227, DOI 10.1016/j.radonc.2015.11.006

Yamamoto T, 2014, INT J RADIAT ONCOL, V90, P414, DOI 10.1016/j.ijrobp.2014.06.006

Yamamoto T, 2013, MED PHYS, V40, DOI 10.1118/1.4820538

Yamamoto T, 2012, ACAD RADIOL, V19, P1554, DOI 10.1016/j.acra.2012.07.006

Yamamoto T, 2011, MED PHYS, V38, P1348, DOI 10.1118/1.3547719

Yamamoto T, 2011, INT J RADIAT ONCOL, V79, P279, DOI 10.1016/j.ijrobp.2010.02.008

Zhang GG, 2016, J APPL CLIN MED PHYS, V17, P550, DOI 10.1120/jacmp.v17i2.5985

NR 37

TC 0

Z9 0

U1 1

U2 2

PU OXFORD UNIV PRESS

PI OXFORD

PA GREAT CLARENDON ST, OXFORD OX2 6DP, ENGLAND

SN 0449-3060

EI 1349-9157

J9 J RADIAT RES

JI J. Radiat. Res.

PD JAN

PY 2022

VL 63

IS 1

BP 71

EP 79

DI 10.1093/jrr/rrab097

EA OCT 2021

PG 9

WC Biology; Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Life Sciences & Biomedicine - Other Topics; Oncology; Radiology, Nuclear

Medicine & Medical Imaging

GA YL0XH

UT WOS:000745623800010

PM 34718683

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Li, HS

Becker, N

Raman, S

Chan, TCY

Bissonnette, JP

AF Li, Heyse

Becker, Nathan

Raman, Srinivas

Chan, Timothy C. Y.

Bissonnette, Jean-Pierre

TI The value of nodal information in predicting lung cancer relapse using

4DPET/4DCT

SO MEDICAL PHYSICS

LA English

DT Article

DE machine learning; node; NSCLC; PET; 4D

ID POSITRON-EMISSION-TOMOGRAPHY; STANDARDIZED UPTAKE VALUE; PATHOLOGICAL

RESPONSE; TUMOR RESPONSE; SURVIVAL; RADIOTHERAPY; RADIATION; THERAPY;

CHEMOTHERAPY

AB Purpose: There is evidence that computed tomography (CT) and positron emission tomography (PET) imaging metrics are prognostic and predictive in nonsmall cell lung cancer (NSCLC) treatment outcomes. However, few studies have explored the use of standardized uptake value (SUV)-based image features of nodal regions as predictive features. The authors investigated and compared the use of tumor and node image features extracted from the radiotherapy target volumes to predict relapse in a cohort of NSCLC patients undergoing chemoradiation treatment.

Methods: A prospective cohort of 25 patients with locally advanced NSCLC underwent 4DPET/4DCT imaging for radiation planning. Thirty-seven image features were derived from the CT-defined volumes and SUVs of the PET image from both the tumor and nodal target regions. The machine learning methods of logistic regression and repeated stratified five-fold cross-validation (CV) were used to predict local and overall relapses in 2 yr. The authors used well-known feature selection methods (Spearman's rank correlation, recursive feature elimination) within each fold of CV. Classifiers were ranked on their Matthew's correlation coefficient (MCC) after CV. Area under the curve, sensitivity, and specificity values are also presented.

Results: For predicting local relapse, the best classifier found had a mean MCC of 0.07 and was composed of eight tumor features. For predicting overall relapse, the best classifier found had a mean MCC of 0.29 and was composed of a single feature: the volume greater than 0.5 times the maximum SUV (N).

Conclusions: The best classifier for predicting local relapse had only tumor features. In contrast, the best classifier for predicting overall relapse included a node feature. Overall, the methods showed that nodes add value in predicting overall relapse but not local relapse. (C) 2015 American Association of Physicists in Medicine.

C1 [Li, Heyse; Chan, Timothy C. Y.] Univ Toronto, Dept Mech & Ind Engn, Toronto, ON M5S 3G8, Canada.

[Becker, Nathan; Raman, Srinivas; Bissonnette, Jean-Pierre] UHN Princess Margaret Canc Ctr, Radiat Oncol, Toronto, ON M5T 2M9, Canada.

[Chan, Timothy C. Y.; Bissonnette, Jean-Pierre] Techna Inst Adv Technol Hlth, Toronto, ON M5G 1P5, Canada.

RP Li, HS (通讯作者)，Univ Toronto, Dept Mech & Ind Engn, 5 Kings Coll Rd, Toronto, ON M5S 3G8, Canada.

FU Natural Sciences and Engineering Research Council of Canada (NSERC);

Canadian Institutes of Health Research (CIHR) through the Collaborative

Health Research Projects (CHRP) [398106-2011]

FX We would like to thank Dr. Katy Clarke, Dr. Victoria Ford, Dr. Paula

McCloskey, and Dr. Mei Ling Yap for the CT contours and Dr. Vladimir

Pekar for the automated PET thresholding algorithms. We would also like

to thank Dr. Issam El Naqa for his advice. We also thank the High

Performance Computing Virtual Laboratory (HPCVL) for providing the

computational infrastructure used in this paper. This research was

supported in part by the Natural Sciences and Engineering Research

Council of Canada (NSERC) and the Canadian Institutes of Health Research

(CIHR) through the Collaborative Health Research Projects (CHRP) Grant

No. 398106-2011.

CR Ahuja V, 1998, CANCER, V83, P918, DOI 10.1002/(SICI)1097-0142(19980901)83:5<918::AID-CNCR17>3.3.CO;2-#

Aristophanous M, 2012, INT J RADIAT ONCOL, V82, pe99, DOI DOI 10.1016/J.IJR0BP.2010.12.060

Colt HG, 2013, CHEST S, V143

De Ruysscher D, 2012, RADIOTHER ONCOL, V102, P228, DOI 10.1016/j.radonc.2011.10.010

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Downey RJ, 2004, J CLIN ONCOL, V22, P3255, DOI 10.1200/JCO.2004.11.109

El Naqa I, 2009, PATTERN RECOGN, V42, P1162, DOI 10.1016/j.patcog.2008.08.011

El Naqa I, 2009, PHYS MED BIOL, V54, pS9, DOI 10.1088/0031-9155/54/18/S02

Fan RE, 2008, J MACH LEARN RES, V9, P1871

Fox J., 2008, APPL REGRESSION ANAL

Guyon I, 2002, MACH LEARN, V46, P389, DOI 10.1023/A:1012487302797

Guyon Isabelle, 2003, J MACH LEARN RES, V3, P1157, DOI DOI 10.1162/153244303322753616

Hicks RJ, 2004, INT J RADIAT ONCOL, V60, P412, DOI 10.1016/j.ijrobp.2004.03.036

Hoekstra CJ, 2005, J CLIN ONCOL, V23, P8362, DOI 10.1200/JCO.2005.01.1189

Jayalakshmi T., 2011, INT J COMPUT THEORY, V3, P1793

Kong FMS, 2007, J CLIN ONCOL, V25, P3116, DOI 10.1200/JCO.2006.10.3747

Kubicek GJ, 2010, HEAD NECK ONCOL, V2, DOI 10.1186/1758-3284-2-19

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lee VH, 2014, AM J CLIN ONCOL

Guerra JLL, 2012, J NUCL MED, V53, P225, DOI 10.2967/jnumed.111.096305

Mac Manus MP, 2005, LUNG CANCER, V49, P95, DOI 10.1016/j.lungcan.2004.11.024

Machtay M, 2012, J THORAC ONCOL, V7, P716, DOI 10.1097/JTO.0b013e3182429682

MATTHEWS BW, 1975, BIOCHIM BIOPHYS ACTA, V405, P442, DOI 10.1016/0005-2795(75)90109-9

Pottgen C, 2006, CLIN CANCER RES, V12, P97, DOI 10.1158/1078-0432.CCR-05-0510

Sasaki R, 2005, J CLIN ONCOL, V23, P1136, DOI 10.1200/JCO.2005.06.129

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

van Elmpt W, 2012, J NUCL MED, V53, P1514, DOI 10.2967/jnumed.111.102566

van Stiphout RGPM, 2011, RADIOTHER ONCOL, V98, P126, DOI 10.1016/j.radonc.2010.12.002

Vansteenkiste JF, 1999, J CLIN ONCOL, V17, P3201, DOI 10.1200/JCO.1999.17.10.3201

Weber WA, 2003, J CLIN ONCOL, V21, P2651, DOI 10.1200/JCO.2003.12.004

Zhang H, 2014, INT J RADIAT ONCOL, V88, P195, DOI 10.1016/j.ijrobp.2013.09.037

NR 31

TC 6

Z9 6

U1 0

U2 5

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD AUG

PY 2015

VL 42

IS 8

BP 4727

EP 4733

DI 10.1118/1.4926755

PG 7

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA CO1RN

UT WOS:000358933000030

PM 26233200

OA Green Submitted

DA 2022-08-24

ER

PT J

AU Even, AJG

Reymen, B

La Fontaine, MD

Das, M

Jochems, A

Mottaghy, FM

Belderbos, JSA

De Ruysscher, D

Lambin, P

van Elmpt, W

AF Even, Aniek J. G.

Reymen, Bart

La Fontaine, Matthew D.

Das, Marco

Jochems, Arthur

Mottaghy, Felix M.

Belderbos, Jose S. A.

De Ruysscher, Dirk

Lambin, Philippe

van Elmpt, Wouter

TI Predicting tumor hypoxia in non-small cell lung cancer by combining CT,

FDG PET and dynamic contrast-enhanced CT

SO ACTA ONCOLOGICA

LA English

DT Article; Proceedings Paper

CT 15th Acta Oncologica Symposium - Biology-Guided Adaptive Radiotherapy

(BiGART)

CY JUN 13-16, 2017

CL Aarhus, DENMARK

ID IMPROVE RADIOTHERAPY; TARGETING HYPOXIA; DOSE-ESCALATION; MODEL;

QUANTIFICATION; PATIENT; METABOLISM; THERAPY; NSCLC; TRIAL

AB Background: Most solid tumors contain inadequately oxygenated (i.e., hypoxic) regions, which tend to be more aggressive and treatment resistant. Hypoxia PET allows visualization of hypoxia and may enable treatment adaptation. However, hypoxia PET imaging is expensive, time-consuming and not widely available. We aimed to predict hypoxia levels in non-small cell lung cancer (NSCLC) using more easily available imaging modalities: FDG-PET/CT and dynamic contrast-enhanced CT (DCE-CT).

Material and methods: For 34 NSCLC patients, included in two clinical trials, hypoxia HX4-PET/CT, planning FDG-PET/CT and DCE-CT scans were acquired before radiotherapy. Scans were non-rigidly registered to the planning CT. Tumor blood flow (BF) and blood volume (BV) were calculated by kinetic analysis of DCE-CT images. Within the gross tumor volume, independent clusters, i. e., supervoxels, were created based on FDG-PET/CT. For each supervoxel, tumor-to-background ratios (TBR) were calculated (median SUV/aorta SUVmean) for HX4-PET/CT and supervoxel features (median, SD, entropy) for the other modalities. Two random forest models (cross-validated: 10 folds, five repeats) were trained to predict the hypoxia TBR; one based on CT, FDG, BF and BV, and one with only CT and FDG features. Patients were split in a training (trial NCT01024829) and independent test set (trial NCT01210378). For each patient, predicted, and observed hypoxic volumes (HV) (TBR> 1.2) were compared.

Results: Fifteen patients (3291 supervoxels) were used for training and 19 patients (1502 supervoxels) for testing. The model with all features (RMSE training: 0.19 +/- 0.01, test: 0.27) outperformed the model with only CT and FDG-PET features (RMSE training: 0.20 +/- 0.01, test: 0.29). All tumors of the test set were correctly classified as normoxic or hypoxic (HV> 1cm(3)) by the best performing model.

Conclusions: We created a data-driven methodology to predict hypoxia levels and hypoxia spatial patterns using CT, FDG-PET and DCE-CT features in NSCLC. The model correctly classifies all tumors, and could therefore, aid tumor hypoxia classification and patient stratification.

C1 [Even, Aniek J. G.; Reymen, Bart; Jochems, Arthur; De Ruysscher, Dirk; Lambin, Philippe; van Elmpt, Wouter] Maastricht Univ, Med Ctr, Dept Radiat Oncol MAASTRO, GROW Sch Oncol & Dev Biol, Maastricht, Netherlands.

[La Fontaine, Matthew D.; Belderbos, Jose S. A.] Netherlands Canc Inst, Dept Radiat Oncol, Amsterdam, Netherlands.

[Das, Marco; Mottaghy, Felix M.] Maastricht Univ, Med Ctr, Dept Radiol & Nucl Med, Maastricht, Netherlands.

[Mottaghy, Felix M.] Univ Hosp Aachen, Dept Nucl Med, Aachen, Germany.

RP Even, AJG (通讯作者)，Dr Tanslaan 12,POB 1588, NL-6229 ET Maastricht, Netherlands.

EM aniek.even@maastro.nl

RI Mottaghy, Felix/AAU-2673-2020

OI Mottaghy, Felix/0000-0002-7212-6521; Even, Aniek/0000-0002-0890-646X;

Lambin, Philippe/0000-0001-7961-0191

FU ERC [694812 - Hypoximmuno]; Dutch Technology Foundation STW [10696

DuCAT, P14-19 Radiomics STRaTegy]; Technology Programme of the Ministry

of Economic Affairs; EU [257144, 601826]; SME Phase 2 (EU) [673780 -

RAIL]; EUROSTARS (DART); European Program H2020 [BD2Decide -

PHC30-689715]; European Program H2020 (ImmunoSABR) [733008]; Interreg

V-A Euregio Meuse-Rhine ('Euradiomics'), Kankeronderzoekfonds Limburg

from the Health Foundation Limburg; Dutch Cancer Society

FX The authors acknowledge financial support from ERC Advanced Grant

(ERC-ADG-2015, no. 694812 - Hypoximmuno). This research is also

supported by the Dutch Technology Foundation STW (grant no. 10696 DuCAT

and no. P14-19 Radiomics STRaTegy), which is the applied science

division of NWO, and the Technology Programme of the Ministry of

Economic Affairs. The authors also acknowledge financial support from

the EU Seventh Framework Program (ARTFORCE - no. 257144, REQUITE - no.

601826), SME Phase 2 (EU proposal 673780 - RAIL), EUROSTARS (DART), the

European Program H2020-2015-17 (BD2Decide - PHC30-689715 and ImmunoSABR

- no. 733008), Interreg V-A Euregio Meuse-Rhine ('Euradiomics'),

Kankeronderzoekfonds Limburg from the Health Foundation Limburg and the

Dutch Cancer Society.

CR Achanta R, 2012, IEEE T PATTERN ANAL, V34, P2274, DOI 10.1109/TPAMI.2012.120

Begg AC, 2011, NAT REV CANCER, V11, P239, DOI 10.1038/nrc3007

Boellaard R, 2008, EUR J NUCL MED MOL I, V35, P2320, DOI 10.1007/s00259-008-0874-2

Di Perri D, 2017, ACTA ONCOL, V56, P516, DOI 10.1080/0284186X.2017.1287943

Dubois LJ, 2011, P NATL ACAD SCI USA, V108, P14620, DOI 10.1073/pnas.1102526108

Even AJG, 2015, RADIOTHER ONCOL, V116, P281, DOI 10.1016/j.radonc.2015.07.013

Grimes DR, 2016, J R SOC INTERFACE, V13, DOI 10.1098/rsif.2016.0070

Gu SL, 2012, MATH MED BIOL, V29, P31, DOI 10.1093/imammb/dqr002

Horsman MR, 2012, NAT REV CLIN ONCOL, V9, P674, DOI 10.1038/nrclinonc.2012.171

Kelly CJ, 2006, PHYS MED BIOL, V51, P5859, DOI 10.1088/0031-9155/51/22/009

Kerner GSMA, 2016, EJNMMI RES, V6, DOI 10.1186/s13550-016-0187-6

Klein S, 2010, IEEE T MED IMAGING, V29, P196, DOI 10.1109/TMI.2009.2035616

La Fontaine MD, 2017, VET COMP ONCOL, V15, P105, DOI 10.1111/vco.12143

Mandeville HC, 2012, RADIOLOGY, V264, P581, DOI 10.1148/radiol.12111505

Peeters SGJA, 2015, CLIN CANCER RES, V21, P2984, DOI 10.1158/1078-0432.CCR-15-0018

Peeters SGJA, 2015, INT J RADIAT ONCOL, V91, P351, DOI 10.1016/j.ijrobp.2014.09.045

St Lawrence KS, 1998, J CEREBR BLOOD F MET, V18, P1365, DOI 10.1097/00004647-199812000-00011

Staring M, 2014, MED PHYS, V41, DOI 10.1118/1.4851535

van Elmpt W, 2016, EUR J NUCL MED MOL I, V43, P240, DOI 10.1007/s00259-015-3169-4

van Elmpt W, 2012, RADIOTHER ONCOL, V104, P67, DOI 10.1016/j.radonc.2012.03.005

van Loon J, 2010, EUR J NUCL MED MOL I, V37, P1663, DOI 10.1007/s00259-010-1437-x

Wilson WR, 2011, NAT REV CANCER, V11, P393, DOI 10.1038/nrc3064

Wouters BG, 2004, DRUG RESIST UPDATE, V7, P25, DOI 10.1016/j.drup.2003.12.004

Wouters BG, 2003, SEMIN RADIAT ONCOL, V13, P31, DOI 10.1053/srao.2003.50004

Zegers CML, 2015, ACTA ONCOL, V54, P1378, DOI 10.3109/0284186X.2015.1062913

Zegers CML, 2014, CLIN CANCER RES, V20, P6389, DOI 10.1158/1078-0432.CCR-14-1524

NR 26

TC 13

Z9 13

U1 0

U2 0

PU TAYLOR & FRANCIS LTD

PI ABINGDON

PA 2-4 PARK SQUARE, MILTON PARK, ABINGDON OR14 4RN, OXON, ENGLAND

SN 0284-186X

EI 1651-226X

J9 ACTA ONCOL

JI Acta Oncol.

PY 2017

VL 56

IS 11

BP 1591

EP 1596

DI 10.1080/0284186X.2017.1349332

PG 6

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED); Conference Proceedings Citation Index - Science (CPCI-S)

SC Oncology

GA FT9IA

UT WOS:000423464400035

PM 28840770

OA hybrid, Green Submitted, Green Published

DA 2022-08-24

ER

PT J

AU Liang, B

Yan, H

Tian, Y

Chen, XY

Yan, LL

Zhang, T

Zhou, ZM

Wang, LH

Dai, JR

AF Liang, Bin

Yan, Hui

Tian, Yuan

Chen, Xinyuan

Yan, Lingling

Zhang, Tao

Zhou, Zongmei

Wang, Lvhua

Dai, Jianrong

TI Dosiomics: Extracting 3D Spatial Features From Dose Distribution to

Predict Incidence of Radiation Pneumonitis

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE dosiomics; radiomics; dose distribution; pneumonitis prediction;

logistic regression

ID LUNG-CANCER; RADIOTHERAPY; THERAPY; IMAGES; MODELS

AB Radiation pneumonitis (RP) is one of the major toxicities of thoracic radiation therapy. RP incidence has been proven to be closely associated with the dosimetric factors and normal tissue control possibility (NTCP) factors. However, because these factors only utilize limited information of the dose distribution, the prediction abilities of these factors are modest. We adopted the dosiomics method for RP prediction. The dosiomics method first extracts spatial features of the dose distribution within ipsilateral, contralateral, and total lungs, and then uses these extracted features to construct prediction model via univariate and multivariate logistic regression (LR). The dosiomics method is validated using 70 non-small cell lung cancer (NSCLC) patients treated with volumetric modulated arc therapy (VMAT) radiotherapy. Dosimetric and NTCP factors based prediction models are also constructed to compare with the dosiomics features based prediction model. For the dosimetric, NTCP and dosiomics factors/features, the most significant single factors/features are the mean dose, parallel/serial (PS) NTCP and gray level co-occurrence matrix (GLCM) contrast of ipsilateral lung, respectively. And the area under curve (AUC) of univariate LR is 0.665, 0.710 and 0.709, respectively. The second significant factors are V-5 of contralateral lung, equivalent uniform dose (EUD) derived from PS NTCP of contralateral lung and the low gray level run emphasis of gray level run length matrix (GLRLM) of total lungs. The AUC of multivariate LR is improved to 0.676, 0.744, and 0.782, respectively. The results demonstrate that the univariate LR of dosiomics features has approximate predictive ability with NTCP factors, and the multivariate LR outperforms both the dosimetric and NTCP factors. In conclusion, the spatial features of dose distribution extracted by the dosiomics method effectively improves the prediction ability.

C1 [Wang, Lvhua; Dai, Jianrong] Chinese Acad Med Sci, Dept Radiat Oncol, Natl Canc Ctr, Natl Clin Res Ctr Canc,Canc Hosp, Beijing, Peoples R China.

[Liang, Bin; Tian, Yuan] Peking Union Med Coll, Beijing, Peoples R China.

[Liang, Bin; Tian, Yuan] Chinese Acad Med Sci, Canc Hosp, Beijing, Peoples R China.

RP Wang, LH; Dai, JR (通讯作者)，Chinese Acad Med Sci, Dept Radiat Oncol, Natl Canc Ctr, Natl Clin Res Ctr Canc,Canc Hosp, Beijing, Peoples R China.

EM wlhwq@yahoo.com; dai\_jianrong@cicams.ac.cn

FU National Natural Science Foundation of China [11475261, 81801799,

81502649]; National Key RAMP;D Program of China [2016YFC0904600]

FX This work was supported by the National Natural Science Foundation of

China (11475261, 81801799 and 81502649) and the National Key R&D Program

of China (2016YFC0904600).

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Avanzo M, 2015, PHYS MEDICA, V31, P1, DOI 10.1016/j.ejmp.2014.10.006

Boonyawan K, 2018, INT J RADIAT ONCOL, V101, P919, DOI 10.1016/j.ijrobp.2018.04.012

Briere TM, 2016, INT J RADIAT ONCOL, V94, P377, DOI 10.1016/j.ijrobp.2015.10.002

Fawcett T, 2006, PATTERN RECOGN LETT, V27, P861, DOI 10.1016/j.patrec.2005.10.010

Gabrys HS, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00035

Gillies RJ, 2016, RADIOLOGY, V278, P563, DOI 10.1148/radiol.2015151169

KALLMAN P, 1992, INT J RADIAT BIOL, V62, P249, DOI 10.1080/09553009214552071

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

LYMAN JT, 1985, RADIAT RES, V104, pS13, DOI 10.2307/3576626

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Mavroidis P, 2001, PHYS MED BIOL, V46, P2607, DOI 10.1088/0031-9155/46/10/307

Palma DA, 2013, INT J RADIAT ONCOL, V85, P444, DOI 10.1016/j.ijrobp.2012.04.043

Pinnix CC, 2015, INT J RADIAT ONCOL, V92, P175, DOI 10.1016/j.ijrobp.2015.02.010

R Development Core Team, 2009, R LANG ENV STAT COMP

Ramella S, 2010, INT J RADIAT ONCOL, V76, P110, DOI 10.1016/j.ijrobp.2009.01.036

Rossi L, 2018, RADIOTHER ONCOL, V129, P548, DOI 10.1016/j.radonc.2018.07.027

Seppenwoolde Y, 2003, INT J RADIAT ONCOL, V55, P724, DOI 10.1016/S0360-3016(02)03986-X

Tsougos I, 2005, PHYS MED BIOL, V50, P3535, DOI 10.1088/0031-9155/50/15/004

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Vittinghoff E, 2007, AM J EPIDEMIOL, V165, P710, DOI 10.1093/aje/kwk052

Yorke ED, 2002, INT J RADIAT ONCOL, V54, P329, DOI 10.1016/S0360-3016(02)02929-2

Zhen X, 2017, PHYS MED BIOL, V62, P8246, DOI 10.1088/1361-6560/aa8d09

NR 23

TC 43

Z9 47

U1 1

U2 10

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD APR 12

PY 2019

VL 9

AR 269

DI 10.3389/fonc.2019.00269

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA HT2DU

UT WOS:000464374200001

PM 31032229

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Pavic, M

Bogowicz, M

Wurms, X

Glatz, S

Finazzi, T

Riesterer, O

Roesch, J

Rudofsky, L

Friess, M

Veit-Haibach, P

Huellner, M

Opitz, I

Weder, W

Frauenfelder, T

Guckenberger, M

Tanadini-Lang, S

AF Pavic, Matea

Bogowicz, Marta

Wurms, Xaver

Glatz, Stefan

Finazzi, Tobias

Riesterer, Oliver

Roesch, Johannes

Rudofsky, Leonie

Friess, Martina

Veit-Haibach, Patrick

Huellner, Martin

Opitz, Isabelle

Weder, Walter

Frauenfelder, Thomas

Guckenberger, Matthias

Tanadini-Lang, Stephanie

TI Influence of inter-observer delineation variability on radiomics

stability in different tumor sites

SO ACTA ONCOLOGICA

LA English

DT Article

ID LUNG-CANCER; CONFORMAL RADIOTHERAPY; VOLUME DELINEATION; TARGET

DELINEATION; PET RADIOMICS; NECK-CANCER; HEAD; IMPLEMENTATION;

PREDICTION; FEATURES

AB Background: Radiomics is a promising methodology for quantitative analysis and description of radiological images using advanced mathematics and statistics. Tumor delineation, which is still often done manually, is an essential step in radiomics, however, inter-observer variability is a well-known uncertainty in radiation oncology. This study investigated the impact of inter-observer variability (IOV) in manual tumor delineation on the reliability of radiomic features (RF).Methods: Three different tumor types (head and neck squamous cell carcinoma (HNSCC), malignant pleural mesothelioma (MPM) and non-small cell lung cancer (NSCLC)) were included. For each site, eleven individual tumors were contoured on CT scans by three experienced radiation oncologists. Dice coefficients (DC) were calculated for quantification of delineation variability. RF were calculated with an in-house developed software implementation, which comprises 1404 features: shape (n=18), histogram (n=17), texture (n=137) and wavelet (n=1232). The IOV of RF was studied using the intraclass correlation coefficient (ICC). An ICC >0.8 indicates a good reproducibility. For the stable RF, an average linkage hierarchical clustering was performed to identify classes of uncorrelated features.Results: Median DC was high for NSCLC (0.86, range 0.57-0.90) and HNSCC (0.72, 0.21-0.89), whereas it was low for MPM (0.26, 0-0.9) indicating substantial IOV. Stability rate of RF correlated with DC and depended on tumor site, showing a high stability in NSCLC (90% of total parameters), acceptable stability in HNSCC (59% of total parameters) and low stability in MPM (36% of total parameters). Shape features showed the weakest stability across all tumor types. Hierarchical clustering revealed 14 groups of correlated and stable features for NSCLC and 6 groups for both HNSCC and MPM.Conclusion: Inter-observer delineation variability has a relevant influence on radiomics analysis and is strongly influenced by tumor type. This leads to a reduced number of suitable imaging features.

C1 [Pavic, Matea; Bogowicz, Marta; Wurms, Xaver; Glatz, Stefan; Finazzi, Tobias; Riesterer, Oliver; Roesch, Johannes; Rudofsky, Leonie; Guckenberger, Matthias; Tanadini-Lang, Stephanie] Univ Hosp Zurich, Dept Radiat Oncol, Ramistr 100, CH-8091 Zurich, Switzerland.

[Friess, Martina; Opitz, Isabelle; Weder, Walter] Univ Hosp Zurich, Dept Thorac Surg, Zurich, Switzerland.

[Veit-Haibach, Patrick; Huellner, Martin] Univ Zurich, Univ Hosp Zurich, Dept Nucl Med, Zurich, Switzerland.

[Frauenfelder, Thomas] Univ Hosp Zurich, Inst Diagnost & Intervent Radiol, Zurich, Switzerland.

RP Pavic, M (通讯作者)，Univ Hosp Zurich, Dept Radiat Oncol, Ramistr 100, CH-8091 Zurich, Switzerland.

EM matea.pavic@usz.ch

RI Guckenberger, Matthias/AAX-4994-2020; Bogowicz, Marta/AAM-6142-2020;

Frauenfelder, Thomas/O-1734-2016; Guckenberger, Matthias/M-5114-2019

OI Guckenberger, Matthias/0000-0002-7146-9071; Bogowicz,

Marta/0000-0002-4747-5375; Frauenfelder, Thomas/0000-0002-3295-6619;

Tanadini-Lang, Stephanie/0000-0002-4387-1522; Riesterer,

Oliver/0000-0002-9508-0546; Opitz, Isabelle/0000-0001-5900-9040; Pavic,

Matea/0000-0002-3899-6152; Finazzi, Tobias/0000-0002-4118-4171

FU GE Healthcare

FX Martin Huellner received grants from GE Healthcare.

CR Alex Zwanenburg SL, 2017, IMAGE BIOMARKER STAN

Bogowicz M, 2017, RADIOTHER ONCOL, V125, P385, DOI 10.1016/j.radonc.2017.10.023

Bogowicz M, 2017, ACTA ONCOL, V56, P1531, DOI 10.1080/0284186X.2017.1346382

Brouwer CL, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-32

DICE LR, 1945, ECOLOGY, V26, P297, DOI 10.2307/1932409

Fuller CD, 2011, INT J RADIAT ONCOL, V79, P481, DOI 10.1016/j.ijrobp.2009.11.012

Giraud P, 2002, RADIOTHER ONCOL, V62, P27, DOI 10.1016/S0167-8140(01)00444-3

Hatt M, 2017, EUR J NUCL MED MOL I, V44, P151, DOI 10.1007/s00259-016-3427-0

Hatt M, 2013, EUR J NUCL MED MOL I, V40, P1662, DOI 10.1007/s00259-013-2486-8

Hong TS, 2004, INT J RADIAT ONCOL, V60, pS157, DOI 10.1016/S0360-3016(04)01130-7

Koo TK, 2016, J CHIROPR MED, V15, P155, DOI 10.1016/j.jcm.2016.02.012

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Larue RTHM, 2017, BRIT J RADIOL, V90, DOI 10.1259/bjr.20160665

Leijenaar RTH, 2013, ACTA ONCOL, V52, P1391, DOI 10.3109/0284186X.2013.812798

Mitchell DM, 2009, INT J RADIAT ONCOL, V75, P990, DOI 10.1016/j.ijrobp.2008.12.042

Parmar C, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0102107

Peulen H, 2015, RADIOTHER ONCOL, V114, P361, DOI 10.1016/j.radonc.2015.02.011

Rachiglio AM, 2016, ONCOTARGET, V7, P66595, DOI 10.18632/oncotarget.10704

Rasch C, 2002, INT J RADIAT ONCOL, V52, P120, DOI 10.1016/S0360-3016(01)01751-5

Rich JN, 2016, MEDICINE, V95, DOI 10.1097/MD.0000000000004764

Riegel AC, 2006, INT J RADIAT ONCOL, V65, P726, DOI 10.1016/j.ijrobp.2006.01.014

Senan S, 1999, RADIOTHER ONCOL, V53, P247, DOI 10.1016/S0167-8140(99)00143-7

SHROUT PE, 1979, PSYCHOL BULL, V86, P420, DOI 10.1037/0033-2909.86.2.420

Van de Steene J, 2002, RADIOTHER ONCOL, V62, P37, DOI 10.1016/S0167-8140(01)00453-4

van Velden FHP, 2016, MOL IMAGING BIOL, V18, P788, DOI 10.1007/s11307-016-0940-2

Vorwerk H, 2009, RADIOTHER ONCOL, V91, P455, DOI 10.1016/j.radonc.2009.03.014

Walter SD, 1998, STAT MED, V17, P101, DOI 10.1002/(SICI)1097-0258(19980115)17:1<101::AID-SIM727>3.0.CO;2-E

Yip SSF, 2016, PHYS MED BIOL, V61, pR150, DOI 10.1088/0031-9155/61/13/R150

NR 28

TC 103

Z9 107

U1 1

U2 13

PU TAYLOR & FRANCIS LTD

PI ABINGDON

PA 2-4 PARK SQUARE, MILTON PARK, ABINGDON OR14 4RN, OXON, ENGLAND

SN 0284-186X

EI 1651-226X

J9 ACTA ONCOL

JI Acta Oncol.

PY 2018

VL 57

IS 8

BP 1070

EP 1074

DI 10.1080/0284186X.2018.1445283

PG 5

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA GQ4DP

UT WOS:000441618800010

PM 29513054

OA Green Submitted, Bronze

DA 2022-08-24

ER

PT J

AU Carvalho, S

Leijenaar, RTH

Velazquez, ER

Oberije, C

Parmar, C

Van Elmpt, W

Reymen, B

Troost, EGC

Oellers, M

Dekker, A

Gillies, R

Aerts, HJWL

Lambin, P

AF Carvalho, Sara

Leijenaar, Ralph T. H.

Velazquez, Emmanuel Rios

Oberije, Cary

Parmar, Chintan

Van Elmpt, Wouter

Reymen, Bart

Troost, Esther G. C.

Oellers, Michel

Dekker, Andre

Gillies, Robert

Aerts, Hugo J. W. L.

Lambin, Philippe

TI Prognostic value of metabolic metrics extracted from baseline positron

emission tomography images in non-small cell lung cancer

SO ACTA ONCOLOGICA

LA English

DT Article

ID SOLID TUMORS; PET; VOLUME; SURVIVAL; QUANTIFICATION; RADIOTHERAPY;

PREDICTION; IMPACT

AB Background. Maximum, mean and peak SUV of primary tumor at baseline FDG-PET scans, have often been found predictive for overall survival in non-small cell lung cancer (NSCLC) patients. In this study we further investigated the prognostic power of advanced metabolic metrics derived from intensity volume histograms (IVH) extracted from PET imaging. Methods. A cohort of 220 NSCLC patients (mean age, 66.6 years; 149 men, 71 women), stages I-IIIB, treated with radiotherapy with curative intent were included (NCT00522639). Each patient underwent standardized pre-treatment CT-PET imaging. Primary GTV was delineated by an experienced radiation oncologist on CT-PET images. Common PET descriptors such as maximum, mean and peak SUV, and metabolic tumor volume (MTV) were quantified. Advanced descriptors of metabolic activity were quantified by IVH. These comprised five groups of features: absolute and relative volume above relative intensity threshold (AVRI and RVRI), absolute and relative volume above absolute intensity threshold (AVAI and RVAI), and absolute intensity above relative volume threshold (AIRV). MTV was derived from the IVH curves for volumes with SUV above 2.5, 3 and 4, and of 40% and 50% maximum SUV. Univariable analysis using Cox Proportional Hazard Regression was performed for overall survival assessment. Results. Relative volume above higher SUV (80%) was an independent predictor of OS (p = 0.05). None of the possible surrogates for MTV based on volumes above SUV of 3, 40% and 50% of maximum SUV showed significant associations with OS [p (AVAI(3)) = 0.10, p (AVAI(4)) = 0.22, p (AVRI(40%)) = 0.15, p (AVRI(50%)) = 0.17]. Maximum and peak SUV (r = 0.99) revealed no prognostic value for OS [p (maximum SUV) = 0.20, p (peak SUV) = 0.22]. Conclusions. New methods using more advanced imaging features extracted from PET were analyzed. Best prognostic value for OS of NSCLC patients was found for relative portions of the tumor above higher uptakes (80% SUV).

C1 [Carvalho, Sara; Leijenaar, Ralph T. H.; Velazquez, Emmanuel Rios; Oberije, Cary; Parmar, Chintan; Van Elmpt, Wouter; Reymen, Bart; Troost, Esther G. C.; Oellers, Michel; Dekker, Andre; Aerts, Hugo J. W. L.; Lambin, Philippe] MUMC, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Maastricht, Netherlands.

[Aerts, Hugo J. W. L.] Harvard Univ, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiat Oncol,Med Sch, Boston, MA 02115 USA.

[Aerts, Hugo J. W. L.] Harvard Univ, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiol,Med Sch, Boston, MA 02115 USA.

[Gillies, Robert] Univ S Florida, Coll Med, H Lee Moffitt Canc Ctr & Res Inst, Dept Canc Imaging & Metab, Tampa, FL 33612 USA.

[Gillies, Robert] Univ S Florida, Coll Med, H Lee Moffitt Canc Ctr & Res Inst, Dept Radiol, Tampa, FL 33612 USA.

RP Carvalho, S (通讯作者)，Maastricht Univ Med Ctr, Dept Radiat Oncol, MAASTRO Clin, GROW Sch Oncol & Dev Biol, Dr Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

EM sara.carvalho@maastro.nl

RI Aerts, Hugo/P-6350-2015; Dekker, Andre/AAE-4830-2019; Oberije,

Cary/ABA-6178-2020; Aerts, Hugo/ABF-2821-2020; Oberije,

Cary/I-4018-2013; parmar, chintan/J-2977-2019

OI Aerts, Hugo/0000-0002-2122-2003; Dekker, Andre/0000-0002-0422-7996;

Oberije, Cary/0000-0003-0749-5117; Aerts, Hugo/0000-0002-2122-2003;

Oberije, Cary/0000-0003-0749-5117; parmar, chintan/0000-0002-2140-814X;

Lambin, Philippe/0000-0001-7961-0191; Troost, Esther/0000-0001-9550-9050

FU QuIC - ConCePT project; EFPI A companies and the Innovative Medicine

Initiative Joint Undertaking (IMI JU) [115151]; National Institute of

Health [NIH-USA U01 CA 143062-01]; CTMM framework (AIRFORCE project)

[030-103]; EU; euroCAT; Kankeronderzoekfonds Limburg from the Health

Foundation Limburg; Dutch Cancer Society [KWF UM 2011-5020, KWF UM

2009-4454]; NATIONAL CANCER INSTITUTE [U01CA143062] Funding Source: NIH

RePORTER

FX We acknowledge financial support from the QuIC - ConCePT project, which

is partly funded by EFPI A companies and the Innovative Medicine

Initiative Joint Undertaking (IMI JU) under Grant Agreement No. 115151.

We also acknowledge financial support from the National Institute of

Health (NIH-USA U01 CA 143062-01, Radiomics of NSCLC), the CTMM

framework (AIRFORCE project, grant 030-103), EU 6th and 7th framework

program (EUROXY, METOXIA, EURECA, ARTFORCE), euroCAT (IVA

Interreg-www.eurocat.info), Kankeronderzoekfonds Limburg from the Health

Foundation Limburg and the Dutch Cancer Society (KWF UM 2011-5020, KWF

UM 2009-4454).

CR Abelson JA, 2012, LUNG CANCER, V78, P219, DOI 10.1016/j.lungcan.2012.08.016

Aerts HJWL, 2009, RADIOTHER ONCOL, V91, P386, DOI 10.1016/j.radonc.2009.03.006

Agarwal M, 2010, EUR J NUCL MED MOL I, V37, P691, DOI 10.1007/s00259-009-1291-x

[Anonymous], 1993, 50 ICRU

Boellaard R, 2008, EUR J NUCL MED MOL I, V35, P2320, DOI 10.1007/s00259-008-0874-2

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Deasy JO, 2003, MED PHYS, V30, P979, DOI 10.1118/1.1568978

DRZYMALA RE, 1991, INT J RADIAT ONCOL, V21, P71, DOI 10.1016/0360-3016(91)90168-4

El Naqa I, 2009, PATTERN RECOGN, V42, P1162, DOI 10.1016/j.patcog.2008.08.011

Fuss M, 2010, ACTA ONCOL, V49, P948, DOI 10.3109/0284186X.2010.510533

Hoang JK, 2008, J CLIN ONCOL, V26, P1459, DOI 10.1200/JCO.2007.14.3628

Hyun SH, 2013, ANN SURG, V257, P364, DOI 10.1097/SLA.0b013e318262a6ec

Kauppi JT, 2012, ACTA ONCOL, V51, P636, DOI 10.3109/0284186X.2011.643822

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Oncology MR, 2010, RAD NSCLC IND MLD BR

Salminen E, 2001, ANN MED, V33, P404, DOI 10.3109/07853890108995953

Soussan M, EUR J NUCL MED MOL I

Travis WD, 2004, WHO CLASSIFICATION T

Van de Wiele C, 2013, EUR J NUCL MED MOL I, V40, P290, DOI 10.1007/s00259-012-2280-z

van Velden FHP, 2011, EUR J NUCL MED MOL I, V38, P1636, DOI 10.1007/s00259-011-1845-6

Vanderhoek M, 2012, J NUCL MED, V53, P4, DOI 10.2967/jnumed.111.093443

Velazquez ER, 2010, ACTA ONCOL, V49, P1033, DOI 10.3109/0284186X.2010.498441

Wahl RL, 2009, J NUCL MED, V50, p122S, DOI 10.2967/jnumed.108.057307

NR 24

TC 39

Z9 40

U1 0

U2 6

PU INFORMA HEALTHCARE

PI LONDON

PA TELEPHONE HOUSE, 69-77 PAUL STREET, LONDON EC2A 4LQ, ENGLAND

SN 0284-186X

J9 ACTA ONCOL

JI Acta Oncol.

PD OCT

PY 2013

VL 52

IS 7

BP 1398

EP 1404

DI 10.3109/0284186X.2013.812795

PG 7

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA 223AU

UT WOS:000324776100021

PM 24047338

OA Green Published, Green Accepted

DA 2022-08-24

ER

PT J

AU Huynh, E

Coroller, TP

Narayan, V

Agrawal, V

Romano, J

Franco, I

Parmar, C

Hou, Y

Mak, RH

Aerts, HJWL

AF Huynh, Elizabeth

Coroller, Thibaud P.

Narayan, Vivek

Agrawal, Vishesh

Romano, John

Franco, Idalid

Parmar, Chintan

Hou, Ying

Mak, Raymond H.

Aerts, Hugo J. W. L.

TI Associations of Radiomic Data Extracted from Static and

Respiratory-Gated CT Scans with Disease Recurrence in Lung Cancer

Patients Treated with SBRT

SO PLOS ONE

LA English

DT Article

ID STEREOTACTIC BODY RADIOTHERAPY; PROSPECTIVE PHASE-II; RADIATION-THERAPY;

EARLY-STAGE; COMPUTED-TOMOGRAPHY; FEATURES; OUTCOMES; VARIABILITY;

CARCINOMA; TEXTURE

AB Radiomics aims to quantitatively capture the complex tumor phenotype contained in medical images to associate them with clinical outcomes. This study investigates the impact of different types of computed tomography (CT) images on the prognostic performance of radiomic features for disease recurrence in early stage non-small cell lung cancer (NSCLC) patients treated with stereotactic body radiation therapy (SBRT). 112 early stage NSCLC patients treated with SBRT that had static free breathing (FB) and average intensity projection (AIP) images were analyzed. Nineteen radiomic features were selected from each image type (FB or AIP) for analysis based on stability and variance. The selected FB and AIP radiomic feature sets had 6 common radiomic features between both image types and 13 unique features. The prognostic performances of the features for distant metastasis (DM) and locoregional recurrence (LRR) were evaluated using the concordance index (CI) and compared with two conventional features (tumor volume and maximum diameter). P-values were corrected for multiple testing using the false discovery rate procedure. None of the FB radiomic features were associated with DM, however, seven AIP radiomic features, that described tumor shape and heterogeneity, were (CI range: 0.638-0.676). Conventional features from FB images were not associated with DM, however, AIP conventional features were (CI range: 0.643-0.658). Radiomic and conventional multivariate models were compared between FB and AIP images using cross validation. The differences between the models were assessed using a permutation test. AIP radiomic multivariate models (median CI = 0.667) outperformed all other models (median CI range: 0.601-0.630) in predicting DM. None of the imaging features were prognostic of LRR. Therefore, image type impacts the performance of radiomic models in their association with disease recurrence. AIP images contained more information than FB images that were associated with disease recurrence in early stage NSCLC patients treated with SBRT, which suggests that AIP images may potentially be more optimal for the development of an imaging biomarker.

C1 [Huynh, Elizabeth; Coroller, Thibaud P.; Narayan, Vivek; Agrawal, Vishesh; Romano, John; Franco, Idalid; Parmar, Chintan; Hou, Ying; Mak, Raymond H.; Aerts, Hugo J. W. L.] Harvard Med Sch, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiat Oncol, Boston, MA 02115 USA.

[Aerts, Hugo J. W. L.] Harvard Med Sch, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiol, Boston, MA USA.

RP Huynh, E (通讯作者)，Harvard Med Sch, Brigham & Womens Hosp, Dana Farber Canc Inst, Dept Radiat Oncol, Boston, MA 02115 USA.

EM ehuynh@lroc.harvard.edu

RI parmar, chintan/J-2977-2019; Aerts, Hugo/P-6350-2015; Aerts,

Hugo/ABF-2821-2020

OI parmar, chintan/0000-0002-2140-814X; Aerts, Hugo/0000-0002-2122-2003;

Aerts, Hugo/0000-0002-2122-2003; Mak, Raymond/0000-0002-8754-0565

FU National Institute of Health [NIH-USA U24CA194354, NIH-USA U01CA190234];

Kaye Scholar Award; Brigham and Women's Hospital Department of Radiation

Oncology Clinical Translational Grant; Varian Medical Research

Collaborations

FX Authors acknowledge financial support from the National Institute of

Health (NIH-USA U24CA194354, and NIH-USA U01CA190234). This project was

partially funded by the Kaye Scholar Award, the Brigham and Women's

Hospital Department of Radiation Oncology Clinical Translational Grant

and Varian Medical Research Collaborations. The study sponsors had no

role in study design data collection and analysis, decision to publish,

or preparation of the manuscript.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

[Anonymous], 2015, LANG ENV STAT COMP

Baumann P, 2009, J CLIN ONCOL, V27, P3290, DOI 10.1200/JCO.2008.21.5681

BENJAMINI Y, 1995, J R STAT SOC B, V57, P289, DOI 10.1111/j.2517-6161.1995.tb02031.x

Chen YS, 2008, RADIOTHER ONCOL, V88, P351, DOI 10.1016/j.radonc.2008.07.013

Cheng NM, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0150509

Chi A, 2010, RADIOTHER ONCOL, V94, P1, DOI 10.1016/j.radonc.2009.12.008

Christensen JD, 2015, CLIN CHEST MED, V36, P147, DOI 10.1016/j.ccm.2015.02.002

Church TR, 2013, NEW ENGL J MED, V368, P1980, DOI 10.1056/NEJMoa1209120

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Coroller TP, 2016, RADIOTHER ONCOL

Crino L, 2010, ANN ONCOL, V21, pv103, DOI 10.1093/annonc/mdq207

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Fakiris AJ, 2009, INT J RADIAT ONCOL, V75, P677, DOI 10.1016/j.ijrobp.2008.11.042

Fave X, 2015, COMPUT MED IMAG GRAP, V44, P54, DOI 10.1016/j.compmedimag.2015.04.006

Gamer M., 2012, IRR VARIOUS COEFFICI

Grills IS, 2010, J CLIN ONCOL, V28, P928, DOI 10.1200/JCO.2009.25.0928

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Huang YQ, 2016, J CLIN ONCOL, V34, P2157, DOI 10.1200/JCO.2015.65.9128

Husson F, 2015, FACTOMINER MULTIVARI

Huynh E, 2016, RADIOTHER ONCOL

Jameson JL, 2015, NEW ENGL J MED, V372, P2229, DOI 10.1056/NEJMsb1503104

Jia Wu, 2016, RADIOLOGY

Kramer GM, 2016, MOL IMAGING BIOL

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Li H, 2016, RADIOLOGY, V281, P382, DOI 10.1148/radiol.2016152110

Lo A, 2015, P NATL ACAD SCI USA, V112, P13892, DOI 10.1073/pnas.1518285112

Mackin D, 2015, INVEST RADIOL, V50, P757, DOI 10.1097/RLI.0000000000000180

Mak RH, 2015, CLIN LUNG CANCER, V16, P24, DOI 10.1016/j.cllc.2014.09.005

Nie K, 2016, CLIN CANC RES

Onishi H, 2004, CANCER-AM CANCER SOC, V101, P1623, DOI 10.1002/cncr.20539

Pan H, 2011, CANCER-AM CANCER SOC, V117, P4566, DOI 10.1002/cncr.26067

Parmar C, 2015, FRONT ONCOL, V5, DOI 10.3389/fonc.2015.00272

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep11044

Pieper S, 2004, 2004 2ND IEEE INTERNATIONAL SYMPOSIUM ON BIOMEDICAL IMAGING: MACRO TO NANO, VOLS 1 and 2, P632

Rietzel E, 2005, MED PHYS, V32, P874, DOI 10.1118/1.1869852

Schroder MS, 2011, BIOINFORMATICS, V27, P3206, DOI 10.1093/bioinformatics/btr511

Segal E, 2007, NAT BIOTECHNOL, V25, P675, DOI 10.1038/nbt1306

Solda F, 2013, RADIOTHER ONCOL, V109, P1, DOI 10.1016/j.radonc.2013.09.006

Steck H., 2008, ADV NEURAL INFORM PR, P1209

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Yip SSF, 2016, PHYS MED BIOL, V61, P906, DOI 10.1088/0031-9155/61/2/906

Zhao BS, 2016, SCI REP-UK, V6, DOI 10.1038/srep23428

Zhao BS, 2009, RADIOLOGY, V252, P263, DOI 10.1148/radiol.2522081593

Zinn PO, 2011, PLOS ONE, V6, DOI 10.1371/journal.pone.0025451

NR 46

TC 54

Z9 57

U1 0

U2 15

PU PUBLIC LIBRARY SCIENCE

PI SAN FRANCISCO

PA 1160 BATTERY STREET, STE 100, SAN FRANCISCO, CA 94111 USA

SN 1932-6203

J9 PLOS ONE

JI PLoS One

PD JAN 3

PY 2017

VL 12

IS 1

AR e0169172

DI 10.1371/journal.pone.0169172

PG 17

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA EH2QJ

UT WOS:000391612300135

PM 28046060

OA Green Published, Green Submitted, gold

DA 2022-08-24

ER

PT J

AU Lee, S

Ybarra, N

Jeyaseelan, K

Faria, S

Kopek, N

Brisebois, P

Bradley, JD

Robinson, C

Seuntjens, J

El Naqa, I

AF Lee, Sangkyu

Ybarra, Norma

Jeyaseelan, Krishinima

Faria, Sergio

Kopek, Neil

Brisebois, Pascale

Bradley, Jeffrey D.

Robinson, Clifford

Seuntjens, Jan

El Naqa, Issam

TI Bayesian network ensemble as a multivariate strategy to predict

radiation pneumonitis risk

SO MEDICAL PHYSICS

LA English

DT Article

DE Bayesian network; radiation pneumonitis; NTCP; biomarker; ensemble

learning

ID RADIOTHERAPY; MODELS; DISTRIBUTIONS; IRRADIATION; THERAPY

AB Purpose: Prediction of radiation pneumonitis (RP) has been shown to be challenging due to the involvement of a variety of factors including dose-volume metrics and radiosensitivity biomarkers. Some of these factors are highly correlated and might affect prediction results when combined. Bayesian network (BN) provides a probabilistic framework to represent variable dependencies in a directed acyclic graph. The aim of this study is to integrate the BN framework and a systems' biology approach to detect possible interactions among RP risk factors and exploit these relationships to enhance both the understanding and prediction of RP.

Methods: The authors studied 54 nonsmall-cell lung cancer patients who received curative 3D-conformal radiotherapy. Nineteen RP events were observed (common toxicity criteria for adverse events grade 2 or higher). Serum concentration of the following four candidate biomarkers were measured at baseline and midtreatment: alpha-2-macroglobulin, angiotensin converting enzyme (ACE), transforming growth factor, interleukin-6. Dose-volumetric and clinical parameters were also included as covariates. Feature selection was performed using a Markov blanket approach based on the Koller-Sahami filter. The Markov chain Monte Carlo technique estimated the posterior distribution of BN graphs built from the observed data of the selected variables and causality constraints. RP probability was estimated using a limited number of high posterior graphs (ensemble) and was averaged for the final RP estimate using Bayes' rule. A resampling method based on bootstrapping was applied to model training and validation in order to control under-and overfit pitfalls.

Results: RP prediction power of the BN ensemble approach reached its optimum at a size of 200. The optimized performance of the BN model recorded an area under the receiver operating characteristic curve (AUC) of 0.83, which was significantly higher than multivariate logistic regression (0.77), mean heart dose (0.69), and a pre-to-midtreatment change in ACE (0.66). When RP prediction was made only with pretreatment information, the AUC ranged from 0.76 to 0.81 depending on the ensemble size. Bootstrap validation of graph features in the ensemble quantified confidence of association between variables in the graphs where ten interactions were statistically significant.

Conclusions: The presented BN methodology provides the flexibility to model hierarchical interactions between RP covariates, which is applied to probabilistic inference on RP. The authors' preliminary results demonstrate that such framework combined with an ensemble method can possibly improve prediction of RP under real-life clinical circumstances such as missing data or treatment plan adaptation. (C) 2015 Author(s).

C1 [Lee, Sangkyu; Ybarra, Norma; Jeyaseelan, Krishinima; Seuntjens, Jan; El Naqa, Issam] McGill Univ, Med Phys Unit, Montreal, PQ H3G 1A4, Canada.

[Faria, Sergio; Kopek, Neil; Brisebois, Pascale] Montreal Gen Hosp, Dept Radiat Oncol, Montreal, PQ H3G 1A4, Canada.

[Bradley, Jeffrey D.; Robinson, Clifford] Washington Univ, Sch Med, Radiat Oncol, St Louis, MO 63110 USA.

RP Lee, S (通讯作者)，McGill Univ, Med Phys Unit, Montreal, PQ H3G 1A4, Canada.

EM sangkyu.lee@mail.mcgill.ca

RI Robinson, Cliff/A-5178-2013; Naqa, Issam El/T-3066-2019

OI Robinson, Cliff/0000-0002-1399-9904; Naqa, Issam El/0000-0001-6023-1132;

Seuntjens, Jan/0000-0003-2222-5924

FU Canadian Institute of Health Research (CIHR) [MOP-114910]; Excellence in

Radiation Research for the 21st Century (CIHR, Canada); CREATE Medical

Physics Research Training Network grant (NSERC, Canada)

FX The authors acknowledge the consults from Dr. Jung Hun Oh and Dr.

Natalie Japkowicz. The authors also thank Dr. Christina Speirs for

providing them a part of clinical data. The computational work was

enabled in part by computer resources provided by WestGrid

(www.westgrid.ca) and Calcul Quebec (http://www.calculquebec.ca/). This

research was funded by the Canadian Institute of Health Research (CIHR)

grant MOP-114910, Excellence in Radiation Research for the 21st Century

(CIHR, Canada), and the CREATE Medical Physics Research Training Network

grant (NSERC, Canada).

CR Anscher MS, 2001, J CLIN ONCOL, V19, P3758, DOI 10.1200/JCO.2001.19.17.3758

Bradley JD, 2007, INT J RADIAT ONCOL, V69, P985, DOI 10.1016/j.ijrobp.2007.04.077

Chen YY, 2001, INT J RADIAT ONCOL, V49, P641, DOI 10.1016/S0360-3016(00)01445-0

Chickering DM, 2004, J MACH LEARN RES, V5, P1287

Das SK, 2008, MED PHYS, V35, P5098, DOI 10.1118/1.2996012

Efron B, 1997, J AM STAT ASSOC, V92, P548, DOI 10.2307/2965703

El Naqa I, 2006, INT J RADIAT ONCOL, V64, P1275, DOI 10.1016/j.ijrobp.2005.11.022

El Naqa I, 2012, PHYS MED BIOL, V57, pR75, DOI 10.1088/0031-9155/57/11/R75

Fleckenstein K, 2007, SEMIN RADIAT ONCOL, V17, P89, DOI 10.1016/j.semradonc.2006.11.004

Friedman N, 2003, MACH LEARN, V50, P95, DOI 10.1023/A:1020249912095

Friedman N, 1997, MACH LEARN, V29, P131, DOI 10.1023/A:1007465528199

Friedman N, 1999, UNCERTAINTY IN ARTIFICIAL INTELLIGENCE, PROCEEDINGS, P196

Gan G, 2007, ASA SIAM SER STAT AP, V20, P1, DOI 10.1137/1.9780898718348

Gelman A., 1996, BAYESIAN STAT, P599

Ghosh SN, 2009, INT J RADIAT ONCOL, V75, P1528, DOI 10.1016/j.ijrobp.2009.07.1743

Heckerman D., 1997, MSRTR9705

Hoeting JA, 1999, STAT SCI, V14, P382, DOI 10.1214/ss/1009212519

Hope AJ, 2006, INT J RADIAT ONCOL, V65, P112, DOI 10.1016/j.ijrobp.2005.11.046

Huang EX, 2011, ACTA ONCOL, V50, P51, DOI 10.3109/0284186X.2010.521192

Jayasurya K, 2010, MED PHYS, V37, P1401, DOI 10.1118/1.3352709

Koller D., 1996, SIDLWP19960032 STANF

Koller D., 1999, PROBABILISTIC GRAPHI

Kong FM, 2006, INT J RADIAT ONCOL, V65, P1075, DOI 10.1016/j.ijrobp.2006.01.051

KUTCHER GJ, 1989, INT J RADIAT ONCOL, V16, P1623, DOI 10.1016/0360-3016(89)90972-3

Kwa SLS, 1998, INT J RADIAT ONCOL, V42, P1, DOI 10.1016/S0360-3016(98)00196-5

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Machtay M, 2012, INT J RADIAT ONCOL, V82, P425, DOI 10.1016/j.ijrobp.2010.09.004

MADIGAN D, 1995, INT STAT REV, V63, P215, DOI 10.2307/1403615

Marks LB, 2010, INT J RADIAT ONCOL, V76, pS70, DOI 10.1016/j.ijrobp.2009.06.091

Murphy K, 2001, COMP SCI STAT, V33, P1024

National Cancer Institute, 2013, SURV EP END RES

National Cancer Institute, 2015, NONSM CELL LUNG CANC

Ng A. Y., 2001, ADV NEURAL INFORM PR, V14

Niemierko A, 1997, MED PHYS, V24, P103, DOI 10.1118/1.598063

Oh JH, 2011, PHYS MED BIOL, V56, P1635, DOI 10.1088/0031-9155/56/6/008

Oh JH, 2011, J PROTEOME RES, V10, P1406, DOI 10.1021/pr101226q

Parashar B, 2011, AM J CLIN ONCOL-CANC, V34, P160, DOI 10.1097/COC.0b013e3181d6b40f

Sahiner B, 2008, MED PHYS, V35, P1559, DOI 10.1118/1.2868757

Scutari M, 2013, BAYESIAN ANAL, V8, P505, DOI 10.1214/13-BA819

Smith WP, 2009, ARTIF INTELL MED, V46, P119, DOI 10.1016/j.artmed.2008.12.002

Spencer SJ, 2009, J BIOMED BIOTECHNOL, DOI 10.1155/2009/892863

Turesson I, 1996, INT J RADIAT ONCOL, V36, P1065, DOI 10.1016/S0360-3016(96)00426-9

Zhao L, 2008, LUNG CANCER, V59, P232, DOI 10.1016/j.lungcan.2007.08.010

Zhao LJ, 2007, CYTOKINE, V37, P71, DOI 10.1016/j.cyto.2007.02.019

NR 44

TC 29

Z9 30

U1 0

U2 17

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD MAY

PY 2015

VL 42

IS 5

BP 2421

EP 2430

DI 10.1118/1.4915284

PG 10

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA CI5ER

UT WOS:000354776800033

PM 25979036

OA hybrid

DA 2022-08-24

ER

PT J

AU Li, XD

Chen, EL

Guo, BN

Yang, W

Han, RZ

Hu, CC

Zhang, LD

Pan, CD

Ma, SL

Kuang, Y

AF Li, Xiadong

Chen, Enle

Guo, Bina

Yang, Wan

Han, Ruozhen

Hu, Chengcheng

Zhang, Lidan

Pan, Chuandi

Ma, Shenglin

Kuang, Yu

TI The impact of respiratory motion and CT pitch on the robustness of

radiomics feature extraction in 4DCT lung imaging

SO COMPUTER METHODS AND PROGRAMS IN BIOMEDICINE

LA English

DT Article

DE Lung cancer; Four-dimensional computer tomography; Concordance

correlation coefficient; Radiomics

ID QUANTIFICATION

AB Purpose/Objective(s): The precise radiomics analysis on thoracic 4DCT data is easily compromised by the respiratory motion and CT scan parameter setting, thus leading to the risk of overfitting and/or misinterpretation of data in AI-enabled therapeutic model building. In this study, we investigated the impact of respiratory amplitudes, frequencies and CT scan pitch settings within the thoracic 4DCT scan on robust radiomics feature selection.

Materials/Methods: A Three-dimensional QUSAR (TM) lung tumor phantom was used to simulate different respiratory amplitudes and frequencies along with different CT scan pitch settings. A total of 43 tumor respiratory patterns extracted from 43 patients with non-small cell lung cancer were used to drive the QUSAR (TM) lung tumor phantom to mimic the human tumor motion. The 4DCT images of the QUSAR (TM) lung tumor phantom with different respiratory patterns and different CT scan pitch setups were acquired for radiomics feature extraction. A static high-quality CT images of the phantom acquired were also used as a reference for radiomics feature extraction. The range of respiratory amplitudes was mimicked at 3mm at left and right (LR) and anterior and posterior (AP) directions and 3mm 15 mm at the superior and inferior (SI) direction with an interval of 2 mm. The respiratory frequencies were set at 10, 11, 12, 13, 14, 15 and 20 beats per minute (BPMs), respectively. The CT scan pitches were set at 0.025, 0.048, 0.071, 0.93, 0.108, 0.14, 0.16, 0.18, 0.21, 0.23, and 0.25, respectively, which was based on a procedure described in Med. Phys. 30(1):88-97. The pairwise Concordance Correlation Coefficient (CCC) was used to determine the robustness of radiomics feature extraction via comparing the agreement in feature values between 1766 radiomics features extracted from each image acquired under different combinations of respiratory amplitudes and frequencies and CT scan pitches of 4DCT and those extracted from the static CT images.

Results: (1) When the respiratory amplitudes were at 3, 5, 7, 9, 12 and 15mm in the SI direction, the maximum CCC index could be achieved at the reconstructed 4DCT phase images of 60%, 70%, 30%, 20%, 60%similar to 70% and 10%, respectively. Under these six amplitudes, the maximum intensity projection (MIP) and average intensity projection (AIP) images reconstructed show mean CCC values of 0.778 and 0.609, respectively, in pairwise radiomics feature extraction comparison between 4DCT and static CT. (2) When the respiratory amplitude was set at 12 mm in the SI direction, the maximum CCC index could be consistently achieved at the reconstructed 4DCT phase of 90% for the seven respiratory frequencies of 10, 11, 12, 13, 14, 15 and 20 BPMs, respectively. Under these respiratory states, the MIP and AIP images reconstructed show mean CCC values of 0.702 and 0.562, respectively. (3) When the respiratory amplitude was set at 12 mm and the respiratory frequency was set at 13 BPM, the maximum CCC index could be obtained at the reconstructed 4DCT phase of 90% for all scan pitches used except the 0% phase which was obtained at the pitch setting of 0.048. Under these CT scan pitch settings, the MIP and AIP images reconstructed show mean CCC values of 0.558 and 0.782, respectively. (4) The total number of robust fea-tures were 50, 34 and 35 with different respiratory amplitudes and phases and CT scanning pitch used (CCC values >= 0.99).

Conclusion: In 4DCT, the respiratory amplitude, frequency and CT scan pitch are three limiting factors that greatly affect the robustness of radiomics feature extraction. The reconstructed 4DCT phases with better robustness along with suitable respiratory amplitude, frequency and CT scan pitch determined could be used to guide the breathing training for patients with lung cancer for radiation therapy to improve the robust radiomics feature extraction process (C) 2020 Elsevier B.V. All rights reserved.

C1 [Li, Xiadong; Zhang, Lidan] Hangzhou Canc Hosp, Radiotherapy Dept, Hangzhou 310000, Peoples R China.

[Li, Xiadong; Ma, Shenglin] Zhejiang Univ, Affiliated Hangzhou Peoples Hosp 1, Dept Radiat Oncol, Sch Med, Hangzhou 310000, Peoples R China.

[Chen, Enle; Pan, Chuandi] Wenzhou Med Univ, Wenzhou 325035, Peoples R China.

[Chen, Enle; Yang, Wan; Han, Ruozhen; Hu, Chengcheng] Wenzhou Cent Hosp, Radiotherapy Technol Dept, Wenzhou 325000, Peoples R China.

[Kuang, Yu] Univ Nevada, Med Phys Program, Las Vegas, NV 89154 USA.

[Guo, Bina] Wenzhou Cent Hosp, Informat Sect, Wenzhou 325000, Peoples R China.

RP Ma, SL (通讯作者)，Zhejiang Univ, Affiliated Hangzhou Peoples Hosp 1, Dept Radiat Oncol, Sch Med, Hangzhou 310000, Peoples R China.; Pan, CD (通讯作者)，Wenzhou Med Univ, Wenzhou 325035, Peoples R China.; Kuang, Y (通讯作者)，Univ Nevada, Med Phys Program, Las Vegas, NV 89154 USA.

EM 15968755211@163.com; mashenglin@medmail.com.cn; yu.kuang@unlv.edu

CR Cheng Leishu, 2019, CT BASED RADIOMICS A, V44, P251, DOI [10.11817/j.issn.1672-7347.2019.03.004., DOI 10.11817/J.ISSN.1672-7347.2019.03.004]

Cusumano D, 2018, PREDICTING TUMOUR MO, DOI [10.1016/j.radonc.2018.07.025, DOI 10.1016/J.RADONC.2018.07.025]

Dou TH, 2015, MED PHYS, V42, P6084, DOI 10.1118/1.4931416

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

Hilgers G, 2015, J APPL CLIN MED PHYS, V16, P389, DOI 10.1120/jacmp.v16i3.5111

Huynh E, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169172

Larue RTHM, 2017, RADIOTHER ONCOL, V125, P147, DOI 10.1016/j.radonc.2017.07.023

Ley-Zaporozhan J, 2008, INVEST RADIOL, V43, P461, DOI 10.1097/RLI.0b013e318169000e

Li XD, 2018, IEEE ACCESS, V6, P37775, DOI 10.1109/ACCESS.2018.2851027

Morris ED, 2018, J APPL CLIN MED PHYS, V19, P217, DOI 10.1002/acm2.12423

National Cancer Center Singapore, 2018, S169610 NAT CANC CTR, V3, DOI [10.21037/jxym.2018.06.03., DOI 10.21037/JXYM.2018.06.03]

Paulo A, 2018, 3D ADAPTIVE HISTOGRA, P363, DOI [10.5220/0006615303630370, DOI 10.5220/0006615303630370]

Rizzo Stefania, 2018, Eur Radiol Exp, V2, P36, DOI 10.1186/s41747-018-0068-z

Sah BR, 2019, ABDOM RADIOL, V44, P2048, DOI 10.1007/s00261-018-1724-8

Schafer JC, 2018, ROFO-FORTSCHR RONTG, V190, P542, DOI 10.1055/s-0044-100725

Seppenwoolde Y., INT J RAD ONCOL BIOL, V53, P822

Valenti M, 2018, PHYS MEDICA, V52, P133, DOI 10.1016/j.ejmp.2018.07.006

Werner R, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0835-7

Wu GR, 2012, MED PHYS, V39, P7694, DOI 10.1118/1.4768226

Yang F, 2018, RADIOTHER ONCOL, V129, P209, DOI 10.1016/j.radonc.2018.09.009

NR 20

TC 5

Z9 5

U1 2

U2 8

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0169-2607

EI 1872-7565

J9 COMPUT METH PROG BIO

JI Comput. Meth. Programs Biomed.

PD DEC

PY 2020

VL 197

AR 105719

DI 10.1016/j.cmpb.2020.105719

PG 10

WC Computer Science, Interdisciplinary Applications; Computer Science,

Theory & Methods; Engineering, Biomedical; Medical Informatics

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Computer Science; Engineering; Medical Informatics

GA OZ3HL

UT WOS:000594821100001

PM 32916542

DA 2022-08-24

ER

PT J

AU Lane, B

Khan, MT

Choudhury, A

Salem, A

West, CML

AF Lane, Brian

Khan, Mairah T.

Choudhury, Ananya

Salem, Ahmed

West, Catharine M. L.

TI Development and validation of a hypoxia-associated signature for lung

adenocarcinoma

SO SCIENTIFIC REPORTS

LA English

DT Article

ID CANCER; RADIOTHERAPY; RESPONSES; HEAD

AB Hypoxia is common in non-small cell lung cancer (NSCLC) and an attractive therapeutic target. As hypoxia-targeting treatments are effective in patients with the most hypoxic tumours, we aimed to develop a lung adenocarcinoma (LUAD) hypoxia-related gene expression signature. RNAseq was used to identify genes significantly differentially expressed under hypoxia (1% O-2) in four LUAD cell lines. Identified genes were used for unsupervised clustering of a TCGA-LUAD training dataset (n = 252) and in a machine learning approach to build a hypoxia-related signature. Thirty-five genes were upregulated in common in three of the four lines and reduced in the training cohort to a 28-gene signature. The signature was prognostic in the TCGA training (HR 2.12, 95% CI 1.34-3.37, p = 0.0011) and test (n = 250; HR 2.13, 95% CI 1.32-3.45, p = 0.0016) datasets. The signature was prognostic for overall survival in a meta-analysis of nine other datasets (n = 1257; HR 2.08, 95% CI 1.60-2.70, p < 0.0001). The 28-gene LUAD hypoxia related signature can be taken forward for further validation using a suitable gene expression platform.

C1 [Lane, Brian; Khan, Mairah T.; Choudhury, Ananya; West, Catharine M. L.] Univ Manchester, Manchester Acad Hlth Sci Ctr, Christie NHS Fdn Trust Hosp, Div Canc Sci,Translat Radiobiol Grp, Manchester M20 4BX, Lancs, England.

[Salem, Ahmed] Christie NHS Fdn Trust Hosp, Dept Clin Oncol, Manchester M20 4BX, Lancs, England.

RP West, CML (通讯作者)，Univ Manchester, Manchester Acad Hlth Sci Ctr, Christie NHS Fdn Trust Hosp, Div Canc Sci,Translat Radiobiol Grp, Manchester M20 4BX, Lancs, England.

EM Catharine.West@manchester.ac.uk

RI West, Catharine/J-4152-2012

OI West, Catharine/0000-0002-0839-3449; Salem, Ahmed/0000-0001-5148-7072;

Choudhury, Ananya/0000-0002-3561-6580

FU Early Careers Fellowship from Manchester Cancer Research Centre; Cancer

Research UK [C147/A25254]; CRUK-Manchester Institute PhD studentship

[C5759/A27412]; NIHR Manchester Biomedical Research Centre

FX This research was funded by an Early Careers Fellowship from Manchester

Cancer Research Centre (A.S.), Cancer Research UK funding to the Cancer

Research Manchester Centre (C147/A25254; B.L.) and a CRUK-Manchester

Institute PhD studentship (C5759/A27412) to M.T.K. The work was

supported by the NIHR Manchester Biomedical Research Centre. The authors

would like to thank Andy Hayes and Leo Zeef from the Genomic

Technologies facility at the University of Manchester for the

RNA-sequencing and sequencing analysis of the LUAD cell lines. The

authors would also like to thank Lingjian Yang for his initial

contributions to the project.

CR Balduzzi S, 2019, EVID-BASED MENT HEAL, V22, P153, DOI 10.1136/ebmental-2019-300117

Bareschino Maria Anna, 2011, J Thorac Dis, V3, P122, DOI 10.3978/j.issn.2072-1439.2010.12.08

Bhandari V, 2019, NAT GENET, V51, P308, DOI 10.1038/s41588-018-0318-2

Bolger AM, 2014, BIOINFORMATICS, V30, P2114, DOI 10.1093/bioinformatics/btu170

Brustugun OT, 2015, SEMIN RADIAT ONCOL, V25, P87, DOI 10.1016/j.semradonc.2014.11.006

Buffa FM, 2010, BRIT J CANCER, V102, P428, DOI 10.1038/sj.bjc.6605450

Chi JT, 2006, PLOS MED, V3, P395, DOI 10.1371/journal.pmed.0030047

Delprat V, 2020, SCI REP-UK, V10, DOI 10.1038/s41598-020-57677-5

Dobin A, 2013, BIOINFORMATICS, V29, P15, DOI 10.1093/bioinformatics/bts635

Eustace A, 2013, CLIN CANCER RES, V19, P4879, DOI 10.1158/1078-0432.CCR-13-0542

Jin HJ, 2017, BMC BIOINFORMATICS, V18, DOI 10.1186/s12859-017-1526-y

Lee P, 2020, NAT REV MOL CELL BIO, V21, P268, DOI 10.1038/s41580-020-0227-y

Leek JT, 2012, BIOINFORMATICS, V28, P882, DOI 10.1093/bioinformatics/bts034

Lendahl U, 2009, NAT REV GENET, V10, P821, DOI 10.1038/nrg2665

Ley K, 2017, J IMMUNOL, V199, P2191, DOI 10.4049/jimmunol.1701135

MacLeod MKL, 2009, SEMIN IMMUNOL, V21, P53, DOI 10.1016/j.smim.2009.02.006

Mo ZM, 2020, FRONT GENET, V11, DOI 10.3389/fgene.2020.00647

Newman AM, 2015, NAT METHODS, V12, P453, DOI [10.1038/NMETH.3337, 10.1038/nmeth.3337]

Noman MZ, 2015, AM J PHYSIOL-CELL PH, V309, pC569, DOI 10.1152/ajpcell.00207.2015

Overgaard J, 2007, J CLIN ONCOL, V25, P4066, DOI 10.1200/JCO.2007.12.7878

Pietrobon V, 2021, J TRANSL MED, V19, DOI 10.1186/s12967-020-02667-4

Qian J, 2019, ADV EXP MED BIOL, V1136, P43, DOI 10.1007/978-3-030-12734-3\_3

Ritchie ME, 2015, NUCLEIC ACIDS RES, V43, DOI 10.1093/nar/gkv007

Salem A, 2018, JNCI-J NATL CANCER I, V110, DOI 10.1093/jnci/djx160

Sean D, 2007, BIOINFORMATICS, V23, P1846, DOI 10.1093/bioinformatics/btm254

Sergushichev A., 2016, ALGORITHM FAST PRERA, DOI [10.1101/060012, DOI 10.1101/060012]

Shay JES, 2012, SEMIN CELL DEV BIOL, V23, P389, DOI 10.1016/j.semcdb.2012.04.004

Shi R, 2021, THERANOSTICS, V11, P5061, DOI 10.7150/thno.56202

Starmans MHW, 2012, RADIOTHER ONCOL, V102, P436, DOI 10.1016/j.radonc.2012.02.002

Sun J, 2020, THER ADV MED ONCOL, V12, DOI 10.1177/1758835920937904

Sung H, 2021, CA-CANCER J CLIN, V71, P209, DOI 10.3322/caac.21660

Thiruthaneeswaran N, 2021, EUR J CANCER, V148, P260, DOI 10.1016/j.ejca.2021.01.039

Tibshirani R, 2002, P NATL ACAD SCI USA, V99, P6567, DOI 10.1073/pnas.082099299

Toustrup K, 2011, CANCER RES, V71, P5923, DOI 10.1158/0008-5472.CAN-11-1182

Winter SC, 2007, CANCER RES, V67, P3441, DOI 10.1158/0008-5472.CAN-06-3322

Yang LJ, 2018, EBIOMEDICINE, V31, P182, DOI 10.1016/j.ebiom.2018.04.019

Yang LJ, 2018, BRIT J RADIOL, V92, DOI 10.1259/bjr.20180036

Yang LJ, 2018, ONCOTARGET, V9, P3946, DOI 10.18632/oncotarget.23280

Yang LJ, 2017, CLIN CANCER RES, V23, P4761, DOI 10.1158/1078-0432.CCR-17-0038

Yoshihara K, 2013, NAT COMMUN, V4, DOI 10.1038/ncomms3612

Zappa C, 2016, TRANSL LUNG CANCER R, V5, P288, DOI 10.21037/tlcr.2016.06.07

Zhang J, 2014, ONCOTARGET, V5, P9664, DOI 10.18632/oncotarget.1856

NR 42

TC 2

Z9 2

U1 4

U2 5

PU NATURE PORTFOLIO

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD JAN 25

PY 2022

VL 12

IS 1

AR 1290

DI 10.1038/s41598-022-05385-7

PG 10

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA YN5IJ

UT WOS:000747291900081

PM 35079065

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Velazquez, ER

Parmar, C

Jermoumi, M

Mak, RH

van Baardwijk, A

Fennessy, FM

Lewis, JH

De Ruysscher, D

Kikinis, R

Lambin, P

Aerts, HJWL

AF Velazquez, Emmanuel Rios

Parmar, Chintan

Jermoumi, Mohammed

Mak, Raymond H.

van Baardwijk, Angela

Fennessy, Fiona M.

Lewis, John H.

De Ruysscher, Dirk

Kikinis, Ron

Lambin, Philippe

Aerts, Hugo J. W. L.

TI Volumetric CT-based segmentation of NSCLC using 3D-Slicer

SO SCIENTIFIC REPORTS

LA English

DT Article

ID GROSS TUMOR VOLUME; LUNG-CANCER; ENSEMBLE SEGMENTATION; OBSERVER

VARIATION; PET-CT; RADIOTHERAPY; DELINEATION; DEFINITION; TISSUE;

CONSTRAINTS

AB Accurate volumetric assessment in non-small cell lung cancer (NSCLC) is critical for adequately informing treatments. In this study we assessed the clinical relevance of a semiautomatic computed tomography (CT)-based segmentation method using the competitive region-growing based algorithm, implemented in the free and public available 3D-Slicer software platform. We compared the 3D-Slicer segmented volumes by three independent observers, who segmented the primary tumour of 20 NSCLC patients twice, to manual slice-by-slice delineations of five physicians. Furthermore, we compared all tumour contours to the macroscopic diameter of the tumour in pathology, considered as the "gold standard". The 3D-Slicer segmented volumes demonstrated high agreement (overlap fractions > 0.90), lower volume variability (p = 0.0003) and smaller uncertainty areas (p = 0.0002), compared to manual slice-by-slice delineations. Furthermore, 3D-Slicer segmentations showed a strong correlation to pathology (r = 0.89, 95% CI, 0.81-0.94). Our results show that semiautomatic 3D-Slicer segmentations can be used for accurate contouring and are more stable than manual delineations. Therefore, 3D-Slicer can be employed as a starting point for treatment decisions or for high-throughput data mining research, such as Radiomics, where manual delineating often represent a time-consuming bottleneck.

C1 [Velazquez, Emmanuel Rios; Parmar, Chintan; Jermoumi, Mohammed; Mak, Raymond H.; Lewis, John H.; Aerts, Hugo J. W. L.] Harvard Univ, Brigham & Womens Hosp, Sch Med, Dept Radiat Oncol,Dana Farber Canc Inst, Boston, MA 02115 USA.

[Velazquez, Emmanuel Rios; Parmar, Chintan; van Baardwijk, Angela; Lambin, Philippe; Aerts, Hugo J. W. L.] Maastricht Univ, GROW Res Inst, Dept Radiat Oncol MAASTRO, Maastricht, Netherlands.

[Jermoumi, Mohammed] Univ Massachusetts, Lowell, MA USA.

[De Ruysscher, Dirk] Katholieke Univ Leuven, Univ Hosp Leuven, Louvain, Belgium.

[Fennessy, Fiona M.; Kikinis, Ron] Harvard Univ, Brigham & Womens Hosp, Sch Med, Dept Radiol,Dana Farber Canc Inst, Boston, MA 02115 USA.

RP Velazquez, ER (通讯作者)，Harvard Univ, Brigham & Womens Hosp, Sch Med, Dept Radiat Oncol,Dana Farber Canc Inst, Boston, MA 02115 USA.

EM Emmanuel\_Rios@dfci.harvard.edu; Hugo\_Aerts@dfci.harvard.edu

RI parmar, chintan/J-2977-2019; Aerts, Hugo/P-6350-2015; Aerts,

Hugo/ABF-2821-2020

OI parmar, chintan/0000-0002-2140-814X; Aerts, Hugo/0000-0002-2122-2003;

Aerts, Hugo/0000-0002-2122-2003; Mak, Raymond/0000-0002-8754-0565;

Lambin, Philippe/0000-0001-7961-0191

FU National Institute of Health (NIH-USA) [U01 CA 143062-01]; CTMM

framework (AIRFORCE project) [030-103]; EU; euroCAT (IVA Interreg);

Kankeronderzoekfonds Limburg from the Health Foundation Limburg; Dutch

Cancer Society [KWF UM 2011-5020, KWF UM 2009-4454]; QuIC-ConCePT

project [115151]; NATIONAL CANCER INSTITUTE [U01CA143062] Funding

Source: NIH RePORTER; NATIONAL INSTITUTE OF BIOMEDICAL IMAGING AND

BIOENGINEERING [P41EB015902] Funding Source: NIH RePORTER

FX Authors acknowledge financial support from the National Institute of

Health (NIH-USA U01 CA 143062-01, Radiomics of NSCLC), the CTMM

framework (AIRFORCE project, grant 030-103), EU 6th and 7th framework

program (METOXIA, EURECA, ARTFORCE), euroCAT (IVA Interreg -

www.eurocat.info), Kankeronderzoekfonds Limburg from the Health

Foundation Limburg and the Dutch Cancer Society (KWF UM 2011-5020, KWF

UM 2009-4454). Authors also acknowledge financial support from the

QuIC-ConCePT project (Grant Agreement No. 115151).

CR Aerts HJWL, 2009, RADIOTHER ONCOL, V91, P386, DOI 10.1016/j.radonc.2009.03.006

Bowden P, 2002, INT J RADIAT ONCOL, V53, P566, DOI 10.1016/S0360-3016(02)02783-9

Buckler AJ, 2011, RADIOLOGY, V258, P906, DOI 10.1148/radiol.10100799

Buckler AJ, 2011, RADIOLOGY, V259, P875, DOI 10.1148/radiol.10100800

Caldwell CB, 2001, INT J RADIAT ONCOL, V51, P923, DOI 10.1016/S0360-3016(01)01722-9

Cheebsumon P, 2012, EJNMMI RES, V2, DOI 10.1186/2191-219X-2-56

Daisne JF, 2003, RADIOTHER ONCOL, V69, P247, DOI 10.1016/S0167-8140(03)00270-6

De Ruysscher D, 2011, METHODS MOL BIOL, V727, P53, DOI 10.1007/978-1-61779-062-1\_4

Dehmeshi J, 2008, IEEE T MED IMAGING, V27, P467, DOI 10.1109/TMI.2007.907555

Egger J, 2013, SCI REP-UK, V3, DOI 10.1038/srep01364

Greco C, 2007, LUNG CANCER, V57, P125, DOI 10.1016/j.lungcan.2007.03.020

Gu YH, 2013, PATTERN RECOGN, V46, P692, DOI 10.1016/j.patcog.2012.10.005

Hatt M, 2010, INT J RADIAT ONCOL, V77, P301, DOI 10.1016/j.ijrobp.2009.08.018

Jemal A, 2010, CA-CANCER J CLIN, V60, P277, DOI [10.3322/caac.20073, 10.3322/caac.20115, 10.3322/caac.20107]

K Wu, 2009, INT J RADIAT ONCOL, V77, P699

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Nestle U, 2005, J NUCL MED, V46, P1342

Schaefer A, 2013, EUR J NUCL MED MOL I, V40, P1233, DOI 10.1007/s00259-013-2407-x

Sonke JJ, 2010, SEMIN RADIAT ONCOL, V20, P94, DOI 10.1016/j.semradonc.2009.11.003

Steenbakkers RJHM, 2006, INT J RADIAT ONCOL, V64, P435, DOI 10.1016/j.ijrobp.2005.06.034

Steenbakkers RJHM, 2005, RADIOTHER ONCOL, V77, P182, DOI 10.1016/j.radonc.2005.09.017

van Baardwijk A, 2008, INT J RADIAT ONCOL, V71, P1394, DOI 10.1016/j.ijrobp.2007.11.070

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

van Baardwijk A, 2010, J CLIN ONCOL, V28, P1380, DOI 10.1200/JCO.2009.24.7221

Van de Steene J, 2002, RADIOTHER ONCOL, V62, P37, DOI 10.1016/S0167-8140(01)00453-4

Velazquez ER, 2012, RADIOTHER ONCOL, V105, P167, DOI 10.1016/j.radonc.2012.09.023

Wanet M, 2011, RADIOTHER ONCOL, V98, P117, DOI 10.1016/j.radonc.2010.10.006

Ye X., 2010, INT J BIOMEDICAL IMA, V2010, P1

NR 29

TC 122

Z9 135

U1 3

U2 57

PU NATURE RESEARCH

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD DEC 18

PY 2013

VL 3

AR 3529

DI 10.1038/srep03529

PG 7

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA 273YH

UT WOS:000328571700003

PM 24346241

OA gold, Green Published, Green Submitted

DA 2022-08-24

ER

PT J

AU Brada, M

Forbes, H

Ashley, S

Fenwick, J

AF Brada, Michael

Forbes, Helen

Ashley, Susan

Fenwick, John

TI Improving Outcomes in NSCLC: Optimum Dose Fractionation in Radical

Radiotherapy Matters

SO JOURNAL OF THORACIC ONCOLOGY

LA English

DT Article

DE Localized and locally advanced non-small cell lung cancer; Radical

radiotherapy fractionation; Prognosis by dose fractionation;

Hypofractionated radiotherapy

ID CELL LUNG-CANCER; INTENSITY-MODULATED RADIOTHERAPY; CONCURRENT

CHEMOTHERAPY; CONFORMAL RADIOTHERAPY; ESCALATION; THERAPY; PHASE-3;

TRIAL; CHART

AB Introduction: We analyzed a comprehensive national radiotherapy data set to compare outcomes of the most frequently used moderate hypofractionation regimen (55 Gy in 20 fractions) and conventional fractionation regimen (60-66 Gy in 30-33 fractions).

Methods: A total of 169,863 cases of NSCLC registered in England from January 2012 to December 2016 obtained from the Public Health England were divided into cohort 1 (training set) diagnosed in 2012 to 2013 and cohort 2 (validation set) diagnosed in 2014 to 2016. Radiotherapy data were obtained from theNational Radiotherapy Dataset and linked by National Health Service number to survival data from the Office of National Statistics and Hospital Episode Statistics, from which surgical data and Charlson comorbidity index were obtained. Of 73,186 patients with stages I to III NSCLC, 12,898 received radical fractionated radiotherapy (cohort 1-4894; cohort 2-8004). The proportional hazards model was used to investigate overall survival from time of diagnosis. Survival was adjusted for the prognostic factors of age, sex, stage of disease, comorbidity, other radical treatments, and adjuvant chemotherapy, and the difference between the treatment schedules was summarized by hazard ratio (HR) and 95% confidence interval. The significance of any difference was evaluated by the log likelihood test.

Results: Of patients with stages I to III NSCLC, 17% to 18% received radical fractionated radiotherapy. After adjustment for independent prognostic factors of age, stage, comorbidity, and other radical and adjuvant treatments, patients in cohort 1 treated with the 2.75 Gy per fraction regimen had a median survival of 25 months compared with 29 months for patients treated with the 2 Gy per fraction regimen(HR = 1.16, p = 0.001). Similarly, in cohort 2, the respective median survival values were 25 and 28 months (HR = 1.10, p = 0.02).

Conclusions: Big data analysis of a comprehensive national cohort of patients with NSCLC treated in England suggests that compared with a 4-week regimen of 55 Gy in 20 fractions, a 6-week regimen of conventional daily fractionation to a dose of 60 to 66 Gy at 2 Gy per fraction is associated with a survival benefit. Within the limitations of the retrospective big data analysis with potential selection bias and in the absence of randomized trials, the results suggest that conventional fractionation regimens should remain the standard of care. (C) 2022 International Association for the Study of Lung Cancer. Published by Elsevier Inc.

C1 [Brada, Michael; Forbes, Helen; Ashley, Susan; Fenwick, John] Clatterbridge Canc Ctr NHS Fdn Trust, Dept Radiat Oncol, Wirral CH63 4JY, Merseyside, England.

[Brada, Michael; Fenwick, John] Univ Liverpool, Inst Translat Med, Dept Mol & Clin Canc Med, Liverpool, Merseyside, England.

[Forbes, Helen] Clatterbridge Canc Ctr NHS Fdn Trust, Natl Clin Anal & Specialised Applicat Team NATCAN, Wirral, Merseyside, England.

RP Brada, M (通讯作者)，Clatterbridge Canc Ctr NHS Fdn Trust, Dept Radiat Oncol, Wirral CH63 4JY, Merseyside, England.

EM michael.brada@liverpool.ac.uk

FU Clatterbridge Cancer Centre NHS Foundation Trust; Clatterbridge

Charitable Fund [743]

FX This work was supported by the Clatterbridge Cancer Centre NHS

Foundation Trust who funded NATCANSAT and by the Clatterbridge

Charitable Fund 743. The national data (anonymized) were kindly provided

by the Public Health England and the National Health Service England,

and the authors are grateful for their support.

CR ALBERTI W, 1995, BRIT MED J, V311, P899

Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Auperin A, 2006, ANN ONCOL, V17, P473, DOI 10.1093/annonc/mdj117

Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

Ball D, 2019, LANCET ONCOL, V20, P494, DOI 10.1016/S1470-2045(18)30896-9

Bedford JL, 2008, ACTA ONCOL, V47, P1438, DOI 10.1080/02841860802282778

Bentzen SM, 2002, CLIN ONCOL-UK, V14, P372, DOI 10.1053/clon.2002.0117

Brada M, 2019, RADIOTHER ONCOL, V132, P204, DOI 10.1016/j.radonc.2018.10.015

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Brunt AM, 2020, LANCET, V395, P1613, DOI 10.1016/S0140-6736(20)30932-6

Christian JA, 2007, INT J RADIAT ONCOL, V67, P735, DOI 10.1016/j.ijrobp.2006.09.047

De Ruysscher D, 2019, RADIOTHER ONCOL, V135, P141, DOI 10.1016/j.radonc.2019.03.009

Dearnaley D, 2016, LANCET ONCOL, V17, P1047, DOI 10.1016/S1470-2045(16)30102-4

Din OS, 2013, RADIOTHER ONCOL, V109, P8, DOI 10.1016/j.radonc.2013.07.014

Fenwick JD, 2009, CLIN ONCOL-UK, V21, P343, DOI 10.1016/j.clon.2008.12.011

Fenwick JD, 2020, INT J RADIAT ONCOL, V106, P733, DOI 10.1016/j.ijrobp.2019.11.397

Gildea G, DERIVATION CHARLSONC

Hatton MQF, 2019, BMJ OPEN, V9, DOI 10.1136/bmjopen-2017-019903

Haviland JS, 2013, LANCET ONCOL, V14, P1086, DOI 10.1016/S1470-2045(13)70386-3

Iqbal MS, 2019, CLIN ONCOL-UK, V31, pE1, DOI 10.1016/j.clon.2018.10.006

Maguire J, 2014, EUR J CANCER, V50, P2939, DOI 10.1016/j.ejca.2014.07.009

Mehta M, 2001, INT J RADIAT ONCOL, V49, P23, DOI 10.1016/S0360-3016(00)01374-2

NHS, HOSP EP STAT HES

Nix MG, 2020, RADIOTHER ONCOL, V143, P58, DOI 10.1016/j.radonc.2019.07.026

Panakis N, 2008, RADIOTHER ONCOL, V87, P65, DOI 10.1016/j.radonc.2007.12.012

Partridge M, 2011, RADIOTHER ONCOL, V99, P6, DOI 10.1016/j.radonc.2011.02.014

Quan HD, 2011, AM J EPIDEMIOL, V173, P676, DOI 10.1093/aje/kwq433

Saunders M, 1997, LANCET, V350, P161, DOI 10.1016/S0140-6736(97)06305-8

NR 29

TC 3

Z9 3

U1 0

U2 0

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 1556-0864

EI 1556-1380

J9 J THORAC ONCOL

JI J. Thorac. Oncol.

PD APR

PY 2022

VL 17

IS 4

BP 532

EP 543

DI 10.1016/j.jtho.2022.01.006

PG 12

WC Oncology; Respiratory System

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Respiratory System

GA 2Q5NF

UT WOS:000820468200012

PM 35092841

OA hybrid

DA 2022-08-24

ER

PT J

AU Lieverse, RIY

Van Limbergen, EJ

Oberije, CJG

Troost, EGC

Hadrup, SR

Dingemans, AMC

Hendriks, LEL

Eckert, F

Hiley, C

Dooms, C

Lievens, Y

de Jong, MC

Bussink, J

Geets, X

Valentini, V

Elia, G

Neri, D

Billiet, C

Abdollahi, A

Pasquier, D

Boisselier, P

Yaromina, A

De Ruysscher, D

Dubois, LJ

Lambin, P

AF Lieverse, Relinde I. Y.

Van Limbergen, Evert J.

Oberije, Cary J. G.

Troost, Esther G. C.

Hadrup, Sine R.

Dingemans, Anne-Marie C.

Hendriks, Lizza E. L.

Eckert, Franziska

Hiley, Crispin

Dooms, Christophe

Lievens, Yolande

de Jong, Monique C.

Bussink, Johan

Geets, Xavier

Valentini, Vincenzo

Elia, Giuliano

Neri, Dario

Billiet, Charlotte

Abdollahi, Amir

Pasquier, David

Boisselier, Pierre

Yaromina, Ala

De Ruysscher, Dirk

Dubois, Ludwig J.

Lambin, Philippe

TI Stereotactic ablative body radiotherapy (SABR) combined with

immunotherapy (L19-IL2) versus standard of care in stage IV NSCLC

patients, ImmunoSABR: a multicentre, randomised controlled open-label

phase II trial

SO BMC CANCER

LA English

DT Article

DE Immunotherapy; L19-IL2; Anti-PD-L1; Anti-PD-1; Radiotherapy; SABR; Phase

2; NSCLC; Stage IV; Multicentre

ID CELL LUNG-CANCER; LOCAL CONSOLIDATIVE THERAPY; ED-B FIBRONECTIN;

EXTRA-DOMAIN-B; IMMUNOCYTOKINE L19-IL2; MAINTENANCE THERAPY;

RADIATION-THERAPY; DOSE-ESCALATION; SOLID TUMORS; MARKER

AB BackgroundAbout 50% of non-small cell lung cancer (NSCLC) patients have metastatic disease at initial diagnosis, which limits their treatment options and, consequently, the 5-year survival rate (15%). Immune checkpoint inhibitors (ICI), either alone or in combination with chemotherapy, have become standard of care (SOC) for most good performance status patients. However, most patients will not obtain long-term benefit and new treatment strategies are therefore needed. We previously demonstrated clinical safety of the tumour-selective immunocytokine L19-IL2, consisting of the anti-ED-B scFv L19 antibody coupled to IL2, combined with stereotactic ablative radiotherapy (SABR).MethodsThis investigator-initiated, multicentric, randomised controlled open-label phase II clinical trial will test the hypothesis that the combination of SABR and L19-IL2 increases progression free survival (PFS) in patients with limited metastatic NSCLC. One hundred twenty-six patients will be stratified according to their metastatic load (oligo-metastatic: <= 5 or poly-metastatic: 6 to 10) and randomised to the experimental-arm (E-arm) or the control-arm (C-arm). The C-arm will receive SOC, according to the local protocol. E-arm oligo-metastatic patients will receive SABR to all lesions followed by L19-IL2 therapy; radiotherapy for poly-metastatic patients consists of irradiation of one (symptomatic) to a maximum of 5 lesions (including ICI in both arms if this is the SOC). The accrual period will be 2.5-years, starting after the first centre is initiated and active. Primary endpoint is PFS at 1.5-years based on blinded radiological review, and secondary endpoints are overall survival, toxicity, quality of life and abscopal response. Associative biomarker studies, immune monitoring, CT-based radiomics, stool collection, iRECIST and tumour growth rate will be performed.DiscussionThe combination of SABR with or without ICI and the immunocytokine L19-IL2 will be tested as 1st, 2nd or 3rd line treatment in stage IV NSCLC patients in 14 centres located in 6 countries. This bimodal and trimodal treatment approach is based on the direct cytotoxic effect of radiotherapy, the tumour selective immunocytokine L19-IL2, the abscopal effect observed distant from the irradiated metastatic site(s) and the memory effect. The first results are expected end 2023.Trial registrationImmunoSABR Protocol Code: NL67629.068.18; EudraCT: 2018-002583-11; Clinicaltrials.gov: NCT03705403; ISRCTN ID: ISRCTN49817477; Date of registration: 03-April-2019.

C1 [Lieverse, Relinde I. Y.; Oberije, Cary J. G.; Yaromina, Ala; Dubois, Ludwig J.; Lambin, Philippe] Maastricht Univ, GROW Sch Oncol & Dev Biol, Dept Precis Med, D Lab, Maastricht, Netherlands.

[Lieverse, Relinde I. Y.; Oberije, Cary J. G.; Yaromina, Ala; Dubois, Ludwig J.; Lambin, Philippe] Maastricht Univ, GROW Sch Oncol & Dev Biol, Dept Precis Med, M Lab, Maastricht, Netherlands.

[Van Limbergen, Evert J.; De Ruysscher, Dirk] Maastricht Univ, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Med Ctr, Maastricht, Netherlands.

[Troost, Esther G. C.] Tech Univ Dresden, Dept Radiotherapy & Radiat Oncol, Fac Med, Fetscherstr 74, D-01307 Dresden, Germany.

[Troost, Esther G. C.] Tech Univ Dresden, Univ Hosp Carl Gustav Carus, Fetscherstr 74, D-01307 Dresden, Germany.

[Troost, Esther G. C.] Natl Ctr Radiat Res Oncol, OncoRay, Dresden, Germany.

[Hadrup, Sine R.] Tech Univ Denmark, Dept Hlth Technol, Lyngby, Denmark.

[Dingemans, Anne-Marie C.] Erasmus MC, Dept Pulm Med, Rotterdam, Netherlands.

[Dingemans, Anne-Marie C.; Hendriks, Lizza E. L.] Maastricht Univ, GROW Sch Oncol & Dev Biol, Dept Pulm Dis, Med Ctr, Maastricht, Netherlands.

[Eckert, Franziska] Eberhard Karls Univ Tubingen, Dept Radiat Oncol, Univ Hosp, Hoppe Seyler Str 3, D-72076 Tubingen, Germany.

[Eckert, Franziska] Eberhard Karls Univ Tubingen, Med Fac Tubingen, Hoppe Seyler Str 3, D-72076 Tubingen, Germany.

[Hiley, Crispin] UCL, Canc Res UK Lung Canc Ctr Excellence, Canc Inst, Paul OGorman Bldg,72 Huntley St, London WC1E 6DD, England.

[Dooms, Christophe] Univ Hosp KU Leuven, Dept Resp Dis, Resp Oncol Unit, Leuven, Belgium.

[Lievens, Yolande] Ghent Univ Hosp, Dept Radiat Oncol, Ghent, Belgium.

[Lievens, Yolande] Univ Ghent, Ghent, Belgium.

[de Jong, Monique C.] Netherlands Canc Inst, Antoni van Leeuwenhoek Hosp, Dept Radiat Oncol, NL-1066 CX Amsterdam, Netherlands.

[Bussink, Johan] Radboud Univ Nijmegen, Dept Radiat Oncol, Med Ctr, Nijmegen, Netherlands.

[Geets, Xavier] Clin Univ St Luc, Dept Radiat Oncol, MIRO IREC Lab, UCL, Brussels, Belgium.

[Valentini, Vincenzo] Fdn Policlin Univ A Gemelli IRCCS, Dipartimento Diagnost Immagini Radioterapia Oncol, Rome, Italy.

[Valentini, Vincenzo] Univ Cattolica Sacro Cuore, Ist Radiol, Rome, Italy.

[Elia, Giuliano] Philochem AG, Libernstr 3, CH-8112 Otelfingen, Switzerland.

[Neri, Dario] Swiss Fed Inst Technol, Inst Pharmaceut Sci, Dept Chem & Appl Biosci, Zurich, Switzerland.

[Billiet, Charlotte] Iridium Network, Dept Radiat Oncol, Antwerp, Belgium.

[Billiet, Charlotte] Univ Antwerp, Fac Med & Hlth Sci, Campus Drie Eiken,Bldg S,Univ Pl 1, B-2610 Antwerp, Belgium.

[Abdollahi, Amir] Heidelberg Fac Med MFHD, Dept Radiat Oncol, Div Mol & Translat Radiat Oncol, D-69120 Heidelberg, Germany.

[Abdollahi, Amir] Heidelberg Univ Hosp UKHD, Heidelberg Ion Beam Therapy Ctr HIT, D-69120 Heidelberg, Germany.

[Abdollahi, Amir] Heidelberg Univ Hosp UKHD, Natl Ctr Tumor Dis NCT, Clin Cooperat Unit Translat Radiat Oncol, Heidelberg, Germany.

[Abdollahi, Amir] German Canc Res Ctr, Heidelberg, Germany.

[Abdollahi, Amir] German Canc Consortium DKTK Core Ctr, Heidelberg, Germany.

[Abdollahi, Amir] Heidelberg Univ, Natl Ctr Radiat Oncol NCRO, Heidelberg Inst Radiat Oncol HIRO, Heidelberg, Germany.

[Pasquier, David] Oscar Lambret Comprehens Canc Ctr, Acad Dept Radiat Oncol, Lille, France.

[Boisselier, Pierre] Univ Montpellier, Dept Radiat Oncol, ICM Val dAurelle, Montpellier, France.

RP Lieverse, RIY (通讯作者)，Maastricht Univ, GROW Sch Oncol & Dev Biol, Dept Precis Med, D Lab, Maastricht, Netherlands.; Lieverse, RIY (通讯作者)，Maastricht Univ, GROW Sch Oncol & Dev Biol, Dept Precis Med, M Lab, Maastricht, Netherlands.

EM relinde.lieverse@maastrichtuniversity.nl

RI Elia, Giuliano/H-3438-2011; Oberije, Cary/ABA-6178-2020; Yaromina,

Ala/AAN-9204-2021; Pasquier, David/O-8004-2014; Neri, Dario/P-4368-2016;

Hadrup, Sine Reker/P-3388-2014

OI Elia, Giuliano/0000-0001-8216-9560; Oberije, Cary/0000-0003-0749-5117;

Pasquier, David/0000-0001-6019-7309; Neri, Dario/0000-0001-5234-7370;

Dooms, Christophe/0000-0001-7324-7977; Hendriks,

Lizza/0000-0002-3521-2535; Bussink, Johan/0000-0002-5751-4796; Hadrup,

Sine Reker/0000-0002-5937-4344; Lambin, Philippe/0000-0001-7961-0191

FU European Program H2020 (ImmunoSAB) [733008]; ERC advanced grant

(ERC-ADG-2015) [694812 -Hypoximmuno]

FX The authors would like to acknowledge financial support from the

European Program H2020 (ImmunoSABR - no 733008). Authors also

acknowledge financial support from ERC advanced grant (ERC-ADG-2015, no

694812 -Hypoximmuno). None of these funding bodies have and had

influence on this study, protocol or manuscript. Their role was to make

this one of a kind multicentric, investigator initiated, phase II trial

possible.

CR Adalsteinsson VA, 2017, NAT COMMUN, V8, DOI 10.1038/s41467-017-00965-y

Antonia SJ, 2018, NEW ENGL J MED, V379, P2342, DOI 10.1056/NEJMoa1809697

Arrieta O, 2019, LUNG CANCER, V130, P67, DOI 10.1016/j.lungcan.2019.02.006

Benedict SH, 2010, MED PHYS, V37, P4078, DOI 10.1118/1.3438081

Bergsma DP, 2017, FRONT ONCOL, V7, DOI 10.3389/fonc.2017.00210

Birchler MT, 2003, LARYNGOSCOPE, V113, P1231, DOI 10.1097/00005537-200307000-00023

Buchbinder EI, 2019, J IMMUNOTHER CANCER, V7, DOI 10.1186/s40425-019-0522-3

Carbone DP, 2017, NEW ENGL J MED, V376, P2415, DOI 10.1056/NEJMoa1613493

CARNEMOLLA B, 1989, J CELL BIOL, V108, P1139, DOI 10.1083/jcb.108.3.1139

de Jong EEC, 2017, ACTA ONCOL, V56, P1459, DOI 10.1080/0284186X.2017.1346824

Devarakonda S, 2018, J CLIN ONCOL, V36, P2995, DOI 10.1200/JCO.2018.78.1963

Dingemans AMC, 2019, J THORAC ONCOL, V14, P2109, DOI 10.1016/j.jtho.2019.07.025

Domagala-Kulawik J, 2015, TRANSL LUNG CANCER R, V4, P177, DOI 10.3978/j.issn.2218-6751.2015.01.11

Dutcher JP, 2014, J IMMUNOTHER CANCER, V2, DOI 10.1186/s40425-014-0026-0

Ebbinghaus C, 2004, CURR PHARM DESIGN, V10, P1537, DOI 10.2174/1381612043384808

Eigentler TK, 2011, CLIN CANCER RES, V17, P7732, DOI 10.1158/1078-0432.CCR-11-1203

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Ettinger DS, 2019, J NATL COMPR CANC NE, V17, P1464, DOI 10.6004/jnccn.2019.0059

Fang Penny, 2018, Int J Part Ther, V4, P23, DOI 10.14338/IJPT-17-00033.1

Fang P, 2018, RADIOTHER ONCOL, V128, P584, DOI 10.1016/j.radonc.2018.02.025

Ferlay J, 2015, INT J CANCER, V136, pE359, DOI 10.1002/ijc.29210

Ferrara R, 2018, JAMA ONCOL, V4, P1543, DOI 10.1001/jamaoncol.2018.3676

Giaj-Levra N, 2020, LUNG CANCER, V139, P216, DOI 10.1016/j.lungcan.2019.11.005

Giaj-Levra N, 2019, J THORAC ONCOL, V14, P2053, DOI 10.1016/j.jtho.2019.05.037

Gomez DR, 2019, J CLIN ONCOL, V37, DOI 10.1200/JCO.19.00201

Gomez DR, 2016, LANCET ONCOL, V17, P1672, DOI 10.1016/S1470-2045(16)30532-0

Gray JE, 2020, J THORAC ONCOL, V15, P288, DOI 10.1016/j.jtho.2019.10.002

Greco C, 2011, INT J RADIAT ONCOL, V79, P1151, DOI 10.1016/j.ijrobp.2009.12.038

Gururangan S, 2017, CANCER IMMUNOL IMMUN, V66, P1589, DOI 10.1007/s00262-017-2051-6

Hellmann MD, 2019, NEW ENGL J MED, V381, P2020, DOI 10.1056/NEJMoa1910231

Hendriks LEL, 2019, EUR J CANCER, V123, P28, DOI 10.1016/j.ejca.2019.09.013

Ibrahim EM, 2014, BREAST CANCER RES TR, V148, P467, DOI 10.1007/s10549-014-3185-2

Iyengar P, 2018, JAMA ONCOL, V4, DOI 10.1001/jamaoncol.2017.3501

Jao K, 2018, LUNG CANCER, V123, P22, DOI 10.1016/j.lungcan.2018.06.023

Johannsen M, 2010, EUR J CANCER, V46, P2926, DOI 10.1016/j.ejca.2010.07.033

Kang JK, 2010, CLIN EXP METASTAS, V27, P273, DOI 10.1007/s10585-010-9325-0

Khan ZA, 2005, EXP LUNG RES, V31, P701, DOI 10.1080/01902140591007236

Lai JH, 2018, ONCOTARGETS THER, V11, P9111, DOI 10.2147/OTT.S174877

Lancia A, 2017, ACTA ONCOL, V56, P1621, DOI 10.1080/0284186X.2017.1346383

Levy A, 2019, EUR J CANCER, V122, P109, DOI 10.1016/j.ejca.2019.09.012

Lievens Y, 2020, RADIOTHER ONCOL, V148, P157, DOI 10.1016/j.radonc.2020.04.003

Lieverse RIY, 2020, HUMAN FIBRONECTIN EX, DOI 10.1002/1878-0261.12705

List T, 2013, CLIN PHARMACOL-ADV A, V5, P29, DOI 10.2147/CPAA.S49231

Marabondo S, 2017, EXPERT OPIN DRUG SAF, V16, P1347, DOI 10.1080/14740338.2017.1382472

Menrad A, 2005, EXPERT OPIN THER TAR, V9, P491, DOI 10.1517/14728222.9.3.491

Mezquita L, 2018, JAMA ONCOL, V4, P351, DOI 10.1001/jamaoncol.2017.4771

Milano MT, 2008, CANCER-AM CANCER SOC, V112, P650, DOI 10.1002/cncr.23209

Novello S, 2016, ANN ONCOL, V27, pv1, DOI 10.1093/annonc/mdw326

Ost P, 2018, J CLIN ONCOL, V36, P446, DOI 10.1200/JCO.2017.75.4853

Palma DA, 2019, LANCET, V393, P2051, DOI 10.1016/S0140-6736(18)32487-5

Pimentel VO, 2019, RADIOTHER ONCOL, V133, pS75, DOI 10.1016/S0167-8140(19)30577-8

Rekers NH, 2018, ONCOIMMUNOLOGY, V7, DOI 10.1080/2162402X.2017.1414119

Rekers NH, 2015, RADIOTHER ONCOL, V116, P438, DOI 10.1016/j.radonc.2015.06.019

Remon J, 2020, J THORAC ONCOL, V15, P914, DOI 10.1016/j.jtho.2020.03.006

Salama JK, 2012, CANCER-AM CANCER SOC, V118, P2962, DOI 10.1002/cncr.26611

Salem A, 2018, JNCI-J NATL CANCER I, V110, DOI 10.1093/jnci/djx160

Santimaria M, 2003, CLIN CANCER RES, V9, P571

Schernberg A, 2017, ACTA ONCOL, V56, P1522, DOI 10.1080/0284186X.2017.1348623

Schwartz RN, 2002, ONCOLOGY-NY, V16, P11

Seymour L, 2017, LANCET ONCOL, V18, pE143, DOI 10.1016/S1470-2045(17)30074-8

Siegel R, 2014, CA-CANCER J CLIN, V64, P9, DOI [10.3322/caac.21208, 10.3322/caac.21254, 10.1001/jamaoto.2014.2530, 10.1136/bmj.g1502]

Stinauer MA, 2011, RADIAT ONCOL, V6, DOI 10.1186/1748-717X-6-34

Syn NL, 2017, LANCET ONCOL, V18, pE731, DOI 10.1016/S1470-2045(17)30607-1

Theelen WSME, 2019, JAMA ONCOL, V5, P1276, DOI 10.1001/jamaoncol.2019.1478

Tijink BM, 2009, EUR J NUCL MED MOL I, V36, P1235, DOI 10.1007/s00259-009-1096-y

van den Heuvel MM, 2015, J TRANSL MED, V13, DOI 10.1186/s12967-015-0397-0

Van Limbergen EJ, 2017, BRIT J RADIOL, V90, DOI 10.1259/bjr.20170157

Vanpouille-Box C, 2017, NAT COMMUN, V8, DOI 10.1038/ncomms15618

Wang DY, 2018, JAMA ONCOL, V4, P1721, DOI 10.1001/jamaoncol.2018.3923

Weide B, 2019, CANCER IMMUNOL IMMUN, V68, P1547, DOI 10.1007/s00262-019-02383-z

Zegers CML, 2015, CLIN CANCER RES, V21, P1151, DOI 10.1158/1078-0432.CCR-14-2676

Zhang SL, 2020, INT IMMUNOPHARMACOL, V80, DOI 10.1016/j.intimp.2020.106247

NR 72

TC 20

Z9 20

U1 1

U2 8

PU BMC

PI LONDON

PA CAMPUS, 4 CRINAN ST, LONDON N1 9XW, ENGLAND

EI 1471-2407

J9 BMC CANCER

JI BMC Cancer

PD JUN 15

PY 2020

VL 20

IS 1

DI 10.1186/s12885-020-07055-1

PG 10

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA MH6MZ

UT WOS:000546842100008

PM 32539805

OA Green Published, gold

DA 2022-08-24

ER

PT J

AU Amugongo, LM

Osorio, EV

Green, A

Cobben, D

van Herk, M

McWilliam, A

AF Amugongo, Lameck Mbangula

Osorio, Eliana Vasquez

Green, Andrew

Cobben, David

van Herk, Marcel

McWilliam, Alan

TI Early prediction of tumour-response to radiotherapy in NSCLC patients

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE prediction; tumour changes; NSCLC; radiotherapy

ID CELL LUNG-CANCER; ADAPTIVE RADIOTHERAPY; COMPUTED-TOMOGRAPHY; VOLUME

CHANGES; CT; MOTION; RESISTANCE; RADIOMICS; PET

AB Objective. In this study we developed an automatic method to predict tumour volume and shape in weeks 3 and 4 of radiotherapy (RT), using cone-beam computed tomography (CBCT) scans acquired up to week 2, allowing identification of large tumour changes. Approach. 240 non-small cell lung cancer (NSCLC) patients, treated with 55 Gy in 20 fractions, were collected. CBCTs were rigidly registered to the planning CT. Intensity values were extracted in each voxel of the planning target volume across all CBCT images from days 1, 2, 3, 7 and 14. For each patient and in each voxel, four regression models were fitted to voxel intensity; applying linear, Gaussian, quadratic and cubic methods. These models predicted the intensity value for each voxel in weeks 3 and 4, and the tumour volume found by thresholding. Each model was evaluated by computing the root mean square error in pixel value and structural similarity index metric (SSIM) for all patients. Finally, the sensitivity and specificity to predict a 30% change in volume were calculated for each model. Main results. The linear, Gaussian, quadratic and cubic models achieved a comparable similarity score, the average SSIM for all patients was 0.94, 0.94, 0.90, 0.83 in week 3, respectively. At week 3, a sensitivity of 84%, 53%, 90% and 88%, and specificity of 99%, 100%, 91% and 42% were observed for the linear, Gaussian, quadratic and cubic models respectively. Overall, the linear model performed best at predicting those patients that will benefit from RT adaptation. The linear model identified 21% and 23% of patients in our cohort with more than 30% tumour volume reduction to benefit from treatment adaptation in weeks 3 and 4 respectively. Significance. We have shown that it is feasible to predict the shape and volume of NSCLC tumours from routine CBCTs and effectively identify patients who will respond to treatment early.

C1 [Amugongo, Lameck Mbangula; Osorio, Eliana Vasquez; Green, Andrew; van Herk, Marcel; McWilliam, Alan] Univ Manchester, Div Canc Sci, Manchester, Lancs, England.

[Amugongo, Lameck Mbangula; Osorio, Eliana Vasquez; Green, Andrew; van Herk, Marcel; McWilliam, Alan] Christie NHS Fdn Trust, Dept Radiotherapy Related Res, Manchester, Lancs, England.

[Cobben, David] Clatterbridge Canc Ctr NHS Fdn Trust, Birkenhead, Merseyside, England.

RP Amugongo, LM (通讯作者)，Univ Manchester, Div Canc Sci, Manchester, Lancs, England.; Amugongo, LM (通讯作者)，Christie NHS Fdn Trust, Dept Radiotherapy Related Res, Manchester, Lancs, England.

EM lameckmbangula.amugongo@postgrad.manchester.ac.uk

OI Amugongo, Lameck Mbangula/0000-0001-6468-2643; Green,

Andrew/0000-0002-8297-0953; Vasquez Osorio, Eliana M/0000-0003-0741-994X

FU NIHR Manchester Biomedical Research Centre; Newton Fund as part of the

Development in Africa with Radio Astronomy (DARA) Big Data project

FX Marcel van Herk, Andrew Green and Eliana Vasquez Osorio are supported by

NIHR Manchester Biomedical Research Centre. Lameck Mbangula Amugongo is

supported by Newton Fund as part of the Development in Africa with Radio

Astronomy (DARA) Big Data project.

CR Amugongo LM, 2020, PHYS MED BIOL, V65, DOI 10.1088/1361-6560/aba7d3

Barker HE, 2015, NAT REV CANCER, V15, P409, DOI 10.1038/nrc3958

Berkovic P, 2017, ACTA ONCOL, V56, P1656, DOI 10.1080/0284186X.2017.1352103

Britton KR, 2007, INT J RADIAT ONCOL, V68, P1036, DOI 10.1016/j.ijrobp.2007.01.021

Cook GJR, 2014, CLIN TRANSL IMAGING, V2, P269, DOI 10.1007/s40336-014-0064-0

Das AK, 2010, SEMIN RADIAT ONCOL, V20, P149, DOI 10.1016/j.semradonc.2010.01.002

Elsayad K, 2016, STRAHLENTHER ONKOL, V192, P83, DOI 10.1007/s00066-015-0927-y

Fox J, 2009, INT J RADIAT ONCOL, V74, P341, DOI 10.1016/j.ijrobp.2008.07.063

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Giraud P, 2000, INT J RADIAT ONCOL, V48, P1015, DOI 10.1016/S0360-3016(00)00750-1

Guckenberger M, 2012, STRAHLENTHER ONKOL, V188, P894, DOI 10.1007/s00066-012-0161-9

Guckenberger M, 2011, INT J RADIAT ONCOL, V81, pE275, DOI 10.1016/j.ijrobp.2011.01.067

Guckenberger M, 2011, INT J RADIAT ONCOL, V79, P901, DOI 10.1016/j.ijrobp.2010.04.050

Hyndman RJ, 2006, INT J FORECASTING, V22, P679, DOI 10.1016/j.ijforecast.2006.03.001

Kanakavelu N, 2016, REP PRACT ONCOL RADI, V21, P487, DOI 10.1016/j.rpor.2016.07.001

Kwint M, 2014, RADIOTHER ONCOL, V113, P392, DOI 10.1016/j.radonc.2014.10.009

Moller DS, 2016, RADIOTHER ONCOL, V121, P32, DOI 10.1016/j.radonc.2016.08.019

Moller DS, 2014, RADIOTHER ONCOL, V110, P517, DOI 10.1016/j.radonc.2013.10.013

O'Connor JPB, 2015, CLIN CANCER RES, V21, P249, DOI 10.1158/1078-0432.CCR-14-0990

Persoon LCGG, 2015, ACTA ONCOL, V54, P1501, DOI 10.3109/0284186X.2015.1061213

Poludniowski G, 2009, PHYS MED BIOL, V54, P3847, DOI 10.1088/0031-9155/54/12/016

Postmus PE, 2017, ANN ONCOL, V28, P1, DOI 10.1093/annonc/mdx222

Ramella S, 2017, J THORAC ONCOL, V12, P1122, DOI 10.1016/j.jtho.2017.03.025

Rasmussen CE, 2005, ADAPT COMPUT MACH LE, P1

Rit S, 2009, MED PHYS, V36, P2283, DOI 10.1118/1.3115691

Roengvoraphoj O, 2018, STRAHLENTHER ONKOL, V194, P107, DOI 10.1007/s00066-017-1229-3

Siker ML, 2006, INT J RADIAT ONCOL, V66, P135, DOI 10.1016/j.ijrobp.2006.03.064

Sonke JJ, 2019, SEMIN RADIAT ONCOL, V29, P245, DOI 10.1016/j.semradonc.2019.02.007

Sonke JJ, 2010, SEMIN RADIAT ONCOL, V20, P94, DOI 10.1016/j.semradonc.2009.11.003

Tvilum M, 2015, ACTA ONCOL, V54, P1430, DOI 10.3109/0284186X.2015.1062544

van Timmeren JE, 2017, RADIOTHER ONCOL, V123, P363, DOI 10.1016/j.radonc.2017.04.016

Wang Z, 2004, IEEE T IMAGE PROCESS, V13, P600, DOI 10.1109/TIP.2003.819861

Wolthaus JWH, 2005, PHYS MED BIOL, V50, P1569, DOI 10.1088/0031-9155/50/7/017

Woodford C, 2007, INT J RADIAT ONCOL, V69, P1316, DOI 10.1016/j.ijrobp.2007.07.2369

Yan D, 1997, PHYS MED BIOL, V42, P123, DOI 10.1088/0031-9155/42/1/008

NR 35

TC 0

Z9 0

U1 1

U2 3

PU IOP Publishing Ltd

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD NOV 21

PY 2021

VL 66

IS 22

AR 225002

DI 10.1088/1361-6560/ac2f88

PG 13

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA WR8ND

UT WOS:000714750900001

PM 34644691

OA hybrid

DA 2022-08-24

ER

PT J

AU Hatt, M

Cheze-le Rest, C

van Baardwijk, A

Lambin, P

Pradier, O

Visvikis, D

AF Hatt, Mathieu

Cheze-le Rest, Catherine

van Baardwijk, Angela

Lambin, Philippe

Pradier, Olivier

Visvikis, Dimitris

TI Impact of Tumor Size and Tracer Uptake Heterogeneity in F-18-FDG PET and

CT Non-Small Cell Lung Cancer Tumor Delineation

SO JOURNAL OF NUCLEAR MEDICINE

LA English

DT Article

DE NSCLC; F-18-FDG; tumor delineation; tumor volumes; tumor size; uptake

heterogeneity

ID RADIOTHERAPY; SEGMENTATION; VOLUME; DEFINITION; THRESHOLD; ALGORITHM;

PATHOLOGY; IMAGES

AB The objectives of this study were to investigate the relationship between CT-and F-18-FDG PET-based tumor volumes in non-small cell lung cancer (NSCLC) and the impact of tumor size and uptake heterogeneity on various approaches to delineating uptake on PET images. Methods: Twenty-five NSCLC cancer patients with F-18-FDG PET/CT were considered. Seventeen underwent surgical resection of their tumor, and the maximum diameter was measured. Two observers manually delineated the tumors on the CT images and the tumor uptake on the corresponding PET images, using a fixed threshold at 50% of the maximum (T-50), an adaptive threshold methodology, and the fuzzy locally adaptive Bayesian (FLAB) algorithm. Maximum diameters of the delineated volumes were compared with the histopathology reference when available. The volumes of the tumors were compared, and correlations between the anatomic volume and PET uptake heterogeneity and the differences between delineations were investigated. Results: All maximum diameters measured on PET and CT images significantly correlated with the histopathology reference (r > 0.89, P < 0.0001). Significant differences were observed among the approaches: CT delineation resulted in large overestimation (132% +/- 37%), whereas all delineations on PET images resulted in underestimation (from 215% +/- 17% for T-50 to 24% +/- 8% for FLAB) except manual delineation (18% +/- 17%). Overall, CT volumes were significantly larger than PET volumes (55 +/- 74 cm(3) for CT vs. from 18 +/- 25 to 47 +/- 76 cm(3) for PET). A significant correlation was found between anatomic tumor size and heterogeneity (larger lesions were more heterogeneous). Finally, the more heterogeneous the tumor uptake, the larger was the underestimation of PET volumes by threshold-based techniques. Conclusion: Volumes based on CT images were larger than those based on PET images. Tumor size and tracer uptake heterogeneity have an impact on threshold-based methods, which should not be used for the delineation of cases of large heterogeneous NSCLC, as these methods tend to largely underestimate the spatial extent of the functional tumor in such cases. For an accurate delineation of PET volumes in NSCLC, advanced image segmentation algorithms able to deal with tracer uptake heterogeneity should be preferred.

C1 [Hatt, Mathieu; Cheze-le Rest, Catherine; Pradier, Olivier; Visvikis, Dimitris] CHRU Morvan, INSERM, LaTIM U650, F-29609 Brest, France.

[van Baardwijk, Angela; Lambin, Philippe] MAASTricht Radiat Oncol Clin, Maastricht, Netherlands.

[Pradier, Olivier] CHRU Morvan, Dept Radiotherapy, F-29609 Brest, France.

RP Hatt, M (通讯作者)，CHRU Morvan, INSERM, LaTIM U650, 5 Ave Foch, F-29609 Brest, France.

RI Hatt, Mathieu/M-8917-2017; Visvikis, Dimitris/AAM-7868-2021; VISVIKIS,

Dimitris/H-4277-2014; Visvikis, Dimitris/AAM-7865-2021

OI Hatt, Mathieu/0000-0002-8938-8667; Lambin, Philippe/0000-0001-7961-0191;

VISVIKIS, Dimitris/0000-0003-0831-3637

FU French National Research Agency [ANR-08-ETEC-005-01]

FX This work was partly funded by the French National Research Agency under

contract ANR-08-ETEC-005-01. No other potential conflict of interest

relevant to this article was reported.

CR Aristophanous M, 2011, INT J RADIAT ONCOL, V80, P900, DOI 10.1016/j.ijrobp.2010.08.028

Basu S, 2011, EUR J NUCL MED MOL I, V38, P987, DOI 10.1007/s00259-011-1787-z

Belhassen S, 2010, MED PHYS, V37, P1309, DOI 10.1118/1.3301610

Biehl KJ, 2006, J NUCL MED, V47, P1808

Chiti A, 2010, RADIOTHER ONCOL, V96, P277, DOI 10.1016/j.radonc.2010.07.021

Daisne JF, 2003, RADIOTHER ONCOL, V69, P247, DOI 10.1016/S0167-8140(03)00270-6

Dewalle-Vignion AS, 2011, IEEE T MED IMAGING, V30, P409, DOI 10.1109/TMI.2010.2083681

Eary JF, 2008, J NUCL MED, V49, P1973, DOI 10.2967/jnumed.108.053397

El Naqa I, 2009, PATTERN RECOGN, V42, P1162, DOI 10.1016/j.patcog.2008.08.011

El Naqa I, 2007, MED PHYS, V34, P4738, DOI 10.1118/1.2799886

Hatt M, 2011, EUR J NUCL MED MOL I, V38, P1595, DOI 10.1007/s00259-011-1834-9

Hatt M, 2011, EUR J NUCL MED MOL I, V38, P1191, DOI 10.1007/s00259-011-1755-7

Hatt M, 2011, EUR J NUCL MED MOL I, V38, P663, DOI 10.1007/s00259-010-1688-6

Hatt M, 2010, J NUCL MED, V51, P1368, DOI 10.2967/jnumed.110.078501

Hatt M, 2010, INT J RADIAT ONCOL, V77, P301, DOI 10.1016/j.ijrobp.2009.08.018

Hatt M, 2009, IEEE T MED IMAGING, V28, P881, DOI 10.1109/TMI.2008.2012036

Hellwig D, 2007, J NUCL MED, V48, P1761, DOI 10.2967/jnumed.107.044362

Hicks RJ, 2001, J NUCL MED, V42, P1596

Lambin P, 2010, RADIOTHER ONCOL, V96, P145, DOI 10.1016/j.radonc.2010.07.001

MacManus M, 2009, RADIOTHER ONCOL, V91, P85, DOI 10.1016/j.radonc.2008.11.008

Montgomery DWG, 2007, MED PHYS, V34, P722, DOI 10.1118/1.2432404

Nelson AD, 2009, J NUCL MED, V50, p340P

Nestle U, 2005, J NUCL MED, V46, P1342

Petit SF, 2009, RADIOTHER ONCOL, V91, P393, DOI 10.1016/j.radonc.2009.02.020

Schaefer A, 2008, EUR J NUCL MED MOL I, V35, P1989, DOI 10.1007/s00259-008-0875-1

Sebastian TB, 2006, LECT NOTES COMPUT SC, V4191, P782

Stroom J, 2007, INT J RADIAT ONCOL, V69, P267, DOI 10.1016/j.ijrobp.2007.04.065

Thevenaz P, 2000, IEEE T MED IMAGING, V19, P739, DOI 10.1109/42.875199

Thorwarth D, 2010, RADIOTHER ONCOL, V96, P317, DOI 10.1016/j.radonc.2010.07.012

Tixier F, 2011, J NUCL MED, V52, P369, DOI 10.2967/jnumed.110.082404

Van Baardwijk A, 2007, INT J RADIAT ONCOL, V68, P771, DOI 10.1016/j.ijrobp.2006.12.067

Wu KL, 2010, J NUCL MED, V51, P1517, DOI 10.2967/jnumed.110.077974

Wu KL, 2010, INT J RADIAT ONCOL, V77, P699, DOI 10.1016/j.ijrobp.2009.05.028

Yaremko B, 2005, NUCL MED COMMUN, V26, P433, DOI 10.1097/00006231-200505000-00007

Yu H, 2009, INT J RADIAT ONCOL, V75, P618, DOI 10.1016/j.ijrobp.2009.04.043

Yu HM, 2009, EUR J RADIOL, V72, P104, DOI 10.1016/j.ejrad.2008.06.015

Yu JM, 2009, INT J RADIAT ONCOL, V75, P1468, DOI 10.1016/j.ijrobp.2009.01.019

NR 37

TC 115

Z9 117

U1 0

U2 14

PU SOC NUCLEAR MEDICINE INC

PI RESTON

PA 1850 SAMUEL MORSE DR, RESTON, VA 20190-5316 USA

SN 0161-5505

EI 1535-5667

J9 J NUCL MED

JI J. Nucl. Med.

PD NOV 1

PY 2011

VL 52

IS 11

BP 1690

EP 1697

DI 10.2967/jnumed.111.092767

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 844BJ

UT WOS:000296722000012

PM 21990577

OA Green Submitted, Green Accepted, Green Published, Bronze

DA 2022-08-24

ER

PT J

AU Lian, CF

Ruan, S

Denoeux, T

Li, H

Vera, P

AF Lian, Chunfeng

Ruan, Su

Denoeux, Thierry

Li, Hua

Vera, Pierre

TI Joint Tumor Segmentation in PET-CT Images Using Co-Clustering and Fusion

Based on Belief Functions

SO IEEE TRANSACTIONS ON IMAGE PROCESSING

LA English

DT Article

DE Tumor co-segmentation; co-clustering; context information; information

fusion; adaptive distance metric; spatial regularization; belief

functions; PET-CT

ID FDG-PET; THRESHOLDING ALGORITHM; MARKOV-FIELDS; QUANTIFICATION;

DELINEATION; CLASSIFICATION; PREDICTION; MULTISCALE; RADIOMICS; FEATURES

AB Precise delineation of target tumor is a key factor to ensure the effectiveness of radiation therapy. While hybrid positron emission tomography-computed tomography (PET-CT) has become a standard imaging tool in the practice of radiation oncology, many existing automatic/semi-automatic methods still perform tumor segmentation on mono-modal images. In this paper, a co-clustering algorithm is proposed to concurrently segment 3D tumors in PET-CT images, considering that the two complementary imaging modalities can combine functional and anatomical information to improve segmentation performance. The theory of belief functions is adopted in the proposed method to model, fuse, and reason with uncertain and imprecise knowledge from noisy and blurry PET-CT images. To ensure reliable segmentation for each modality, the distance metric for the quantification of clustering distortions and spatial smoothness is iteratively adapted during the clustering procedure. On the other hand, to encourage consistent segmentation between different modalities, a specific context term is proposed in the clustering objective function. Moreover, during the iterative optimization process, clustering results for the two distinct modalities are further adjusted via a belief-functions-based information fusion strategy. The proposed method has been evaluated on a data set consisting of 21 paired PET-CT images for non-small cell lung cancer patients. The quantitative and qualitative evaluations show that our proposed method performs well compared with the state-of-the-art methods.

C1 [Lian, Chunfeng; Denoeux, Thierry] Univ Technol Compiegne, Sorbonne Univ, CNRS, Heudiasyc, F-60200 Compiegne, France.

[Lian, Chunfeng; Ruan, Su; Vera, Pierre] Univ Rouen Normandie, LITIS, QuantIF, F-76130 Rouen, France.

[Li, Hua] Washington Univ, Dept Radiat Oncol, St Louis, MO 63110 USA.

[Vera, Pierre] Henri Becquerel Canc Ctr, Dept Nucl Med, F-76038 Rouen, France.

RP Ruan, S (通讯作者)，Univ Rouen Normandie, LITIS, QuantIF, F-76130 Rouen, France.

EM chunfeng.lian@utc.fr; su.ruan@univ-rouen.fr; thierry.denoeux@hds.utc.fr;

li.hua@wustl.edu; pierre.vera@chb.unicancer.fr

RI Lian, Chunfeng/AAE-1958-2020

OI Lian, Chunfeng/0000-0002-9319-6633; Ruan, Su/0000-0001-8785-6917

FU NCI NIH HHS [R01 CA233873] Funding Source: Medline

CR Abdoli M, 2013, MED PHYS, V40, DOI 10.1118/1.4816296

Bagci U, 2013, MED IMAGE ANAL, V17, P929, DOI 10.1016/j.media.2013.05.004

Beck A, 2009, SIAM J IMAGING SCI, V2, P183, DOI 10.1137/080716542

Beichel RR, 2016, MED PHYS, V43, P2948, DOI 10.1118/1.4948679

Belhassen S, 2010, MED PHYS, V37, P1309, DOI 10.1118/1.3301610

Berthon B, 2016, PHYS MED BIOL, V61, P4855, DOI 10.1088/0031-9155/61/13/4855

Bi YX, 2008, ARTIF INTELL, V172, P1731, DOI 10.1016/j.artint.2008.06.002

Boudaren MEY, 2016, IEEE GEOSCI REMOTE S, V13, P1865, DOI 10.1109/LGRS.2016.2615647

Cui H, 2015, PHYS MED BIOL, V60, P4893, DOI 10.1088/0031-9155/60/12/4893

Dewalle-Vignion AS, 2011, IEEE T MED IMAGING, V30, P409, DOI 10.1109/TMI.2010.2083681

El Naqa I, 2007, MED PHYS, V34, P4738, DOI 10.1118/1.2799886

Foster B, 2014, COMPUT BIOL MED, V50, P76, DOI 10.1016/j.compbiomed.2014.04.014

Foster B, 2014, IEEE T BIO-MED ENG, V61, P711, DOI 10.1109/TBME.2013.2288258

Geets X, 2007, EUR J NUCL MED MOL I, V34, P1427, DOI 10.1007/s00259-006-0363-4

Gribben H, 2009, I S BIOMED IMAGING, P290, DOI 10.1109/ISBI.2009.5193041

Han DF, 2011, LECT NOTES COMPUT SC, V6801, P245, DOI 10.1007/978-3-642-22092-0\_21

Hanzouli-Ben Salah H, 2017, MED PHYS, V44, P5835, DOI 10.1002/mp.12531

Hatt M, 2018, MED IMAGE ANAL, V44, P177, DOI 10.1016/j.media.2017.12.007

Hatt M, 2017, MED PHYS, V44, pE1, DOI 10.1002/mp.12124

Hatt M, 2017, J NUCL MED, V58, P365, DOI 10.2967/jnumed.116.184655

Hatt M, 2009, IEEE T MED IMAGING, V28, P881, DOI 10.1109/TMI.2008.2012036

Jaouen V, 2014, IEEE T IMAGE PROCESS, V23, P4773, DOI 10.1109/TIP.2014.2353854

Jentzen W, 2007, J NUCL MED, V48, P108

Jiao LM, 2016, IEEE T SYST MAN CY-S, V46, P1711, DOI 10.1109/TSMC.2015.2503381

Joussleme A.-L., 2001, Information Fusion, V2, P91, DOI 10.1016/S1566-2535(01)00026-4

Ju W, 2015, IEEE T IMAGE PROCESS, V24, DOI 10.1109/TIP.2015.2488902

Kamnitsas K, 2017, MED IMAGE ANAL, V36, P61, DOI 10.1016/j.media.2016.10.004

Krizhevsky A, 2017, COMMUN ACM, V60, P84, DOI 10.1145/3065386

Lapuyade-Lahorgue J, 2017, IEEE T IMAGE PROCESS, V26, P3187, DOI 10.1109/TIP.2017.2685345

Lapuyade-Lahorgue J, 2015, MED PHYS, V42, P5720, DOI 10.1118/1.4929561

Lelandais B, 2014, MED IMAGE ANAL, V18, P1247, DOI 10.1016/j.media.2014.06.014

Li F, 2018, KNOWL-BASED SYST, V142, P29, DOI 10.1016/j.knosys.2017.11.023

Li H, 2008, MED PHYS, V35, P3711, DOI 10.1118/1.2956713

Li X, 2013, IEEE T IMAGE PROCESS, V22, P3028, DOI 10.1109/TIP.2013.2253478

Lian CF, 2018, MED IMAGE ANAL, V46, P106, DOI 10.1016/j.media.2018.02.009

Lian CF, 2018, IEEE T BIO-MED ENG, V65, P21, DOI 10.1109/TBME.2017.2688453

Lian CF, 2016, IEEE T FUZZY SYST, V24, P1555, DOI 10.1109/TFUZZ.2016.2540068

Lian CF, 2016, MED IMAGE ANAL, V32, P257, DOI 10.1016/j.media.2016.05.007

Liu MX, 2016, IEEE T CYBERNETICS, V46, P298, DOI 10.1109/TCYB.2015.2401733

Liu ZG, 2018, IEEE T FUZZY SYST, V26, P1217, DOI 10.1109/TFUZZ.2017.2718483

Liu ZG, 2018, IEEE T CYBERNETICS, V48, P1605, DOI 10.1109/TCYB.2017.2710205

Liu Z, 2018, IEEE T IMAGE PROCESS, V27, P1822, DOI 10.1109/TIP.2017.2784560

Makni N, 2014, INFORM FUSION, V19, P61, DOI 10.1016/j.inffus.2012.04.002

Markel Daniel, 2013, Int J Mol Imaging, V2013, P980769, DOI 10.1155/2013/980769

Masson MH, 2008, PATTERN RECOGN, V41, P1384, DOI 10.1016/j.patcog.2007.08.014

Mi H, 2015, MED IMAGE ANAL, V23, P84, DOI 10.1016/j.media.2015.04.016

Montgomery DWG, 2007, MED PHYS, V34, P722, DOI 10.1118/1.2432404

Mu W, 2015, IEEE T BIO-MED ENG, V62, P2465, DOI 10.1109/TBME.2015.2433397

Onoma DP, 2014, COMPUT MED IMAG GRAP, V38, P753, DOI 10.1016/j.compmedimag.2014.09.007

Pieczynski W, 2006, IMAGE VISION COMPUT, V24, P61, DOI 10.1016/j.imavis.2005.09.012

Shafer G., 1976, DEMPSTERS RULE COMBI, P57, DOI [10.2307/j.ctv10vm1qb.7, DOI 10.2307/J.CTV10VM1QB.7]

Sharif MS, 2010, INT J BIOMED IMAGING, V2010, DOI 10.1155/2010/105610

Soh LK, 1999, IEEE T GEOSCI REMOTE, V37, P780, DOI 10.1109/36.752194

Song Q, 2013, IEEE T MED IMAGING, V32, P1685, DOI 10.1109/TMI.2013.2263388

Tan S, 2017, PHYS MED BIOL, V62, P5383, DOI 10.1088/1361-6560/aa6e20

Thibault G, 2014, IEEE T BIO-MED ENG, V61, P630, DOI 10.1109/TBME.2013.2284600

Vallieres M, 2015, PHYS MED BIOL, V60, P5471, DOI 10.1088/0031-9155/60/14/5471

Vauclin S, 2009, PHYS MED BIOL, V54, P6901, DOI 10.1088/0031-9155/54/22/010

Waltz RA, 2006, MATH PROGRAM, V107, P391, DOI 10.1007/s10107-004-0560-5

Wanet M, 2011, RADIOTHER ONCOL, V98, P117, DOI 10.1016/j.radonc.2010.10.006

Wojak J, 2010, I S BIOMED IMAGING, P217, DOI 10.1109/ISBI.2010.5490374

Xu ZY, 2015, L N COMPUT VIS BIOME, V22, P15, DOI 10.1007/978-3-319-18431-9\_2

Yu H, 2009, IEEE T MED IMAGING, V28, P374, DOI 10.1109/TMI.2008.2004425

Zhang J, 2013, IEEE T IMAGE PROCESS, V22, P31, DOI 10.1109/TIP.2012.2214045

NR 64

TC 39

Z9 41

U1 4

U2 182

PU IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC

PI PISCATAWAY

PA 445 HOES LANE, PISCATAWAY, NJ 08855-4141 USA

SN 1057-7149

EI 1941-0042

J9 IEEE T IMAGE PROCESS

JI IEEE Trans. Image Process.

PD FEB

PY 2019

VL 28

IS 2

BP 755

EP 766

DI 10.1109/TIP.2018.2872908

PG 12

WC Computer Science, Artificial Intelligence; Engineering, Electrical &

Electronic

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Computer Science; Engineering

GA GW6EI

UT WOS:000447041700005

PM 30296224

OA Green Submitted, Green Accepted

DA 2022-08-24

ER

PT J

AU Lopci, E

Grizzi, F

Russo, C

Toschi, L

Grassi, I

Cicoria, G

Lodi, F

Mattioli, S

Fanti, S

AF Lopci, Egesta

Grizzi, Fabio

Russo, Carlo

Toschi, Luca

Grassi, Ilaria

Cicoria, Gianfranco

Lodi, Filippo

Mattioli, Sandro

Fanti, Stefano

TI Early and delayed evaluation of solid tumours with Cu-64-ATSM PET/CT: a

pilot study on semiquantitative and computer-aided fractal geometry

analysis

SO NUCLEAR MEDICINE COMMUNICATIONS

LA English

DT Article

DE copper-64 diacetyl-bisN4-methylthiosemicarbazone; delayed imaging; early

imaging; fractals; hypoxia imaging; image analysis; positron emission

tomography; computed tomography

ID POSITRON-EMISSION-TOMOGRAPHY; HYPOXIA IMAGING AGENT; LUNG-CANCER;

IN-VIVO; RADIOTHERAPY; CU-60-ATSM; OXYGENATION; TISSUE

AB ObjectiveThe aim of this study was to analyse early and delayed acquisition on copper-64 diacetyl-bisN4-methylthiosemicarbazone (Cu-64-ATSM) PET/CT in a small cohort of patients by comparing semiquantitative and computer-aided fractal geometry analyses.

Patients and methods Five cancer patients, including non-small-cell lung cancer and head and neck cancer, were investigated with Cu-64-ATSM PET/CT. Participants received an intravenous injection of Cu-64-ATSM according to body size and were imaged 60min (early) and 16h (delayed) later on hybrid PET/CT. Reconstructed images were visualized on advanced workstations for the definition of semiquantitative parameters: standardized uptake value (SUV)(max), SUVratio-to-muscle, SUVmean, hypoxic volume (HV) and hypoxic burden (HB=HVxSUV(mean)). DICOM data retrieved from both scans were analysed using an ad-hoc computer program to determine the mean intensity value, SD, relative dispersion, three-dimensional histogram fractal dimension and three-dimensional fractal dimension.

ResultsAll tumour lesions showed increased uptake of Cu-64-ATSM at early evaluation, with a median SUVratio-to-muscle of 4.42 (range: 1.58-5.62), a median SUVmax of 5.3 (range: 1.9-7.3), a median SUVmean of 2.8 (range: 1.5-3.9), a median HV of 41.6cm(3) (range: 2.8-453.7) and a median HB of 161.5cm(3) (range: 4.4-1112.5). All semiquantitative data obtained at 1h were consistent with the parameters obtained on delayed imaging (P < 0.05). A borderline statistically significant difference was found only for SUVmax of the muscle (P=0.045). Fractal geometry analysis on DICOM images showed that all parameters at early imaging showed no statistically significant difference with late acquisition (P > 0.05).

ConclusionOur findings support the consistency of Cu-64-ATSM PET/CT images obtained at early and delayed acquisition for the assessment of tumour lesions.

C1 [Lopci, Egesta; Mattioli, Sandro; Fanti, Stefano] Alma Mater Studiorum Univ Bologna, Res Doctorate Course Specialized Med Sci, Bologna, Italy.

[Grassi, Ilaria; Cicoria, Gianfranco; Lodi, Filippo; Fanti, Stefano] Univ Hosp S Orsola Malpighi, PET Unit, Bologna, Italy.

[Mattioli, Sandro] Univ Hosp S Orsola Malpighi, Div Thorac Surg, Bologna, Italy.

[Lopci, Egesta] Humanitas Clin & Res Hosp, Dept Nucl Med, Rozzano, Italy.

[Grizzi, Fabio] Humanitas Clin & Res Hosp, Dept Inflammat & Immunol, Rozzano, Italy.

[Toschi, Luca] Humanitas Clin & Res Hosp, Dept Med Oncol, Rozzano, Italy.

[Russo, Carlo] Michele Rodriguez Fdn, Milan, Italy.

RP Lopci, E (通讯作者)，Humanitas Clin & Res Hosp, Dept Nucl Med, Via Manzoni 56, I-20089 Milan, Italy.

EM egesta.lopci@gmail.com

RI Lopci, Egesta/AFS-1754-2022; Grassi, Ilaria/AAA-6436-2021; Cicoria,

Gianfranco/AAM-9288-2021; Grizzi, Fabio/K-3448-2018; Lopci,

Egesta/K-8966-2016; Toschi, Luca/K-4445-2018

OI Lopci, Egesta/0000-0001-9732-1094; Grassi, Ilaria/0000-0002-9566-7670;

Cicoria, Gianfranco/0000-0001-6287-3059; Lopci,

Egesta/0000-0001-9732-1094; Russo, Carlo/0000-0001-8296-4345; FANTI,

STEFANO/0000-0003-1486-2624; Lodi, Filippo/0000-0003-0549-0793; Toschi,

Luca/0000-0002-4023-7542

CR Apte S, 2011, CURR ORG SYNTH, V8, P593, DOI 10.2174/157017911796117179

Carlson DJ, 2011, INT J RADIAT ONCOL, V79, P1188, DOI 10.1016/j.ijrobp.2010.10.007

Dehdashti F, 2003, EUR J NUCL MED MOL I, V30, P844, DOI 10.1007/s00259-003-1130-4

Dehdashti F, 2008, J NUCL MED, V49, P201, DOI 10.2967/jnumed.107.048520

Di Ieva A, 2008, NEUROSURG REV, V31, P271, DOI 10.1007/s10143-008-0127-7

Di Ieva A, 2014, NEUROSCIENTIST, V20, P403, DOI 10.1177/1073858413513927

Dietz DW, 2008, DIS COLON RECTUM, V51, P1641, DOI 10.1007/s10350-008-9420-3

Evans SM, 2003, CANCER LETT, V195, P1, DOI 10.1016/S0304-3835(03)00012-0

Fujibayashi Y, 1997, J NUCL MED, V38, P1155

Grassi I, 2014, CLIN NUCL MED, V39, pE59, DOI 10.1097/RLU.0b013e3182a756f0

GRAY LH, 1953, BRIT J RADIOL, V26, P638, DOI 10.1259/0007-1285-26-312-638

Grigsby PW, 2007, MOL IMAGING BIOL, V9, P278, DOI 10.1007/s11307-007-0095-2

Hockel M, 2001, JNCI-J NATL CANCER I, V93, P266, DOI 10.1093/jnci/93.4.266

Horsman MR, 2012, NAT REV CLIN ONCOL, V9, P674, DOI 10.1038/nrclinonc.2012.171

Laforest R, 2005, EUR J NUCL MED MOL I, V32, P764, DOI 10.1007/s00259-004-1756-x

Lennon FE, 2015, NAT REV CLIN ONCOL, V12, P664, DOI 10.1038/nrclinonc.2015.108

Lewis JS, 2001, P NATL ACAD SCI USA, V98, P1206, DOI 10.1073/pnas.98.3.1206

Lewis JS, 2001, J NUCL MED, V42, P655

Lewis JS, 1999, J NUCL MED, V40, P177

Lopci E, 2016, CLIN NUCL MED, V41, pE87, DOI 10.1097/RLU.0000000000001017

Lopci E, 2014, AM J NUCL MED MOLEC, V4, P365

Mees G, 2009, EUR J NUCL MED MOL I, V36, P1674, DOI 10.1007/s00259-009-1195-9

Minagawa Y, 2011, ANN NUCL MED, V25, P339, DOI 10.1007/s12149-011-0471-5

Nyflot MJ, 2012, RADIOTHER ONCOL, V105, P36, DOI 10.1016/j.radonc.2012.09.012

O'Connor JP, 2016, SEMIN CELL DEV BIOL

O'Donoghue JA, 2005, INT J RADIAT ONCOL, V61, P1493, DOI 10.1016/j.ijrobp.2004.12.057

Semenza GL, 2007, DRUG DISCOV TODAY, V12, P853, DOI 10.1016/j.drudis.2007.08.006

THOMLINSON RH, 1955, BRIT J CANCER, V9, P539, DOI 10.1038/bjc.1955.55

Weeks AJ, 2010, EUR J NUCL MED MOL I, V37, P330, DOI 10.1007/s00259-009-1305-8

NR 29

TC 8

Z9 8

U1 0

U2 12

PU LIPPINCOTT WILLIAMS & WILKINS

PI PHILADELPHIA

PA TWO COMMERCE SQ, 2001 MARKET ST, PHILADELPHIA, PA 19103 USA

SN 0143-3636

EI 1473-5628

J9 NUCL MED COMMUN

JI Nucl. Med. Commun.

PD APR

PY 2017

VL 38

IS 4

BP 340

EP 346

DI 10.1097/MNM.0000000000000656

PG 7

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA EQ6PT

UT WOS:000398205600010

PM 28263239

DA 2022-08-24

ER

PT J

AU Jochems, A

Deist, TM

El Naqa, I

Kessler, M

Mayo, C

Reeves, J

Jolly, S

Matuszak, M

Ten Haken, R

van Soest, J

Oberije, C

Faivre-Finn, C

Price, G

de Ruysscher, D

Lambin, P

Dekker, A

AF Jochems, Arthur

Deist, Timo M.

El Naqa, Issam

Kessler, Marc

Mayo, Chuck

Reeves, Jackson

Jolly, Shruti

Matuszak, Martha

Ten Haken, Randall

van Soest, Johan

Oberije, Cary

Faivre-Finn, Corinne

Price, Gareth

de Ruysscher, Dirk

Lambin, Philippe

Dekker, Andre

TI Developing and Validating a Survival Prediction Model for NSCLC Patients

Through Distributed Learning Across 3 Countries

SO INTERNATIONAL JOURNAL OF RADIATION ONCOLOGY BIOLOGY PHYSICS

LA English

DT Article

ID CELL LUNG-CANCER; RECURSIVE PARTITIONING ANALYSIS; ONCOLOGY GROUP RTOG;

GROSS TUMOR VOLUME; RADIATION-THERAPY; EXTERNAL VALIDATION;

PROGNOSTIC-FACTORS; HEALTH-CARE; 2-YEAR SURVIVAL; DOSE-ESCALATION

AB Purpose: Tools for survival prediction for non-small cell lung cancer (NSCLC) patients treated with chemoradiation or radiation therapy are of limited quality. In this work, we developed a predictive model of survival at 2 years. The model is based on a large volume of historical patient data and serves as a proof of concept to demonstrate the distributed learning approach.

Methods and Materials: Clinical data from 698 lung cancer patients, treated with curative intent with chemoradiation or radiation therapy alone, were collected and stored at 2 different cancer institutes (559 patients at Maastro clinic (Netherlands) and 139 at Michigan university [ United States]). The model was further validated on 196 patients originating from The Christie (United Kingdon). A Bayesian network model was adapted for distributed learning (the animation can be viewed at https://www.youtube.com/watch?v=ZDJFOxpwqEA). Two-year posttreatment survival was chosen as the endpoint. The Maastro clinic cohort data are publicly available at https://www.cancerdata.org/publication/developing-and-validating-survival-prediction-model-nsclc-patients-through-distributed, and the developed models can be found at www.predictcancer.org.

Results: Variables included in the final model were T and N category, age, performance status, and total tumor dose. The model has an area under the curve (AUC) of 0.66 on the external validation set and an AUC of 0.62 on a 5-fold cross validation. A model based on the T and N category performed with an AUC of 0.47 on the validation set, significantly worse than our model (P<.001). Learning the model in a centralized or distributed fashion yields a minor difference on the probabilities of the conditional probability tables (0.6%); the discriminative performance of the models on the validation set is similar (P=.26).

Conclusions: Distributed learning from federated databases allows learning of predictive models on data originating from multiple institutions while avoiding many of the data-sharing barriers. We believe that distributed learning is the future of sharing data in health care. (C) 2017 The Author(s). Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

C1 [Jochems, Arthur; Deist, Timo M.; van Soest, Johan; Oberije, Cary; de Ruysscher, Dirk; Lambin, Philippe; Dekker, Andre] Maastricht Univ, Med Ctr, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Maastricht, Netherlands.

[El Naqa, Issam; Kessler, Marc; Mayo, Chuck; Reeves, Jackson; Jolly, Shruti; Matuszak, Martha; Ten Haken, Randall] Univ Michigan, Dept Radiat Oncol, Ann Arbor, MI 48109 USA.

[Faivre-Finn, Corinne; Price, Gareth] Univ Manchester, Manchester Acad Hlth Sci Ctr, Christie NHS Fdn Trust, Manchester, Lancs, England.

RP Jochems, A (通讯作者)，Maastricht Univ MAASTRO Clin, Dept Radiat Oncol, Doctor Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

EM arthur.jochems@maastro.nl

RI Naqa, Issam El/T-3066-2019; Oberije, Cary/ABA-6178-2020; Dekker,

Andre/AAE-4830-2019

OI Naqa, Issam El/0000-0001-6023-1132; Oberije, Cary/0000-0003-0749-5117;

Dekker, Andre/0000-0002-0422-7996; Ten Haken,

Randall/0000-0003-1331-0297; Faivre-Finn, Corinne/0000-0001-5617-9781;

Price, Gareth/0000-0003-4353-3360; Lambin, Philippe/0000-0001-7961-0191;

van Soest, Johan/0000-0003-2548-0330

FU Interreg grant euroCAT; Dutch Technology Foundation STW (DuCAT) [10696];

Dutch Technology Foundation STW (Radiomics STRaTegy, grant), applied

science division of Nederlandse Organisatie voor Wetenschappelijk

Onderzoek (NWO) [P14-19]; Technology Programme of the Ministry of

Economic Affairs; Manchester Cancer Research UK major center grant; EU

Seventh Framework program (ARTFORCE) [257144, 601826]; CTMM-TraIT;

EUROSTARS (CloudAtlas); Kankeronderzoekfonds Limburg from the Health

Foundation Limburg; Alpe d'HuZes-KWF (DESIGN); Dutch Cancer Society; NIH

[P01 CA059827]; European Program [H2020-2015-17, 733008]; European

Research Council (ERC) [694812]; SME Phase 2 (European Union (EU)

[673780]; Dutch national program COMMIT (Prana Data project); Cancer

Research UK [20465] Funding Source: researchfish; NATIONAL CANCER

INSTITUTE [P01CA059827] Funding Source: NIH RePORTER

FX This work was supported by the Interreg grant euroCAT and the Dutch

Technology Foundation STW (DuCAT, grant No. 10696; Radiomics STRaTegy,

grant No. P14-19), which is the applied science division of Nederlandse

Organisatie voor Wetenschappelijk Onderzoek (NWO); the Technology

Programme of the Ministry of Economic Affairs; and a Manchester Cancer

Research UK major center grant. Financial support was also provided by

the following: EU Seventh Framework program (ARTFORCE, grant No. 257144;

REQUITE, grant No. 601826), CTMM-TraIT, EUROSTARS (CloudAtlas),

Kankeronderzoekfonds Limburg from the Health Foundation Limburg, Alpe

d'HuZes-KWF (DESIGN), Dutch Cancer Society, NIH P01 CA059827, European

Program H2020-2015-17 (ImmunoSABR, grant No. 733008), an European

Research Council (ERC) advanced grant (ERC-ADG-2015, grant No. 694812;

Hypo-ximmuno), and SME Phase 2 (European Union (EU) proposal 673780,

RAIL). This publication was supported by the Dutch national program

COMMIT (Prana Data project).

CR Abernethy AP, 2010, J CLIN ONCOL, V28, P4268, DOI 10.1200/JCO.2010.28.5478

Basaki K, 2006, INT J RADIAT ONCOL, V64, P449, DOI 10.1016/j.ijrobp.2005.07.967

BAUER DF, 1972, J AM STAT ASSOC, V67, P687, DOI 10.2307/2284469

Belderbos J, 2007, EUR J CANCER, V43, P114, DOI 10.1016/j.ejca.2006.09.005

Berghmans T, 2004, LUNG CANCER, V45, P339, DOI 10.1016/j.lungcan.2004.02.016

Bradley JD, 2002, INT J RADIAT ONCOL, V52, P49, DOI 10.1016/S0360-3016(01)01772-2

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Brundage MD, 2002, CHEST, V122, P1037, DOI 10.1378/chest.122.3.1037

Cheng Q, 2016, RADIOTHER ONCOL, V118, P281, DOI 10.1016/j.radonc.2015.12.029

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

Dehing-Oberije C, 2008, INT J RADIAT ONCOL, V70, P1039, DOI 10.1016/j.ijrobp.2007.07.2323

Dehing-Oberije C, 2011, INT J RADIAT ONCOL, V81, P360, DOI 10.1016/j.ijrobp.2010.06.011

Dehing-Oberije C, 2010, RADIOTHER ONCOL, V97, P455, DOI 10.1016/j.radonc.2010.09.028

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Deist TM, 2017, CLIN TRANSL RAD ONCO, V4, P24, DOI 10.1016/j.ctro.2016.12.004

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

DOREY FJ, 1987, STAT MED, V6, P679, DOI 10.1002/sim.4780060605

Druzdzel MJ, 1999, SIXTEENTH NATIONAL CONFERENCE ON ARTIFICIAL INTELLIGENCE (AAAI-99)/ELEVENTH INNOVATIVE APPLICATIONS OF ARTIFICIAL INTELLIGENCE (IAAI-99), P902

Etheredge LM, 2007, HEALTH AFFAIR, V26, pW107, DOI 10.1377/hlthaff.26.2.w107

Firat S, 2002, INT J RADIAT ONCOL, V54, P357, DOI 10.1016/S0360-3016(02)02939-5

HARRINGTON DP, 1982, BIOMETRIKA, V69, P553, DOI 10.1093/biomet/69.3.553

Hollander M., 2013, NONPARAMETRIC STAT M

Jayasurya K, 2010, MED PHYS, V37, P1401, DOI 10.1118/1.3352709

Jochems A, 2016, RADIOTHER ONCOL, V121, P459, DOI 10.1016/j.radonc.2016.10.002

Komaki R, 1998, INT J RADIAT ONCOL, V42, P263, DOI 10.1016/S0360-3016(98)00213-2

Kuschner KW, 2010, BMC BIOINFORMATICS, V11, DOI 10.1186/1471-2105-11-177

Lambin P, 2016, ADV DRUG DELIV REV

Lambin P, 2015, ACTA ONCOL, V54, P1289, DOI 10.3109/0284186X.2015.1062136

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Lambin P, 2010, RADIOTHER ONCOL, V96, P145, DOI 10.1016/j.radonc.2010.07.001

Langendijk H, 2001, Clin Lung Cancer, V3, P33, DOI 10.3816/CLC.2001.n.015

LAURITZEN SL, 1995, COMPUT STAT DATA AN, V19, P191, DOI 10.1016/0167-9473(93)E0056-A

Leijenaar RTH, 2015, ACTA ONCOL, V54, P1423, DOI 10.3109/0284186X.2015.1061214

Leijenaar RTH, 2015, SCI REP-UK, V5, DOI 10.1038/srep11075

Mauguen A, 2012, J CLIN ONCOL, V30, P2788, DOI 10.1200/JCO.2012.41.6677

Non-Small Cell Lung Cancer Collaborative Group, 2000, COCHRANE DATABASE SY

Panth KM, 2015, RADIOTHER ONCOL, V116, P462, DOI 10.1016/j.radonc.2015.06.013

Pfister DG, 2004, J CLIN ONCOL, V22, P330, DOI 10.1200/JCO.2004.09.053

Robin X, 2011, BMC BIOINFORMATICS, V12, DOI 10.1186/1471-2105-12-77

Sesen MB, 2013, PLOS ONE, V8, DOI 10.1371/journal.pone.0082349

Solan Merrill J, 2003, Semin Surg Oncol, V21, P64, DOI 10.1002/ssu.10023

Spirtes P., 1991, Social Science Computer Review, V9, P62, DOI 10.1177/089443939100900106

Stacey D, 2014, COCHRANE DB SYST REV, V28, DOI [DOI 10.1002/14651858.CD001431.PUB4, 10.1002/14651858.CD001431.pub4]

Therneau T. M., 2000, STAT BIOL HEALTH, P39

van Baardwijk A, 2008, INT J RADIAT ONCOL, V71, P1394, DOI 10.1016/j.ijrobp.2007.11.070

van Baardwijk A, 2010, J CLIN ONCOL, V28, P1380, DOI 10.1200/JCO.2009.24.7221

van Elmpt W, 2012, RADIOTHER ONCOL, V104, P67, DOI 10.1016/j.radonc.2012.03.005

Vansteenkiste J, 2014, ANN ONCOL, V25, P1462, DOI 10.1093/annonc/mdu089

Vulto A, 2006, RADIOTHER ONCOL, V78, P131, DOI 10.1016/j.radonc.2005.12.010

Werner-Wasik M, 2000, INT J RADIAT ONCOL, V48, P1475, DOI 10.1016/S0360-3016(00)00801-4

Werner-Wasik M, 2008, INT J RADIAT ONCOL, V70, P385, DOI 10.1016/j.ijrobp.2007.06.034

Zhao LJ, 2007, INT J RADIAT ONCOL, V68, P103, DOI 10.1016/j.ijrobp.2006.11.051

NR 54

TC 57

Z9 59

U1 0

U2 10

PU ELSEVIER SCIENCE INC

PI NEW YORK

PA STE 800, 230 PARK AVE, NEW YORK, NY 10169 USA

SN 0360-3016

EI 1879-355X

J9 INT J RADIAT ONCOL

JI Int. J. Radiat. Oncol. Biol. Phys.

PD OCT 1

PY 2017

VL 99

IS 2

BP 344

EP 352

DI 10.1016/j.ijrobp.2017.04.021

PG 9

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA FF1WN

UT WOS:000408690000022

PM 28871984

OA Green Published, Green Accepted, hybrid

DA 2022-08-24

ER

PT J

AU Dietz, B

Yung, J

Yip, E

Gabos, Z

Fallone, BG

Wachowicz, K

AF Dietz, Bryson

Yung, Jihyun

Yip, Eugene

Gabos, Zsolt

Fallone, B. Gino

Wachowicz, Keith

TI Single patient convolutional neural networks for real-time MR

reconstruction: a proof of concept application in lung tumor

segmentation for adaptive radiotherapy

SO PHYSICS IN MEDICINE AND BIOLOGY

LA English

DT Article

DE MRI; reconstruction; neural networks

ID AUTOCONTOURING ALGORITHM; TRACKING

AB Investigate 3D (spatial and temporal) convolutional neural networks (CNNs) for real-time on-the-fly magnetic resonance imaging (MRI) reconstruction. In particular, we investigated the applicability of training CNNs on a patient-by-patient basis for the purpose of lung tumor segmentation.

Data were acquired with our 3 T Philips Achieva system. A retrospective analysis was performed on six non-small cell lung cancer patients who received fully sampled dynamic acquisitions consisting of 650 free breathing images using a bSSFP sequence. We retrospectively undersampled the six patient's data by 5 x and 10 x acceleration. The retrospective data was used to quantitatively compare the CNN reconstruction to gold truth data via the Dice coefficient (DC) and centroid displacement to compare the tumor segmentations. Reconstruction noise was investigated using the normalized mean square error (NMSE). We further validated the technique using prospectively undersampled data from a volunteer and motion phantom.

The retrospectively undersampled data at 5 x and 10 x acceleration was reconstructed using patient specific trained CNNs. The patient average DCs for the tumor segmentation at 5 x and 10 x acceleration were 0.94 and 0.92, respectively. These DC values are greater than the inter-and intra-observer segmentations acquired by radiation oncologist experts as reported in a previous study of ours. Furthermore, the patient specific CNN can be trained in under 6 h and the reconstruction time was 65 ms per image. The prospectively undersampled CNN reconstruction data yielded qualitatively acceptable images.

We have shown that 3D CNNs can be used for real-time on-the-fly dynamic image reconstruction utilizing both spatial and temporal data in this proof of concept study. We evaluated the technique using six retrospectively undersampled lung cancer patient data sets, as well as prospectively undersampled data acquired from a volunteer and motion phantom. The reconstruction speed achieved for our current implementation was 65 ms per image.

C1 [Dietz, Bryson; Gabos, Zsolt; Fallone, B. Gino; Wachowicz, Keith] Univ Alberta, Dept Oncol, Edmonton, AB, Canada.

[Yung, Jihyun; Yip, Eugene; Fallone, B. Gino; Wachowicz, Keith] Cross Canc Inst, Dept Med Phys, Edmonton, AB, Canada.

[Fallone, B. Gino] Univ Alberta, Dept Phys, Edmonton, AB, Canada.

RP Dietz, B (通讯作者)，Univ Alberta, Dept Oncol, Edmonton, AB, Canada.

EM bdietz@ualberta.ca

OI Yun, Jihyun/0000-0001-6113-0528

FU Alberta Innovates Health Solutions [201301]; Philips

FX The authors would like to acknowledge Alberta Innovates Health

Solutions: 201301 for funding used in part, to support the research

presented. We would also like to acknowledge Philips for their research

support.

CR Abadi M., 2015, PROC USENIX S OPERAT

Al-Rfou R., 2016, ARXIV160502688

Ba J.L., 2015, ARXIV14126980V9

Bieri O, 2005, MAGNET RESON MED, V54, P129, DOI 10.1002/mrm.20527

Caballero J, 2014, IEEE T MED IMAGING, V33, P979, DOI 10.1109/TMI.2014.2301271

Caballero J, 2012, LECT NOTES COMPUT SC, V7510, P256, DOI 10.1007/978-3-642-33415-3\_32

DICE LR, 1945, ECOLOGY, V26, P297, DOI 10.2307/1932409

Dietz B, 2017, MED PHYS, V44, P3978, DOI 10.1002/mp.12354

Fallone BG, 2009, MED PHYS, V36, P2084, DOI 10.1118/1.3125662

Fallone BG, 2014, SEMIN RADIAT ONCOL, V24, P200, DOI 10.1016/j.semradonc.2014.02.011

da Silva GLF, 2018, COMPUT METH PROG BIO, V162, P109, DOI 10.1016/j.cmpb.2018.05.006

Griswold M A, 1999, MAGN RESON MED, V47, P1202

Keall PJ, 2006, MED PHYS, V33, P3874, DOI 10.1118/1.2349696

Keall PJ, 2014, SEMIN RADIAT ONCOL, V24, P203, DOI 10.1016/j.semradonc.2014.02.015

Lustig M, 2007, MAGN RESON MED, V58, P1182, DOI 10.1002/mrm.21391

McCourt M., 2016, ARXIV160309441V1

Mutic S, 2014, SEMIN RADIAT ONCOL, V24, P196, DOI 10.1016/j.semradonc.2014.02.008

Pruessmann KP, 1999, MAGNET RESON MED, V42, P952, DOI 10.1002/(SICI)1522-2594(199911)42:5<952::AID-MRM16>3.0.CO;2-S

Raaymakers BW, 2009, PHYS MED BIOL, V54, pN229, DOI 10.1088/0031-9155/54/12/N01

Ravishankar S, 2011, IEEE T MED IMAGING, V30, P1028, DOI 10.1109/TMI.2010.2090538

Rawat W, 2017, NEURAL COMPUT, V29, P2352, DOI [10.1162/neco\_a\_00990, 10.1162/NECO\_a\_00990]

Schlemper J, 2018, IEEE T MED IMAGING, V37, P491, DOI 10.1109/TMI.2017.2760978

Soffer S, 2019, RADIOLOGY, V290, P590, DOI 10.1148/radiol.2018180547

Umehara K, 2018, J DIGIT IMAGING, V31, P441, DOI 10.1007/s10278-017-0033-z

Valverde S, 2017, NEUROIMAGE, V155, P159, DOI 10.1016/j.neuroimage.2017.04.034

Wang Z, 2004, IEEE T IMAGE PROCESS, V13, P600, DOI 10.1109/TIP.2003.819861

Xiao ZK, 2008, MAGN RESON MED, V60, P650, DOI 10.1002/mrm.21679

Yip E, 2018, MED PHYS, V45, P307, DOI 10.1002/mp.12687

Yip E, 2017, MED PHYS, V44, P84, DOI 10.1002/mp.12027

Yip E, 2014, MED PHYS, V41, P462, DOI 10.1118/1.4885960

Yun J, 2016, BIOMED PHYS ENG EXPR, V2, DOI 10.1088/2057-1976/2/6/067004

Yun JY, 2013, MED PHYS, V40, DOI 10.1118/1.4802735

Yun J, 2012, MED PHYS, V39, P1481, DOI 10.1118/1.3685578

Zeng K, 2018, COMPUT BIOL MED, V99, P133, DOI 10.1016/j.compbiomed.2018.06.010

Zhan ZH, 2009, IEEE T SYST MAN CY B, V39, P1362, DOI 10.1109/TSMCB.2009.2015956

NR 35

TC 6

Z9 6

U1 0

U2 55

PU IOP PUBLISHING LTD

PI BRISTOL

PA TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

SN 0031-9155

EI 1361-6560

J9 PHYS MED BIOL

JI Phys. Med. Biol.

PD OCT

PY 2019

VL 64

IS 19

AR 195002

DI 10.1088/1361-6560/ab408e

PG 15

WC Engineering, Biomedical; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Engineering; Radiology, Nuclear Medicine & Medical Imaging

GA JA1CO

UT WOS:000487555100002

PM 31476750

DA 2022-08-24

ER

PT J

AU Adachi, T

Nagasawa, R

Nakamura, M

Kakino, R

Mizowaki, T

AF Adachi, Takanori

Nagasawa, Ryoko

Nakamura, Mitsuhiro

Kakino, Ryo

Mizowaki, Takashi

TI Vulnerabilities of radiomic features to respiratory motion on

four-dimensional computed tomography-based average intensity projection

images: A phantom study

SO JOURNAL OF APPLIED CLINICAL MEDICAL PHYSICS

LA English

DT Article

DE 4DCT-based AIP; lung cancer; phantom study; radiomics; respiratory

motion; robustness assessment

ID STEREOTACTIC BODY RADIOTHERAPY; LUNG-CANCER; RADIATION-THERAPY; 4D-CT;

CT

AB Purpose To evaluate the influence of respiratory motion on the robustness of radiomic features on four-dimensional computed tomography (4DCT)-based average intensity projection (AIP) images by employing an anthropomorphic chest phantom. Methods Three spherical objects (phi 30 mm), namely, acrylic (100 Hounsfield unit [HU], homogeneous), rubber (-140 HU, homogeneous), and cork (-630 HU, heterogeneous), were moved with motion amplitudes of 0, 1, 2.5, 4, 6, 8, and 10 mm in the phantom, and 4DCT scans were repeated at four different locations. Thereafter, the AIP images were generated considering the average of the 10 respiratory phases of the 4DCT images. Further, the targets were manually delineated on the AIP images in the lung window setting. A total of 851 radiomic features, including 107 unfiltered features and 744 wavelet filter-based features, were extracted from the region of interest for each material. The feature robustness among the different target motion amplitude (epsilon) was evaluated by normalizing the feature variability of the target motion relative to the variability of data from 573 patients with early-stage non-small cell lung cancer. The features with absolute epsilon values <= 0.5 were considered highly robust to target motions. Results The percentage of robust unfiltered and wavelet filter-based features with a motion amplitude of 1 mm was greater than 83.2% and 93.4%, respectively; however, the percentage decreased by more than 24.3% and 17.6%, respectively, for motion amplitudes greater than 2.5 mm. The movement of cork had a small effect on the feature robustness compared to that of acrylic and rubber, regardless of the target motion amplitudes. Conclusions Our phantom study demonstrated that target motion amplitudes <= 1 mm led to the robustness of radiomic features on the 4DCT-based AIP images of thoracic regions. The frequency components and directions of the wavelet filters may be essential factors in 4DCT-based radiomic analysis.

C1 [Adachi, Takanori; Nagasawa, Ryoko; Nakamura, Mitsuhiro; Kakino, Ryo] Kyoto Univ, Grad Sch Med, Dept Informat Technol & Med Engn, Div Med Phys,Human Hlth Sci,Sakyo Ku, 53 Kawahara Cho, Kyoto 6068507, Japan.

[Adachi, Takanori; Nakamura, Mitsuhiro; Kakino, Ryo; Mizowaki, Takashi] Kyoto Univ, Grad Sch Med, Dept Radiat Oncol & Image Appl Therapy, Sakyo Ku, Kyoto, Japan.

RP Nakamura, M (通讯作者)，Kyoto Univ, Grad Sch Med, Dept Informat Technol & Med Engn, Div Med Phys,Human Hlth Sci,Sakyo Ku, 53 Kawahara Cho, Kyoto 6068507, Japan.

EM m\_nkmr@kuhp.kyoto-u.ac.jp

OI Nakamura, Mitsuhiro/0000-0002-6406-2097; Adachi,

Takanori/0000-0003-1356-5118

FU Takeda Science Foundation

FX This study was partially supported by the Takeda Science Foundation.

Takanori Adachi and Ryoko Nagasawa performed statistical analysis and

drafted the manuscript. Takanori Adachi, Ryoko Nagasawa, Mitsuhiro

Nakamura, and Ryo Kakino conceived the study, participated in its design

and coordination, and helped to draft the manuscript. All authors read

and approved the final manuscript.

CR Baker S, 2019, ACTA ONCOL, V58, P237, DOI 10.1080/0284186X.2018.1532602

Benedict SH, 2010, MED PHYS, V37, P4078, DOI 10.1118/1.3438081

Davey A, 2021, PHYS MED BIOL, V66, DOI 10.1088/1361-6560/abfa34

Diwanji TP, 2017, TRANSL LUNG CANCER R, V6, P131, DOI 10.21037/tlcr.2017.04.04

Du Q, 2019, PLOS ONE, V14, DOI 10.1371/journal.pone.0216480

Ezhil M, 2009, RADIAT ONCOL, V4, DOI 10.1186/1748-717X-4-4

Fedorov A, 2012, MAGN RESON IMAGING, V30, P1323, DOI 10.1016/j.mri.2012.05.001

Guckenberger M, 2007, INT J RADIAT ONCOL, V67, P1352, DOI 10.1016/j.ijrobp.2006.11.025

Hatt M, 2018, J NUCL MED, V59

Horner-Rieber J, 2017, RADIOTHER ONCOL, V125, P317, DOI 10.1016/j.radonc.2017.08.029

Huynh E, 2017, PLOS ONE, V12, DOI 10.1371/journal.pone.0169172

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Kakino R, 2020, MED PHYS, V47, P4634, DOI 10.1002/mp.14380

Keall PJ, 2006, MED PHYS, V33, P3874, DOI 10.1118/1.2349696

Kim YJ, 2019, COMPUT MATH METHOD M, V2019, DOI 10.1155/2019/8790694

Larue RTHM, 2017, RADIOTHER ONCOL, V125, P147, DOI 10.1016/j.radonc.2017.07.023

Li Q, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0892-y

Li XD, 2020, COMPUT METH PROG BIO, V197, DOI 10.1016/j.cmpb.2020.105719

Liu HH, 2007, INT J RADIAT ONCOL, V68, P531, DOI 10.1016/j.ijrobp.2006.12.066

Mackin D, 2018, SCI REP-UK, V8, DOI 10.1038/s41598-018-20713-6

Nagata Y, 2015, INT J RADIAT ONCOL, V93, P989, DOI 10.1016/j.ijrobp.2015.07.2278

Nakamura M, 2008, MED PHYS, V35, P4142, DOI 10.1118/1.2968096

Pan T, 2004, MED PHYS, V31, P333, DOI 10.1118/1.1639993

Scrivener M, 2016, TRANSL CANCER RES, V5, P398, DOI 10.21037/tcr.2016.06.18

Shi LT, 2018, TECHNOL CANCER RES T, V17, DOI 10.1177/1533033818782788

Sun B, 2017, CANCER-AM CANCER SOC, V123, P3031, DOI 10.1002/cncr.30693

Tunali I, 2019, MED PHYS, V46, P5075, DOI [10.1002/mp.13808, 10.1002/mp.13808]]

Ueda Y, 2020, J RADIAT RES, V61, P104, DOI 10.1093/jrr/rrz081

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Zhovannik I, 2019, CLIN TRANSL RAD ONCO, V19, P33, DOI 10.1016/j.ctro.2019.07.003

NR 30

TC 1

Z9 1

U1 2

U2 3

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1526-9914

J9 J APPL CLIN MED PHYS

JI J. Appl. Clin. Med. Phys

PD MAR

PY 2022

VL 23

IS 3

AR e13498

DI 10.1002/acm2.13498

EA JAN 2022

PG 11

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA ZP2OR

UT WOS:000747702800001

PM 35088515

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Fernandes, MG

Bussink, J

Stam, B

Wijsman, R

Schinagl, DAX

Monshouwer, R

Teuwen, J

AF Fernandes, Miguel Garrett

Bussink, Johan

Stam, Barbara

Wijsman, Robin

Schinagl, Dominic A. X.

Monshouwer, Rene

Teuwen, Jonas

TI Deep learning model for automatic contouring of cardiovascular

substructures on radiotherapy planning CT images: Dosimetric validation

and reader study based clinical acceptability testing

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Automatic cardiac contouring; Segmentation; Lung cancer; NSCLC; Surface

dice; Cardiac radiotoxicity

ID LUNG-CANCER PATIENTS; AUTO-SEGMENTATION; HEART; SURVIVAL; IMPACT;

TOXICITY

AB Background and purpose: Large radiotherapy (RT) planning imaging datasets with consistently contoured cardiovascular structures are essential for robust cardiac radiotoxicity research in thoracic cancers. This study aims to develop and validate a highly accurate automatic contouring model for the heart, cardiac chambers, and great vessels for RT planning computed tomography (CT) images that can be used for dose-volume parameter estimation. Materials and methods: A neural network model was trained using a dataset of 127 expertly contoured planning CT images from RT treatment of locally advanced non-small-cell lung cancer (NSCLC) patients. Evaluation of geometric accuracy and quality of dosimetric parameter estimation was performed on 50 independent scans with contrast and without contrast enhancement. The model was further evaluated regarding the clinical acceptability of the contours in 99 scans randomly sampled from the RTOG-0617 dataset by three experienced radiation oncologists. Results: Median surface dice at 3 mm tolerance for all dedicated thoracic structures was 90% in the test set. Median absolute difference between mean dose computed with model contours and expert contours was 0.45 Gy averaged over all structures. The mean clinical acceptability rate by majority vote in the RTOG-0617 scans was 91%. Conclusion: This model can be used to contour the heart, cardiac chambers, and great vessels in large datasets of RT planning thoracic CT images accurately, quickly, and consistently. Additionally, the model can be used as a time-saving tool for contouring in clinic practice. (c) 2021 The Authors. Published by Elsevier B.V. Radiotherapy and Oncology 165 (2021) 52-59 This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

C1 [Fernandes, Miguel Garrett; Bussink, Johan; Schinagl, Dominic A. X.; Monshouwer, Rene] Radboud Univ Nijmegen Med Ctr, Radboud Inst Hlth Sci, Dept Radiat Oncol, Nijmegen, Netherlands.

[Fernandes, Miguel Garrett; Teuwen, Jonas] Radboud Univ Nijmegen Med Ctr, Radboud Inst Hlth Sci, Dept Med Imaging, Nijmegen, Netherlands.

[Stam, Barbara; Teuwen, Jonas] Netherlands Canc Inst, Dept Radiat Oncol, Amsterdam, Netherlands.

[Wijsman, Robin] Univ Med Ctr Groningen, Dept Radiat Oncol, Groningen, Netherlands.

RP Fernandes, MG (通讯作者)，POB 9101, NL-6500 HB Nijmegen, Netherlands.

EM miguel.fernandes@radboudumc.nl

RI Monshouwer, R./L-4527-2015; Teuwen, Jonas/B-6378-2018

OI Bussink, Johan/0000-0002-5751-4796; Teuwen, Jonas/0000-0002-1825-1428

CR Aerts H.J.W.L., 2019, \*\*DATA OBJECT\*\*, DOI 10.7937/K9/TCIA.2015.PF0M9REI

Badiyan SN, 2019, INT J RADIAT ONCOL, V104, P590, DOI 10.1016/j.ijrobp.2019.03.007

Bradley JD., 2018, The Cancer Imaging Archive, DOI 10.7937/TCIA.2018.jze75u7v

Bradley JD, 2015, LANCET ONCOL, V16, P187, DOI 10.1016/S1470-2045(14)71207-0

Cicek Ozgun, 2016, Medical Image Computing and Computer-Assisted Intervention - MICCAI 2016. 19th International Conference. Proceedings: LNCS 9901, P424, DOI 10.1007/978-3-319-46723-8\_49

Clark K, 2013, J DIGIT IMAGING, V26, P1045, DOI 10.1007/s10278-013-9622-7

Contreras JA, 2018, RADIOTHER ONCOL, V128, P498, DOI 10.1016/j.radonc.2018.05.017

Darby SC, 2010, INT J RADIAT ONCOL, V76, P656, DOI 10.1016/j.ijrobp.2009.09.064

Feng M, 2011, INT J RADIAT ONCOL, V79, P10, DOI 10.1016/j.ijrobp.2009.10.058

Ghita M, 2020, RADIOTHER ONCOL, V152, P216, DOI 10.1016/j.radonc.2020.07.016

Haq R, 2020, PHYS IMAG RADIAT ONC, V14, P61, DOI 10.1016/j.phro.2020.05.009

Harms J, 2021, MED PHYS, V48, P2867, DOI 10.1002/mp.14810

Liu Liyuan, 2019, VARIANCE ADAPTIVE LE

Liu X, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.717039

Lorenzen EL, 2013, RADIOTHER ONCOL, V108, P254, DOI 10.1016/j.radonc.2013.06.025

Ma JT, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0772-5

McWilliam A, 2017, EUR J CANCER, V85, P106, DOI 10.1016/j.ejca.2017.07.053

Meakin J, GRAND CHALLENGE ORG, DOI [10.5281/ zenodo.3356819, DOI 10.5281/ZENODO.3356819]

Morris ED, 2020, MED PHYS, V47, P576, DOI 10.1002/mp.13940

Nikolov Stanislav, 2021, J Med Internet Res, V23, pe26151, DOI 10.2196/26151

Paszke A, ADV NEUR IN

Payer C, STACOM MICCAI 2017

Ronneberger O, 2015, LECT NOTES COMPUT SC, V9351, P234, DOI 10.1007/978-3-319-24574-4\_28

Stam B, 2017, RADIOTHER ONCOL, V123, P370, DOI 10.1016/j.radonc.2017.04.017

Thor M, 2021, INT J RADIAT ONCOL, V109, P1619, DOI 10.1016/j.ijrobp.2020.11.011

Vivekanandan S, 2017, INT J RADIAT ONCOL, V99, P51, DOI 10.1016/j.ijrobp.2017.04.026

Wijsman R, 2015, RADIOTHER ONCOL, V117, P49, DOI 10.1016/j.radonc.2015.08.010

Wong J, 2020, RADIOTHER ONCOL, V144, P152, DOI 10.1016/j.radonc.2019.10.019

Wong OY, 2018, CLIN LUNG CANCER, V19, pE241, DOI 10.1016/j.cllc.2017.08.002

Zhang TW, 2019, INT J RADIAT ONCOL, V104, P582, DOI 10.1016/j.ijrobp.2018.12.044

Zhuang XH, 2019, MED IMAGE ANAL, V58, DOI 10.1016/j.media.2019.101537

NR 31

TC 1

Z9 1

U1 1

U2 4

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD DEC

PY 2021

VL 165

BP 52

EP 59

DI 10.1016/j.radonc.2021.10.008

EA NOV 2021

PG 8

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA XA0HP

UT WOS:000720339200001

PM 34688808

OA Green Published, hybrid, Green Submitted

DA 2022-08-24

ER

PT J

AU Bongers, ML

de Ruysscher, D

Oberije, C

Lambin, P

Uyl-de Groot, CA

Belderbos, J

Coupe, VMH

AF Bongers, Mathilda L.

de Ruysscher, Dirk

Oberije, Cary

Lambin, Philippe

Uyl-de Groot, Carin A.

Belderbos, Jose

Coupe, Veerle M. H.

TI MODEL-BASED COST-EFFECTIVENESS OF CONVENTIONAL AND INNOVATIVE

CHEMO-RADIATION IN LUNG CANCER

SO INTERNATIONAL JOURNAL OF TECHNOLOGY ASSESSMENT IN HEALTH CARE

LA English

DT Article

DE Cost-effectiveness; Modeling; Chemo-radiation; Radiotherapy; Lung cancer

ID ACCELERATED RADIOTHERAPY; EXTERNAL VALIDATION; ECONOMIC-EVALUATION;

SURVIVAL; CHEMOTHERAPY; METAANALYSIS; PROPHYLAXIS; PREDICTION; TOXICITY

AB Introduction: Optimizing radiotherapy with or without chemotherapy through advanced imaging and accelerated radiation schemes shows promising results in locally advanced non-small-cell lung cancer (NSCLC). This study compared the cost-effectiveness of positron emission tomography-computed tomography based isotoxic accelerated sequential chemo-radiation (SRT2) and concurrent chemo-radiation with daily low-dose cisplatin (CRT2) with standard sequential (SRT1) and concurrent chemo-radiation (CRT1).

Methods: We used an externally validated mathematical model to simulate the four treatment strategies. The model was built using data from 200 NSCLC patients treated with curative sequential chemo-radiation. For concurrent strategies, data from a meta-analysis and a single study were included in the model. Costs, utilities, and resource use estimates were obtained from literature. Primary outcomes were the incremental cost-effectiveness and cost-utility ratio (ICUR) of each strategy. Scenario analyses were carried out to investigate the impact of uncertainty.

Results: Total undiscounted costs and quality-adjusted life-years (QALYs) for SRT1, CRT1, SRT2, and CRT2 were EUR 17,288, EUR 18,756, EUR 19,072, EUR 17,360 and QALYs 1.10, 1.15, 1.40, and 1.40, respectively. Compared with SRT1, the ICURs were EUR 38,024/QALY for CRT1, EUR 6,249/QALY for SRT2, and EUR 346/QALY for CRT2. CRT2 was highly cost-effective compared with SRT1. Moreover, CRT2 was more effective and less costly than CRT1 and SRT2. Therefore, these strategies were dominated by CRT2.

Conclusion: Optimized sequential and concurrent chemo-radiation strategies are more effective and cost-effective than the current conventional sequential and concurrent strategies. Concurrent chemo-radiation with a daily low dose cisplatin regimen is the most cost-effective treatment option for locally advanced inoperable NSCLC patients.

C1 [Bongers, Mathilda L.; Coupe, Veerle M. H.] Vrije Univ Amsterdam, Med Ctr, Dept Epidemiol & Biostat, Amsterdam, Netherlands.

[de Ruysscher, Dirk] Univ Hosp Leuven KU Leuven, Dept Radiat Oncol, Leuven, Belgium.

[Oberije, Cary; Lambin, Philippe] Maastricht Univ, GROW Res Inst, Dept Radiat Oncol MAASTRO, Med Ctr, Maastricht, Netherlands.

[Uyl-de Groot, Carin A.] Erasmus Univ, Inst Med Technol Assessment, Rotterdam, Netherlands.

[Belderbos, Jose] Antoni van Leeuwenhoek Hosp, Netherlands Canc Inst, Dept Radiotherapy, Amsterdam, Netherlands.

RP Coupe, VMH (通讯作者)，Vrije Univ Amsterdam, Med Ctr, Dept Epidemiol & Biostat, Amsterdam, Netherlands.

EM v.coupe@vumc.nl

RI Oberije, Cary/ABA-6178-2020

OI Oberije, Cary/0000-0003-0749-5117; Lambin, Philippe/0000-0001-7961-0191;

Coupe, Veerle/0000-0002-9553-9791

FU CTMM, the Center for Translational Molecular Medicine, project AIRFORCE

[03O-103]

FX This research was performed within the framework of CTMM, the Center for

Translational Molecular Medicine, project AIRFORCE (grant 03O-103).

Study sponsors had no role in the design of the study, the execution of

the project, or the writing of the manuscript.

CR Auperin A, 2010, J CLIN ONCOL, V28, P2181, DOI 10.1200/JCO.2009.26.2543

Belderbos J, 2007, EUR J CANCER, V43, P114, DOI 10.1016/j.ejca.2006.09.005

Bongers ML, 2016, MED DECIS MAKING, V36, P86, DOI 10.1177/0272989X15574500

Bongers ML, 2015, INT J RADIAT ONCOL, V91, P857, DOI 10.1016/j.ijrobp.2014.12.012

De Ruysscher D, 2012, RADIOTHER ONCOL, V102, P228, DOI 10.1016/j.radonc.2011.10.010

De Ruysscher D, 2010, J CLIN ONCOL, V28, P5301, DOI 10.1200/JCO.2010.30.3271

De Ruysscher D, 2009, RADIOTHER ONCOL, V91, P353, DOI 10.1016/j.radonc.2008.10.006

Dehing-Oberije C, 2010, RADIOTHER ONCOL, V97, P455, DOI 10.1016/j.radonc.2010.09.028

Dehing-Oberije C, 2009, RADIOTHER ONCOL, V91, P421, DOI 10.1016/j.radonc.2008.12.002

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Driessen EJM, 2016, RADIOTHER ONCOL, V121, P26, DOI 10.1016/j.radonc.2016.07.025

Grutters JPC, 2010, CANCER TREAT REV, V36, P468, DOI 10.1016/j.ctrv.2010.02.018

Koning CC, 2013, CLIN LUNG CANCER, V14, P481, DOI 10.1016/j.cllc.2013.03.002

Lievens Y, 2005, RADIOTHER ONCOL, V75, P171, DOI 10.1016/j.radonc.2005.03.011

Marseille E, 2015, B WORLD HEALTH ORGAN, V93, P118, DOI 10.2471/BLT.14.138206

Mauguen A, 2012, J CLIN ONCOL, V30, P2788, DOI 10.1200/JCO.2012.41.6677

Nafees B, 2008, HEALTH QUAL LIFE OUT, V6, DOI 10.1186/1477-7525-6-84

O'Rourke N, 2010, COCHRANE DB SYST REV, DOI 10.1002/14651858.CD002140.pub3

Parkin DM, 2005, CA-CANCER J CLIN, V55, P74, DOI 10.3322/canjclin.55.2.74

Polder JJ, 2006, SOC SCI MED, V63, P1720, DOI 10.1016/j.socscimed.2006.04.018

Ramaekers BLT, 2013, J THORAC ONCOL, V8, P1295, DOI 10.1097/JTO.0b013e31829f6c55

Sturza J, 2010, MED DECIS MAKING, V30, P685, DOI 10.1177/0272989X10369004

Tan SS, 2012, INT J TECHNOL ASSESS, V28, P152, DOI 10.1017/S0266462312000062

Timmer-Bonte JNH, 2008, J CLIN ONCOL, V26, P290, DOI 10.1200/JCO.2007.13.0898

Timmer-Bonte JNH, 2006, J CLIN ONCOL, V24, P2991, DOI 10.1200/JCO.2005.04.3281

Uyterlinde W, 2013, CLIN LUNG CANCER, V14, P541, DOI 10.1016/j.cllc.2013.04.001

Vanni T, 2011, PHARMACOECONOMICS, V29, P35, DOI 10.2165/11584600-000000000-00000

Vansteenkiste J, 2013, ANN ONCOL, V24, P89, DOI 10.1093/annonc/mdt241

Whyte S, 2011, MED DECIS MAKING, V31, P625, DOI 10.1177/0272989X10384738

[No title captured]

NR 30

TC 2

Z9 2

U1 0

U2 2

PU CAMBRIDGE UNIV PRESS

PI NEW YORK

PA 32 AVENUE OF THE AMERICAS, NEW YORK, NY 10013-2473 USA

SN 0266-4623

EI 1471-6348

J9 INT J TECHNOL ASSESS

JI Int. J. Technol. Assess. Health Care

PY 2017

VL 33

IS 6

BP 681

EP 690

DI 10.1017/S0266462317000939

PG 10

WC Health Care Sciences & Services; Public, Environmental & Occupational

Health; Medical Informatics

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Health Care Sciences & Services; Public, Environmental & Occupational

Health; Medical Informatics

GA FR4KM

UT WOS:000419034100008

PM 29122046

OA Green Submitted

DA 2022-08-24

ER

PT J

AU Gu, JB

Zhu, J

Qiu, QT

Wang, YG

Bai, T

Duan, JH

Yin, Y

AF Gu, Jiabing

Zhu, Jian

Qiu, Qingtao

Wang, Yungang

Bai, Tong

Duan, Jinghao

Yin, Yong

TI The Feasibility Study of Megavoltage Computed Tomographic (MVCT) I mage

for Texture Feature Analysis

SO FRONTIERS IN ONCOLOGY

LA English

DT Article

DE radiotherapy; helical tomotherpy; megavoltage computed tomotherapy;

radiomics; feature analysis

ID CELL LUNG-CANCER; CT TEXTURE; TUMOR HETEROGENEITY; SETUP VERIFICATION;

DISTANT METASTASIS; ESOPHAGEAL CANCER; PROGNOSTIC VALUE; TOMOTHERAPY;

SURVIVAL; PREDICTION

AB Purpose: To determine whether radiomics texture features can be reproducibly obtained from megavoltage computed tomographic (MVCT) images acquired by Helical TomoTherapy (HT) with different imaging conditions.

Methods: For each of the 195 textures enrolled, the mean intrapatient difference, which is considered to be the benchmark for reproducibility, was calculated from the MVCT images of 22 patients with early-stage non-small-cell lung cancer. Test-retest MVCT images of an in-house designed phantom were acquired to determine the concordance correlation coefficient (CCC) for these 195 texture features. Features with high reproducibility (CCC > 0.9) in the phantom test-retest set were investigated for sensitivities to different imaging protocols, scatter levels, and motion frequencies using a wood phantom and in-vitro animal tissues.

Results: Of the 195 features, 165 (85%) features had CCC > 0.9. For the wood phantom, 124 features were reproducible in two kinds of scatter materials, and further investigations were performed on these features. For animal tissues, 108 features passed the criteria for reproducibility when one layer of scatter was covered, while 106 and 108 features of in-vitro liver and bone passed with two layers of scatter, respectively.Considering the effect of differing acquisition pitch (AcP), 97 features extracted from wood passed, while 103 and 59 features extracted from in-vitro liver and bone passed, respectively. Different reconstruction intervals (RI) had a small effect on the stability of the feature value. When AcP and RI were held consistent without motion, all 124 features calculated from wood passed, and a majority (122 of 124) of the features passed when imaging with a "fine" AcP with different Rls. However, only 55 and 40 features passed with motion frequencies of 20 and 25 beats per minute, respectively.

Conclusion: Motion frequency has a significant impact on MVCT texture features, and features from MVCT were more reproducibility in different scatter conditions than those from CBCT. Considering the effects of AcP and RI, the scanning protocols should be kept consistent when MVCT images are used for feature analysis. Some radiomics features from HT MVCT images are reproducible and could be used for creating clinical prediction models in the future.

C1 [Gu, Jiabing] Univ Jinan, Shandong Acad Med Sci, Sch Med & Life Sci, Jinan, Shandong, Peoples R China.

[Gu, Jiabing; Zhu, Jian; Qiu, Qingtao; Wang, Yungang; Bai, Tong; Duan, Jinghao; Yin, Yong] Shandong Univ, Shandong Canc Hosp, Shandong Acad Med Sci, Dept Radiat Oncol Phys & Technol, Jinan, Shandong, Peoples R China.

RP Zhu, J; Yin, Y (通讯作者)，Shandong Univ, Shandong Canc Hosp, Shandong Acad Med Sci, Dept Radiat Oncol Phys & Technol, Jinan, Shandong, Peoples R China.

EM zhujian.cn@163.com; yinyongsd@126.com

RI Qiu, Qingtao/AAS-9287-2020

FU National Natural Science Fund of China [81472811, 81671785, 81530060];

National Key Research and Develop Program of China [2016YFC0105106];

Science and Technology Planning Project of Shandong Province

[2014GSF118011]; Natural Science Foundation of Shandong Province

[2016ZRC03118, ZR2017PH071]

FX We acknowledge financial support from the National Natural Science Fund

of China (grant numbers 81472811, 81671785, and 81530060), the National

Key Research and Develop Program of China (grant number 2016YFC0105106),

the Science and Technology Planning Project of Shandong Province

(2014GSF118011), and the Natural Science Foundation of Shandong Province

(grant number 2016ZRC03118 and ZR2017PH071).

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

Al-Kadi OS, 2008, IEEE T BIO-MED ENG, V55, P1822, DOI 10.1109/TBME.2008.919735

Boswell S, 2006, MED PHYS, V33, P4395, DOI 10.1118/1.2349698

Chen ML, 2013, MED DOSIM, V38, P280, DOI 10.1016/j.meddos.2013.02.009

Chen YJ, 2007, INT J RADIAT ONCOL, V68, P1537, DOI 10.1016/j.ijrobp.2007.04.023

Cook GJR, 2013, J NUCL MED, V54, P19, DOI 10.2967/jnumed.112.107375

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

Cozzi L, 2017, BMC CANCER, V17, DOI 10.1186/s12885-017-3847-7

Crispin-Ortuzar M, 2018, RADIOTHER ONCOL, V127, P36, DOI 10.1016/j.radonc.2017.11.025

Cunliffe A, 2015, INT J RADIAT ONCOL, V91, P1048, DOI 10.1016/j.ijrobp.2014.11.030

Fave X, 2015, MED PHYS, V42, P6784, DOI 10.1118/1.4934826

Fried DV, 2016, RADIOLOGY, V278, P214, DOI 10.1148/radiol.2015142920

Fried DV, 2014, INT J RADIAT ONCOL, V90, P834, DOI 10.1016/j.ijrobp.2014.07.020

Gabrys HS, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00035

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Ganeshan B, 2012, EUR RADIOL, V22, P796, DOI 10.1007/s00330-011-2319-8

Gao H, 2013, MED PHYS, V40, DOI 10.1118/1.4816303

Gevaert O, 2012, RADIOLOGY, V264, P387, DOI 10.1148/radiol.12111607

Hunter LA, 2013, MED PHYS, V40, DOI 10.1118/1.4829514

Kaiser A, 2006, INT J RADIAT ONCOL, V66, P949, DOI 10.1016/j.ijrobp.2006.05.055

Kalman NS, 2018, RADIOTHER ONCOL, V129, P270, DOI 10.1016/j.radonc.2018.08.024

Kwan JYY, 2018, INT J RADIAT ONCOL, V102, P1107, DOI 10.1016/j.ijrobp.2018.01.057

Machtay M, 2013, J CLIN ONCOL, V31, P3823, DOI 10.1200/JCO.2012.47.5947

Mackie TR, 2006, PHYS MED BIOL, V51, pR427, DOI 10.1088/0031-9155/51/13/R24

MACKIE TR, 1993, MED PHYS, V20, P1709, DOI 10.1118/1.596958

Martin S, 2011, J APPL CLIN MED PHYS, V12, P112, DOI 10.1120/jacmp.v12i3.3505

Scalco E, 2013, RADIOTHER ONCOL, V109, P384, DOI 10.1016/j.radonc.2013.09.019

Shah A, 2012, RADIOTHER ONCOL, V105, P139, DOI 10.1016/j.radonc.2012.04.017

Shen C, 2018, TRANSL ONCOL, V11, P815, DOI 10.1016/j.tranon.2018.04.005

van Timmeren JE, 2017, ACTA ONCOL, P1, DOI DOI 10.1080/0284186X.2017.1350285

Wang H, 2010, EUR J RADIOL, V74, P124, DOI 10.1016/j.ejrad.2009.01.024

Weiss GJ, 2014, PLOS ONE, V9, DOI 10.1371/journal.pone.0100244

Wen Q, 2017, SCI REP-UK, V7, DOI 10.1038/s41598-017-14548-w

Win T, 2013, CLIN CANCER RES, V19, P3591, DOI 10.1158/1078-0432.CCR-12-1307

Zhang HW, 2013, RADIOLOGY, V269, P801, DOI 10.1148/radiol.13130110

Zhang Lifei, 2015, Med Phys, V42, P1341, DOI 10.1118/1.4908210

Zhu J, 2018, RADIAT ONCOL, V13, DOI 10.1186/s13014-018-0989-y

NR 37

TC 4

Z9 5

U1 0

U2 6

PU FRONTIERS MEDIA SA

PI LAUSANNE

PA AVENUE DU TRIBUNAL FEDERAL 34, LAUSANNE, CH-1015, SWITZERLAND

SN 2234-943X

J9 FRONT ONCOL

JI Front. Oncol.

PD DEC 5

PY 2018

VL 8

AR 586

DI 10.3389/fonc.2018.00586

PG 11

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA HC9ME

UT WOS:000452129500001

PM 30568918

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Dekker, A

Vinod, S

Holloway, L

Oberije, C

George, A

Goozee, G

Delaney, GP

Lambin, P

Thwaites, D

AF Dekker, Andre

Vinod, Shahni

Holloway, Lois

Oberije, Cary

George, Armia

Goozee, Gary

Delaney, Geoff P.

Lambin, Philippe

Thwaites, David

TI Rapid learning in practice: A lung cancer survival decision support

system in routine patient care data

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Lung cancer; Rapid learning; Decision support system; Radiotherapy

ID EXTERNAL VALIDATION; BAYESIAN NETWORK; 2-YEAR SURVIVAL; STAGE;

PREDICTION; MODELS

AB Background and purpose: A rapid learning approach has been proposed to extract and apply knowledge from routine care data rather than solely relying on clinical trial evidence. To validate this in practice we deployed a previously developed decision support system (DSS) in a typical, busy clinic for non-small cell lung cancer (NSCLC) patients.

Material and methods: Gender, age, performance status, lung function, lymph node status, tumor volume and survival were extracted without review from clinical data sources for lung cancer patients. With these data the DSS was tested to predict overall survival.

Results: 3919 lung cancer patients were identified with 159 eligible for inclusion, due to ineligible histology or stage, non-radical dose, missing tumor volume or survival. The DSS successfully identified a good prognosis group and a medium/poor prognosis group (2 year OS 69% vs. 27/30%, p < 0.001). Stage was less discriminatory (2 year OS 47% for stage I-II vs. 36% for stage IIIA-IIIB, p = 0.12) with most good prognosis patients having higher stage disease. The DSS predicted a large absolute overall survival benefit (similar to 40%) for a radical dose compared to a non-radical dose in patients with a good prognosis, while no survival benefit of radical radiotherapy was predicted for patients with a poor prognosis.

Conclusions: A rapid learning environment is possible with the quality of clinical data sufficient to validate a DSS. It uses patient and tumor features to identify prognostic groups in whom therapy can be individualized based on predicted outcomes. Especially the survival benefit of a radical versus non-radical dose predicted by the DSS for various prognostic groups has clinical relevance, but needs to be prospectively validated. (C) 2014 The Authors. Published by Elsevier Ireland Ltd.

C1 [Dekker, Andre; Vinod, Shahni; Holloway, Lois; George, Armia; Goozee, Gary; Delaney, Geoff P.] Liverpool & Macarthur Canc Therapy Ctr, Campbelltown, NSW, Australia.

[Dekker, Andre; Vinod, Shahni; Holloway, Lois; George, Armia; Goozee, Gary; Delaney, Geoff P.] Ingham Inst, Sydney, NSW, Australia.

[Dekker, Andre; Oberije, Cary; Lambin, Philippe] Maastricht Univ Med Ctr, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol MAASTRO, Maastricht, Netherlands.

[Dekker, Andre; Holloway, Lois; Thwaites, David] Univ Sydney, Inst Med Phys, Sch Phys, Sydney, NSW 2006, Australia.

[Vinod, Shahni; Holloway, Lois; Goozee, Gary; Delaney, Geoff P.] Univ New S Wales, South Western Sydney Clin Sch, Liverpool, Merseyside, England.

[Vinod, Shahni; Delaney, Geoff P.] Univ Western Sydney, Sch Med, Penrith, NSW 1797, Australia.

[Holloway, Lois] Univ Wollongong, Ctr Med Radiat Phys, Wollongong, NSW 2522, Australia.

RP Dekker, A (通讯作者)，MAASTRO Clin, Dr Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

EM andre.dekker@maastro.nl

RI Oberije, Cary/ABA-6178-2020; Dekker, Andre/AAE-4830-2019

OI Oberije, Cary/0000-0003-0749-5117; Dekker, Andre/0000-0002-0422-7996;

Goozee, Gary/0000-0002-7989-1787; Delaney, Geoff/0000-0002-1829-396X;

Vinod, Shalini/0000-0001-8075-6219; Holloway, Lois/0000-0003-4337-2165;

Lambin, Philippe/0000-0001-7961-0191

FU Australian Department of Health and Ageing (DoHA); Better Access to

Radiation Oncology (BARO) initiative; euroCAT (IVA Interreg); CTMM

(AIRFORCE project) [030-103]; CTMM (TraIT project) [05T-401]; EU;

Kankeronderzoekfonds Limburg from the Health Foundation Limburg; Dutch

Cancer Society [KWF UM 2011-5020, KWF UM 2009-4454]; NCI NIH HHS [U01

CA143062] Funding Source: Medline

FX This research was financially supported by the Australian Department of

Health and Ageing (DoHA), Better Access to Radiation Oncology (BARO)

initiative, euroCAT (IVA Interreg, www.eurocat.info), CTMM (AIRFORCE

project, grant 030-103, TraIT project, grant 05T-401), EU 6th and 7th

framework program (METOXIA, EURECA, ARTFORCE), Kankeronderzoekfonds

Limburg from the Health Foundation Limburg and the Dutch Cancer Society

(KWF UM 2011-5020, KWF UM 2009-4454). None of these funding sources had

any involvement in study design, in the collection, analysis and

interpretation of data, in the writing of the manuscript or in the

decision to submit the manuscript for publication. We would like to

thank Ms. Nasreen Kaadan and Dr. Ariyanto Pramana for providing data for

cross checking.

CR Abernethy AP, 2010, J CLIN ONCOL, V28, P4268, DOI 10.1200/JCO.2010.28.5478

Bouwmeester W, 2012, PLOS MED, V9, DOI 10.1371/journal.pmed.1001221

De Ruysscher D, 2012, RADIOTHER ONCOL, V102, P228, DOI 10.1016/j.radonc.2011.10.010

Dehing-Oberije C, 2008, INT J RADIAT ONCOL, V70, P1039, DOI 10.1016/j.ijrobp.2007.07.2323

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Ferlay J, 2010, INT J CANCER, V127, P2893, DOI 10.1002/ijc.25516

Grand MM, 2012, J MED IMAG RADIAT ON, V56, P31, DOI 10.1111/j.1754-9485.2011.02337.x

Jayasurya K, 2010, MED PHYS, V37, P1401, DOI 10.1118/1.3352709

Lambin P, 2009, RADIOTHER ONCOL, V2010, P145

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Luta G, 2013, CANCER EPIDEMIOL, V37, P121, DOI 10.1016/j.canep.2012.11.006

O'Rourke N, 2010, CLIN ONCOL-UK, V22, P347, DOI 10.1016/j.clon.2010.03.007

Oberije C, 2014, RADIOTHER ONCOL J EU

Oh JH, 2011, PHYS MED BIOL, V56, P1635, DOI 10.1088/0031-9155/56/6/008

Pathak J, 2013, STUD HEALTH TECHNOL, V192, P682, DOI 10.3233/978-1-61499-289-9-682

Santanam L, 2012, INT J RADIAT ONCOL, V83, P1344, DOI 10.1016/j.ijrobp.2011.09.054

Siegel R, 2012, CA-CANCER J CLIN, V62, P10, DOI 10.3322/caac.20138

Sledge G, 2012, AM SOC CLIN ONCOL ED, V2013, P430

Smith SL, 2011, LUNG CANCER, V72, P39, DOI 10.1016/j.lungcan.2010.07.015

Steyerberg EW, 2010, EPIDEMIOLOGY, V21, P128, DOI 10.1097/EDE.0b013e3181c30fb2

Sullivan R, 2011, LANCET ONCOL, V12, P933, DOI 10.1016/S1470-2045(11)70141-3

van Baardwijk A, 2008, INT J RADIAT ONCOL, V71, P1103, DOI 10.1016/j.ijrobp.2007.11.028

Warnock MJ, 2007, J DIGIT IMAGING, V20, P125, DOI 10.1007/s10278-007-9064-1

NR 23

TC 30

Z9 30

U1 0

U2 6

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD OCT

PY 2014

VL 113

IS 1

BP 47

EP 53

DI 10.1016/j.radonc.2014.08.013

PG 7

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA AY5IB

UT WOS:000347604800008

PM 25241994

OA hybrid, Green Accepted

DA 2022-08-24

ER

PT J

AU Ma, CQ

Tian, Z

Wang, RX

Feng, ZS

Jiang, F

Hu, QQ

Yang, F

Shi, AH

Wu, H

AF Ma, Chaoqiong

Tian, Zhen

Wang, Ruoxi

Feng, Zhongsu

Jiang, Fan

Hu, Qiaoqiao

Yang, Fang

Shi, Anhui

Wu, Hao

TI A prediction model for dosimetric-based lung adaptive radiotherapy

SO MEDICAL PHYSICS

LA English

DT Article; Early Access

DE adaptive radiotherapy; lung cancer; machine learning; replanning

prediction

ID BEAM COMPUTED-TOMOGRAPHY; CBCT IMAGE REGISTRATION; CANCER PATIENTS;

PROTON THERAPY; RADIATION-THERAPY; CT; ALGORITHM; SELECTION; SYSTEM;

TOOL

AB Purpose Anatomical changes occurred during the treatment course of radiation therapy for lung cancer patients may introduce clinically unacceptable dosimetric deviations from the planned dose. Adaptive radiotherapy (ART) can compensate these dosimetric deviations in subsequent treatments via plan adaption. Determining whether and when to trigger plan adaption during the treatment course is essential to the effectiveness and efficiency of ART. In this study, we aimed to develop a prediction model as an auxiliary decision-making tool for lung ART to identify the patients with intrathoracic anatomical changes that would potentially benefit from the plan adaptions during the treatment course. Methods Seventy-one pairs of weekly cone-beam computer tomography (CBCT) and planning CT (pCT) from 17 advanced non-small cell lung cancer patients were enrolled in this study. To assess the dosimetric impacts brought by anatomical changes observed on each CBCT, dose distribution of the original treatment plan on the CBCT anatomy was calculated on a virtual CT generated by deforming the corresponding pCT to the CBCT and compared to that of the original plan. A replan was deemed needed for the CBCT anatomy once the recalculated dose distribution violated our dosimetric-based trigger criteria. A three-dimensional region of significant anatomical changes (region of interest, ROI) between each CBCT and the corresponding pCT was identified, and 16 morphological features of the ROI were extracted. Additionally, eight features from the overlapped volume histograms (OVHs) of patient anatomy were extracted for each patient to characterize the patient-specific anatomy. Based on the 24 extracted features and the evaluated replanning needs of the pCT-CBCT pairs, a nonlinear supporting vector machine was used to build a prediction model to identify the anatomical changes on CBCTs that would trigger plan adaptions. The most relevant features were selected using the sequential backward selection (SBS) algorithm and a shuffling-and-splitting validation scheme was used for model evaluation. Results Fifty-five CBCT-pCT pairs were identified of having an ROI, among which 21 CBCT anatomies required plan adaptions. For these 21 positive cases, statistically significant improvements in the sparing of lung, esophagus and spinal cord were achieved by plan adaptions. A high model performance of 0.929 AUC (area under curve) and 0.851 accuracy was achieved with six selected features, including five ROI shape features and one OVH feature. Without involving the OVH features in the feature selection process, the mean AUC and accuracy of the model significantly decreased to 0.826 and 0.779, respectively. Further investigation showed that poor prediction performance with AUC of 0.76 was achieved by the univariate model in solving this binary classification task. Conclusion We built a prediction model based on the features of patient anatomy and the anatomical changes captured by on-treatment CBCT imaging to trigger plan adaption for lung cancer patients. This model effectively associated the anatomical changes with the dosimetric impacts for lung ART. This model can be a promising tool to assist the clinicians in making decisions for plan adaptions during the treatment courses.

C1 [Ma, Chaoqiong; Wang, Ruoxi; Feng, Zhongsu; Jiang, Fan; Hu, Qiaoqiao; Yang, Fang; Shi, Anhui; Wu, Hao] Peking Univ Canc Hosp Inst, Key Iaboratory Carcinogenesis & Translat Res Mi, Dept Radiat Oncol, Minist Educ Beijing, Beijing, Peoples R China.

[Ma, Chaoqiong; Tian, Zhen] Emory Univ, Dept Radiat Oncol, Atlanta, GA USA.

[Tian, Zhen] Univ Chicago, Dept Radiat & Cellular Oncol, Chicago, IL USA.

[Yang, Fang] Daqing Oilfield Gen Hosp, Dept Oncol, Daqing, Heilongjiang, Peoples R China.

[Wu, Hao] Peking Univ Hlth Sci Ctr, Inst Med Technol, Beijing, Peoples R China.

RP Shi, AH; Wu, H (通讯作者)，Peking Univ Canc Hosp Inst, Key Iaboratory Carcinogenesis & Translat Res Mi, Dept Radiat Oncol, Minist Educ Beijing, Beijing, Peoples R China.

EM anhui.shi@bjcancer.org; hao.wu@bjcancer.org

OI WANG, Ruoxi/0000-0002-3988-3731

FU National Key R&D program of China [2019YFF01014405]; Winship Cancer

Institute [IRG-17-181-06]; American Cancer Society

FX This work was supported by the National Key R&D program of China (Grant

no. 2019YFF01014405) and Winship Cancer Institute (Grant no.

IRG-17-181-06) from the American Cancer Society.

CR Bissonnette JP, 2008, INT J RADIAT ONCOL, V71, pS57, DOI 10.1016/j.ijrobp.2007.06.086

Bissonnette JP, 2012, MED PHYS, V39, P1946, DOI 10.1118/1.3690466

Caglar HB, 2010, RADIOTHER ONCOL, V97, P48, DOI 10.1016/j.radonc.2010.07.024

Claesen M., 2014, EASY HYPERPARAMETER

Cole AJ, 2018, PHYS MED BIOL, V63, DOI 10.1088/1361-6560/aad1bb

Dial C, 2016, MED PHYS, V43, P1787, DOI 10.1118/1.4943564

FERRI FJ, 1994, MACH INTELL PATT REC, V16, P403

Guckenberger M, 2011, INT J RADIAT ONCOL, V81, pE275, DOI 10.1016/j.ijrobp.2011.01.067

Harms J, 2019, MED PHYS, V46, P3998, DOI 10.1002/mp.13656

Harrell FE, 1996, STAT MED, V15, P361, DOI 10.1002/(SICI)1097-0258(19960229)15:4<361::AID-SIM168>3.0.CO;2-4

Hastie T., 2009, ELEMENTS STAT LEARNI, V2

Hattu D, 2018, RADIOTHER ONCOL, V127, pS161, DOI 10.1016/S0167-8140(18)30617-0

Huang CL, 2008, APPL SOFT COMPUT, V8, P1381, DOI 10.1016/j.asoc.2007.10.007

Jaffray DA, 2002, INT J RADIAT ONCOL, V53, P1337, DOI 10.1016/S0360-3016(02)02884-5

Janssens G, 2011, INT J BIOMED IMAGING, V2011, DOI 10.1155/2011/891585

Joshi KD., 2017, MED IMAGING 2017 PHY, V10132

Kavanaugh J, 2021, MED PHYS, V48, P2083, DOI 10.1002/mp.14529

Kwint M, 2014, RADIOTHER ONCOL, V113, P392, DOI 10.1016/j.radonc.2014.10.009

Landry G, 2015, MED PHYS, V42, P1354, DOI 10.1118/1.4908223

Landry G, 2015, PHYS MED BIOL, V60, P595, DOI 10.1088/0031-9155/60/2/595

Liang X, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/ab22f9

Liu YZ, 2020, MED PHYS, V47, P2472, DOI 10.1002/mp.14121

Ma CS, 2014, THORAC CANCER, V5, P68, DOI 10.1111/1759-7714.12055

Marchant TE, 2008, PHYS MED BIOL, V53, P5719, DOI 10.1088/0031-9155/53/20/010

McDermott LN, 2006, RADIOTHER ONCOL, V79, P211, DOI 10.1016/j.radonc.2006.04.003

Moller DS, 2016, RADIOTHER ONCOL, V121, P32, DOI 10.1016/j.radonc.2016.08.019

Moller DS, 2014, RADIOTHER ONCOL, V110, P517, DOI 10.1016/j.radonc.2013.10.013

Pedregosa F., 2011, J MACH LEARN RES, V12, P2825

Poludniowski G, 2009, PHYS MED BIOL, V54, P3847, DOI 10.1088/0031-9155/54/12/016

Sonke JJ, 2019, SEMIN RADIAT ONCOL, V29, P245, DOI 10.1016/j.semradonc.2019.02.007

Sonke JJ, 2010, SEMIN RADIAT ONCOL, V20, P94, DOI 10.1016/j.semradonc.2009.11.003

Van den Bosch M, 2017, PHYS IMAG RADIAT ONC, V1, P21, DOI 10.1016/j.phro.2017.02.005

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Veiga C, 2016, INT J RADIAT ONCOL, V95, P549, DOI 10.1016/j.ijrobp.2016.01.055

Veiga C, 2014, MED PHYS, V41, DOI 10.1118/1.4864240

Wang JZ, 2015, MED PHYS, V42, P1005, DOI 10.1118/1.4906252

Yan D, 2018, Z MED PHYS, V28, P173, DOI 10.1016/j.zemedi.2018.03.001

Yoo S, 2006, INT J RADIAT ONCOL, V66, P1553, DOI 10.1016/j.ijrobp.2006.08.031

Yuhui Shi, 1998, Evolutionary Programming VII. 7th International Conference, EP98. Proceedings, P591, DOI 10.1007/BFb0040810

Zhu XF, 2011, MED PHYS, V38, P719, DOI 10.1118/1.3539749

NR 40

TC 0

Z9 0

U1 1

U2 1

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

DI 10.1002/mp.15714

EA AUG 2022

PG 15

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 3T6SF

UT WOS:000840400800001

PM 35649103

DA 2022-08-24

ER

PT J

AU Adachi, T

Nakamura, M

Shintani, T

Mitsuyoshi, T

Kakino, R

Ogata, T

Ono, T

Tanabe, H

Kokubo, M

Sakamoto, T

Matsuo, Y

Mizowaki, T

AF Adachi, Takanori

Nakamura, Mitsuhiro

Shintani, Takashi

Mitsuyoshi, Takamasa

Kakino, Ryo

Ogata, Takashi

Ono, Tomohiro

Tanabe, Hiroaki

Kokubo, Masaki

Sakamoto, Takashi

Matsuo, Yukinori

Mizowaki, Takashi

TI Multi-institutional dose-segmented dosiomic analysis for predicting

radiation pneumonitis after lung stereotactic body radiation therapy

SO MEDICAL PHYSICS

LA English

DT Article

DE dosiomics; machine learning; multi&#8208; institutional study; radiation

pneumonitis; stereotactic body radiation therapy

AB Purpose To predict radiation pneumonitis (RP) grade 2 or worse after lung stereotactic body radiation therapy (SBRT) using dose-based radiomic (dosiomic) features.

Methods This multi-institutional study included 247 early-stage nonsmall cell lung cancer patients who underwent SBRT with a prescribed dose of 48-70 Gy at an isocenter between June 2009 and March 2016. Ten dose-volume indices (DVIs) were used, including the mean lung dose, internal target volume size, and percentage of entire lung excluding the internal target volume receiving greater than x Gy (x = 5, 10, 15, 20, 25, 30, 35, and 40). A total of 6,808 dose-segmented dosiomic features, such as shape, first order, and texture features, were extracted from the dose distribution. Patients were randomly partitioned into two groups: model training (70%) and test datasets (30%) over 100 times. Dosiomic features were converted to z-scores (standardized values) with a mean of zero and a standard deviation (SD) of one to put different variables on the same scale. The feature dimension was reduced using the following methods: interfeature correlation based on Spearman's correlation coefficients and feature importance based on a light gradient boosting machine (LightGBM) feature selection function. Three different models were developed using LightGBM as follows: (a) a model with ten DVIs (DVI model), (b) a model with the selected dosiomic features (dosiomic model), and (c) a model with ten DVIs and selected dosiomic features (hybrid model). Suitable hyperparameters were determined by searching the largest average area under the curve (AUC) value in the receiver operating characteristic curve (ROC-AUC) via stratified fivefold cross-validation. Each of the final three models with the closest the ROC-AUC value to the average ROC-AUC value was applied to the test datasets. The classification performance was evaluated by calculating the ROC-AUC, AUC in the precision-recall curve (PR-AUC), accuracy, precision, recall, and f1-score. The entire process was repeated 100 times with randomization, and 100 individual models were developed for each of the three models. Then the mean value and SD for the 100 random iterations were calculated for each performance metric.

Results Thirty-seven (15.0%) patients developed RP after SBRT. The ROC-AUC and PR-AUC values in the DVI, dosiomic, and hybrid models were 0.660 +/- 0.054 and 0.272 +/- 0.052, 0.837 +/- 0.054 and 0.510 +/- 0.115, and 0.846 +/- 0.049 and 0.531 +/- 0.116, respectively. For each performance metric, the dosiomic and hybrid models outperformed the DVI models (P < 0.05). Texture-based dosiomic feature was confirmed as an effective indicator for predicting RP.

Conclusions Our dose-segmented dosiomic approach improved the prediction of the incidence of RP after SBRT.

C1 [Adachi, Takanori; Nakamura, Mitsuhiro; Kakino, Ryo] Kyoto Univ, Div Med Phys, Dept Informat Technol & Med Engn, Human Hlth Sci,Grad Sch Med, Kyoto, Japan.

[Adachi, Takanori; Nakamura, Mitsuhiro; Shintani, Takashi; Mitsuyoshi, Takamasa; Kakino, Ryo; Ogata, Takashi; Ono, Tomohiro; Matsuo, Yukinori; Mizowaki, Takashi] Kyoto Univ, Grad Sch Med, Dept Radiat Oncol & Image Appl Therapy, Kyoto, Japan.

[Mitsuyoshi, Takamasa; Ogata, Takashi; Kokubo, Masaki] Kobe City Med Ctr Gen Hosp, Dept Radiat Oncol, Kobe, Hyogo, Japan.

[Tanabe, Hiroaki] Kobe City Med Ctr Gen Hosp, Dept Radiol Technol, Kobe, Hyogo, Japan.

[Sakamoto, Takashi] Kyoto Katsura Hosp, Dept Radiat Oncol, Kyoto, Japan.

RP Nakamura, M (通讯作者)，Kyoto Univ, Div Med Phys, Dept Informat Technol & Med Engn, Human Hlth Sci,Grad Sch Med, Kyoto, Japan.; Nakamura, M (通讯作者)，Kyoto Univ, Grad Sch Med, Dept Radiat Oncol & Image Appl Therapy, Kyoto, Japan.

EM m\_nkmr@kuhp.kyoto-u.ac.jp

RI ono, tomohiro/AAN-1841-2021; Matsuo, Yukinori/O-6200-2014

OI Matsuo, Yukinori/0000-0002-4372-8259; Nakamura,

Mitsuhiro/0000-0002-6406-2097; Adachi, Takanori/0000-0003-1356-5118;

Kakino, Ryo/0000-0001-7767-9216

FU Takeda Science Foundation

FX This study was partly supported by the Takeda Science Foundation. We

sincerely appreciate all the staff members at the Medical Physics

Laboratory of Kyoto University Graduate School of Medicine

(http://medicalphysics.hs.med.kyotou.ac.jp/) for their significant

technical support and valuable comments regarding this study.

CR Baker R, 2013, INT J RADIAT ONCOL, V85, P190, DOI 10.1016/j.ijrobp.2012.03.041

Barriger RB, 2012, INT J RADIAT ONCOL, V82, P457, DOI 10.1016/j.ijrobp.2010.08.056

Baumann P, 2009, J CLIN ONCOL, V27, P3290, DOI 10.1200/JCO.2008.21.5681

Chaddad A, 2016, PLOS ONE, V11, DOI 10.1371/journal.pone.0149893

Chang JY, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-152

Collins GS, 2015, BRIT J SURG, V102, P148, DOI 10.1002/bjs.9736

El Naqa I, 2018, MED PHYS, V45, pE834, DOI 10.1002/mp.12811

Fakiris AJ, 2009, INT J RADIAT ONCOL, V75, P677, DOI 10.1016/j.ijrobp.2008.11.042

Gabrys HS, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00035

Guckenberger M, 2010, RADIOTHER ONCOL, V97, P65, DOI 10.1016/j.radonc.2010.04.027

Huynh E, 2016, RADIOTHER ONCOL, V120, P258, DOI 10.1016/j.radonc.2016.05.024

Jones B, 2001, CLIN ONCOL-UK, V13, P71, DOI 10.1007/s001740170083

Kakino R, 2020, MED PHYS, V47, P4634, DOI 10.1002/mp.14380

Kimura T, 2017, JPN J CLIN ONCOL, V47, P277, DOI 10.1093/jjco/hyw198

Knoos T, 2006, PHYS MED BIOL, V51, P5785, DOI 10.1088/0031-9155/51/22/005

Kong FM, 2015, SEMIN RADIAT ONCOL, V25, P100, DOI 10.1016/j.semradonc.2014.12.003

Lafata KJ, 2019, PHYS MED BIOL, V64, DOI 10.1088/1361-6560/aaf5a5

Li Q, 2017, RADIAT ONCOL, V12, DOI 10.1186/s13014-017-0892-y

Liang B, 2020, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.01500

Liang B, 2019, FRONT ONCOL, V9, DOI 10.3389/fonc.2019.00269

Lv WB, 2019, MOL IMAGING BIOL, V21, P954, DOI 10.1007/s11307-018-01304-3

Matsuo Y, 2012, INT J RADIAT ONCOL, V83, pE545, DOI 10.1016/j.ijrobp.2012.01.018

Nagata Y, 2015, INT J RADIAT ONCOL, V93, P989, DOI 10.1016/j.ijrobp.2015.07.2278

Ojala JJ, 2014, J APPL CLIN MED PHYS, V15, P4, DOI 10.1120/jacmp.v15i2.4662

R Development Core Team, 2016, R LANGUAGE ENV STAT

Rossi L, 2018, RADIOTHER ONCOL, V129, P548, DOI 10.1016/j.radonc.2018.07.027

Ryckman JM, 2020, RADIAT ONCOL, V15, DOI 10.1186/s13014-020-1479-6

Saito T, 2015, PLOS ONE, V10, DOI 10.1371/journal.pone.0118432

Sokolova M, 2009, INFORM PROCESS MANAG, V45, P427, DOI 10.1016/j.ipm.2009.03.002

Timmerman R, 2010, JAMA-J AM MED ASSOC, V303, P1070, DOI 10.1001/jama.2010.261

Ueki N, 2015, J THORAC ONCOL, V10, P116, DOI 10.1097/JTO.0000000000000359

van Griethuysen JJM, 2017, CANCER RES, V77, pE104, DOI 10.1158/0008-5472.CAN-17-0339

Wu AQ, 2020, ORAL ONCOL, V104, DOI 10.1016/j.oraloncology.2020.104625

Wu GY, 2020, EUR RADIOL, V30, P2680, DOI 10.1007/s00330-019-06597-8

Yamashita H, 2007, RADIAT ONCOL, V2, DOI 10.1186/1748-717X-2-21

Ye Q., 2017, PROCESS SYST, V30, P1

Zhang J, 2019, J CHEM INF MODEL, V59, P4150, DOI 10.1021/acs.jcim.9b00633

Zhao J, 2016, INT J RADIAT ONCOL, V95, P1357, DOI 10.1016/j.ijrobp.2016.03.024

NR 38

TC 12

Z9 12

U1 1

U2 7

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD APR

PY 2021

VL 48

IS 4

BP 1781

EP 1791

DI 10.1002/mp.14769

EA MAR 2021

PG 11

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA RX5XT

UT WOS:000624340200001

PM 33576510

OA Green Submitted

DA 2022-08-24

ER

PT J

AU Hunter, LA

Krafft, S

Stingo, F

Choi, H

Martel, MK

Kry, SF

Court, LE

AF Hunter, Luke A.

Krafft, Shane

Stingo, Francesco

Choi, Haesun

Martel, Mary K.

Kry, Stephen F.

Court, Laurence E.

TI High quality machine-robust image features: Identification in nonsmall

cell lung cancer computed tomography images

SO MEDICAL PHYSICS

LA English

DT Article

DE quantitative image features; lung cancer; reproducibility

ID CT SCANS; TEXTURE ANALYSIS; EVALUATE; RADIOTHERAPY; INFORMATION;

RADIOMICS; TUMORS

AB Purpose: For nonsmall cell lung cancer (NSCLC) patients, quantitative image features extracted from computed tomography (CT) images can be used to improve tumor diagnosis, staging, and response assessment. For these findings to be clinically applied, image features need to have high intra and intermachine reproducibility. The objective of this study is to identify CT image features that are reproducible, nonredundant, and informative across multiple machines.

Methods: Noncontrast-enhanced, test-retest CT image pairs were obtained from 56 NSCLC patients imaged on three CT machines from two institutions. Two machines ("M1" and "M2") used cine 4D-CT and one machine ("M3") used breath-hold helical 3D-CT. Gross tumor volumes (GTVs) were semiautonomously segmented then pruned by removing voxels with CT numbers less than a prescribed Hounsfield unit (HU) cutoff. Three hundred and twenty eight quantitative image features were extracted from each pruned GTV based on its geometry, intensity histogram, absolute gradient image, co-occurrence matrix, and run-length matrix. For each machine, features with concordance correlation coefficient values greater than 0.90 were considered reproducible. The Dice similarity coefficient (DSC) and the Jaccard index (JI) were used to quantify reproducible feature set agreement between machines. Multimachine reproducible feature sets were created by taking the intersection of individual machine reproducible feature sets. Redundant features were removed through hierarchical clustering based on the average correlation between features across multiple machines.

Results: For all image types, GTV pruning was found to negatively affect reproducibility (reported results use no HU cutoff). The reproducible feature percentage was highest for average images (M1 = 90.5%, M2 = 94.5%, M1 boolean AND M2 = 86.3%), intermediate for end-exhale images (M1 = 75.0%, M2 = 71.0%, M1 boolean AND M2 = 52.1%), and lowest for breath-hold images (M3 = 61.0%). Between M1 and M2, the reproducible feature sets generated from end-exhale images were relatively machine-sensitive (DSC = 0.71, JI = 0.55), and the reproducible feature sets generated from average images were relatively machine-insensitive (DSC = 0.90, JI = 0.87). Histograms of feature pair correlation distances indicated that feature redundancy was machine-sensitive and image type sensitive. After hierarchical clustering, 38 features, 28 features, and 33 features were found to be reproducible and nonredundant for M1 boolean AND M2 (average images), M1 boolean AND M2 (end-exhale images), and M3, respectively. When blinded to the presence of test-retest images, hierarchical clustering showed that the selected features were informative by correctly pairing 55 out of 56 test-retest images using only their reproducible, nonredundant feature set values.

Conclusions: Image feature reproducibility and redundancy depended on both the CT machine and the CT image type. For each image type, the authors found a set of cross-machine reproducible, nonredundant, and informative image features that would be useful for future image-based models. Compared to end-exhale 4D-CT and breath-hold 3D-CT, average 4D-CT derived image features showed superior multimachine reproducibility and are the best candidates for clinical correlation. (C) 2013 Author(s). All article content, except where otherwise noted, is licensed under a Creative Commons Attribution 3.0 Unported License.

C1 [Hunter, Luke A.; Krafft, Shane; Martel, Mary K.; Kry, Stephen F.; Court, Laurence E.] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Houston, TX 77030 USA.

[Stingo, Francesco] Univ Texas MD Anderson Canc Ctr, Dept Biostat, Houston, TX 77030 USA.

[Choi, Haesun] Univ Texas MD Anderson Canc Ctr, Dept Diagnost Radiol, Houston, TX 77030 USA.

RP Court, LE (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, 1515 Holcombe, Houston, TX 77030 USA.

EM LECourt@mdanderson.org

RI Stingo, Francesco/N-6514-2019; Stingo, Francesco/D-9475-2017

OI Stingo, Francesco/0000-0001-9150-8552; Stingo,

Francesco/0000-0001-9150-8552; Kry, Stephen/0000-0001-6899-197X; Krafft,

Shane/0000-0002-4582-8587; Court, Laurence/0000-0002-3241-6145

FU Hertz Applied Science Fellowship; NATIONAL CANCER INSTITUTE

[P30CA016672] Funding Source: NIH RePORTER

FX Luke Hunter was funded by a Hertz Applied Science Fellowship.

CR Al-Kadi OS, 2008, IEEE T BIO-MED ENG, V55, P1822, DOI 10.1109/TBME.2008.919735

Armato SG, 2008, CLIN PHARMACOL THER, V84, P448, DOI 10.1038/clpt.2008.161

Basu S, 2011, IEEE SYS MAN CYBERN, P1306, DOI 10.1109/ICSMC.2011.6083840

Court LE, 2010, MED PHYS, V37, P5850, DOI 10.1118/1.3496356

Davnall F, 2012, INSIGHTS IMAGING, V3, P573, DOI 10.1007/s13244-012-0196-6

Dehing-Oberije C, 2011, INT J RADIAT ONCOL, V81, P360, DOI 10.1016/j.ijrobp.2010.06.011

DICE LR, 1945, ECOLOGY, V26, P297, DOI 10.2307/1932409

Eisen MB, 1998, P NATL ACAD SCI USA, V95, P14863, DOI 10.1073/pnas.95.25.14863

Eisenhauer EA, 2009, EUR J CANCER, V45, P228, DOI 10.1016/j.ejca.2008.10.026

Galloway M., 1975, COMPUT VISION GRAPH, V4, P172, DOI [10.1016/S0146-664X(75)80008-6, DOI 10.1016/S0146-664X(75)80008-6]

Ganeshan B, 2013, RADIOLOGY, V266, P326, DOI 10.1148/radiol.12112428

Ganeshan B, 2011, INVEST RADIOL, V46, P160, DOI 10.1097/RLI.0b013e3181f8e8a2

Ganeshan B, 2010, CANCER IMAGING, V10, P137, DOI 10.1102/1470-7330.2010.0021

Gimenez A, 2002, RADIOGRAPHICS, V22, P601, DOI 10.1148/radiographics.22.3.g02ma25601

HARALICK RM, 1973, IEEE T SYST MAN CYB, VSMC3, P610, DOI 10.1109/TSMC.1973.4309314

Jaccard P., 1901, B SOC VAUDOISE SCI N, V37, P241, DOI DOI 10.5169/SEALS-266440

Keall PJ, 2004, PHYS MED BIOL, V49, P2053, DOI 10.1088/0031-9155/49/10/015

Kido S, 2002, J COMPUT ASSIST TOMO, V26, P573, DOI 10.1097/01.RCT.0000029045.35986.9F

Kumar V, 2012, MAGN RESON IMAGING, V30, P1234, DOI 10.1016/j.mri.2012.06.010

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

LIN LI, 1989, BIOMETRICS, V45, P255, DOI 10.2307/2532051

Lindell RM, 2007, RADIOLOGY, V242, P555, DOI 10.1148/radiol.2422052090

McBride GB, 2005, PROPOSAL STRENGTH OF

Sharma N, 2010, J MED PHYS, V35, P3, DOI 10.4103/0971-6203.58777

Starkschall G, 2011, INT J RADIAT ONCOL, V79, P596, DOI 10.1016/j.ijrobp.2010.03.039

Therasse P, 2000, J NATL CANCER I, V92, P205, DOI 10.1093/jnci/92.3.205

Watkins WT, 2010, MED PHYS, V37, P2855, DOI 10.1118/1.3432615

Wolthaus JWH, 2006, INT J RADIAT ONCOL, V65, P1560, DOI 10.1016/j.ijrobp.2006.04.031

Yoo TS, 2011, I S BIOMED IMAGING, P1770, DOI 10.1109/ISBI.2011.5872749

Zhao BS, 2009, RADIOLOGY, V252, P263, DOI 10.1148/radiol.2522081593

NR 30

TC 72

Z9 76

U1 0

U2 21

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 0094-2405

EI 2473-4209

J9 MED PHYS

JI Med. Phys.

PD DEC

PY 2013

VL 40

IS 12

AR 121916

DI 10.1118/1.4829514

PG 12

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA 266NQ

UT WOS:000328031300043

PM 24320527

OA hybrid, Green Published

DA 2022-08-24

ER

PT J

AU Roelofs, E

Persoon, L

Nijsten, S

Wiessler, W

Dekker, A

Lambin, P

AF Roelofs, Erik

Persoon, Lucas

Nijsten, Sebastiaan

Wiessler, Wolfgang

Dekker, Andre

Lambin, Philippe

TI Benefits of a clinical data warehouse with data mining tools to collect

data for a radiotherapy trial

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Data warehouse; Clinical trials; Data quality; Efficiency

ID QUALITY-ASSURANCE; 2-YEAR SURVIVAL; ONCOLOGY TRIALS; CHALLENGES;

PARTICIPATION; INFORMATICS; PREDICTION; PLATFORM; MODELS

AB Introduction: Collecting trial data in a medical environment is at present mostly performed manually and therefore time-consuming, prone to errors and often incomplete with the complex data considered. Faster and more accurate methods are needed to improve the data quality and to shorten data collection times where information is often scattered over multiple data sources. The purpose of this study is to investigate the possible benefit of modern data warehouse technology in the radiation oncology field.

Material and methods: In this study, a Computer Aided Theragnostics (CAT) data warehouse combined with automated tools for feature extraction was benchmarked against the regular manual data-collection processes. Two sets of clinical parameters were compiled for non-small cell lung cancer (NSCLC) and rectal cancer, using 27 patients per disease. Data collection times and inconsistencies were compared between the manual and the automated extraction method.

Results: The average time per case to collect the NSCLC data manually was 10.4 +/- 2.1 min and 4.3 +/- 1.1 min when using the automated method (p < 0.001). For rectal cancer, these times were 13.5 +/- 4.1 and 6.8 +/- 2.4 min, respectively (p < 0.001). In 3.2% of the data collected for NSCLC and 5.3% for rectal cancer, there was a discrepancy between the manual and automated method.

Conclusions: Aggregating multiple data sources in a data warehouse combined with tools for extraction of relevant parameters is beneficial for data collection times and offers the ability to improve data quality. The initial investments in digitizing the data are expected to be compensated due to the flexibility of the data analysis. Furthermore, successive investigations can easily select trial candidates and extract new parameters from the existing databases. (C) 2012 Elsevier Ireland Ltd. All rights reserved.

C1 [Roelofs, Erik; Persoon, Lucas; Nijsten, Sebastiaan; Dekker, Andre; Lambin, Philippe] Maastricht Univ, Med Ctr, Dept Radiat Oncol, MAASTRO Clin, NL-6229 ET Maastricht, Netherlands.

[Wiessler, Wolfgang] Siemens Healthcare, Malvern, PA USA.

RP Roelofs, E (通讯作者)，Maastricht Univ, Med Ctr, Dept Radiat Oncol MAASTRO, Dr Tanslaan 12, NL-6229 ET Maastricht, Netherlands.

EM erik.roelofs@maastro.nl

RI Dekker, Andre/AAE-4830-2019

OI Dekker, Andre/0000-0002-0422-7996; Lambin, Philippe/0000-0001-7961-0191;

Roelofs, Erik/0000-0003-2172-8669

FU CTMM framework (AIRFORCE project) [03O-103]; EU; Radiomics (NIH, USA);

EU IMI program (QuIC-ConCePT); NIH-QIN (Radiomics of NSCLC) [U01

CA143062]; Dutch Cancer Society [KWF UM 2011-5020, KWF UM 2009-4454];

NATIONAL CANCER INSTITUTE [U01CA143062] Funding Source: NIH RePORTER

FX We thank C. Overhof, R. Debougnoux, A. Claessens, J. van den Bogaard and

B. Hanbeukers for their contribution. We thank Siemens for their

financial and technical support received for this study. Furthermore, we

acknowledge financial support from the CTMM framework (AIRFORCE project,

no 03O-103), EU 7th framework program (METOXIA, EURECA), euroCAT (IVA

Interreg, www.eurocat.info), Radiomics (NIH, USA), EU IMI program

(QuIC-ConCePT), NIH-QIN (Radiomics of NSCLC U01 CA143062) and the Dutch

Cancer Society (KWF UM 2011-5020, KWF UM 2009-4454).

CR Bekelman JE, 2012, INT J RADIAT ONCOL, V83, P782, DOI 10.1016/j.ijrobp.2011.12.080

Bosmans G, 2006, RADIOTHER ONCOL, V81, P73, DOI 10.1016/j.radonc.2006.08.009

Branson A, 2008, STUD HEALTH TECHNOL, V138, P13

Deasy JO, 2010, INT J RADIAT ONCOL, V76, pS151, DOI 10.1016/j.ijrobp.2009.06.094

Dehing-Oberije C, 2008, INT J RADIAT ONCOL, V70, P1039, DOI 10.1016/j.ijrobp.2007.07.2323

Dehing-Oberije C, 2009, RADIOTHER ONCOL, V91, P421, DOI 10.1016/j.radonc.2008.12.002

Dehing-Oberije C, 2009, INT J RADIAT ONCOL, V74, P355, DOI 10.1016/j.ijrobp.2008.08.052

Dekker A, 2011, RADIOTHER ONCOL, V99, pS155, DOI 10.1016/S0167-8140(11)70515-1

Dekker A, RADIOTHER ONCO UNPUB

El Fadly AbdenNaji, 2011, J Biomed Inform, V44 Suppl 1, pS94, DOI 10.1016/j.jbi.2011.07.007

Fairchild A, 2012, RADIOTHER ONCOL, V103, P279, DOI 10.1016/j.radonc.2012.04.015

Gaze MN, 2010, RADIOTHER ONCOL, V97, P593, DOI 10.1016/j.radonc.2010.08.017

Grand MM, 2012, J MED IMAG RADIAT ON, V56, P31, DOI 10.1111/j.1754-9485.2011.02337.x

Ho KF, 2010, RADIOTHER ONCOL, V97, P270, DOI 10.1016/j.radonc.2010.01.017

Jayasurya K, 2010, MED PHYS, V37, P1401, DOI 10.1118/1.3352709

Klein A, 2007, METHOD INFORM MED, V46, P580, DOI 10.1160/ME9060

Knaup P, 2006, INT J MED INFORM, V75, P191, DOI 10.1016/j.ijmedinf.2005.07.020

Kush R, 2007, J AM MED INFORM ASSN, V14, P662, DOI 10.1197/jamia.M2157

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Mathieu M., 2009, GOOD CLIN PRACTICE Q

Movsas B, 2007, INT J RADIAT ONCOL, V68, P1145, DOI 10.1016/j.ijrobp.2007.01.051

Murthy VH, 2004, JAMA-J AM MED ASSOC, V291, P2720, DOI 10.1001/jama.291.22.2720

Nijsten SMJJG, 2009, MED PHYS, V36, P83, DOI 10.1118/1.3026660

Ollers M, 2008, RADIOTHER ONCOL, V87, P142, DOI 10.1016/j.radonc.2007.12.025

Pieterse H, 2010, CPMPICH95 PROF MED C

Prokosch HU, 2009, METHOD INFORM MED, V48, P38, DOI 10.3414/ME9132

Rao RB, 2002, AMIA 2002 SYMPOSIUM, PROCEEDINGS, P632

Richesson RL, 2007, J AM MED INFORM ASSN, V14, P687, DOI 10.1197/jamia.M2470

Roelofs E, 2010, RADIOTHER ONCOL, V97, P567, DOI 10.1016/j.radonc.2010.08.009

Rubin Daniel L, 2008, J Am Coll Radiol, V5, P210, DOI 10.1016/j.jacr.2007.09.004

Sarkar IN, 2010, J TRANSL MED, V8, DOI 10.1186/1479-5876-8-22

Schubart JR, 2000, INT J MED INFORM, V60, P319, DOI 10.1016/S1386-5056(00)00126-X

Thorwarth D, 2010, RADIOTHER ONCOL, V97, P172, DOI 10.1016/j.radonc.2010.05.012

Vaidya M, 2012, RADIOTHER ONCOL, V102, P239, DOI 10.1016/j.radonc.2011.10.014

Watson HJ, 2002, INFORM MANAGE-AMSTER, V39, P491, DOI 10.1016/S0378-7206(01)00120-3

Weber DC, 2011, RADIOTHER ONCOL, V100, P150, DOI 10.1016/j.radonc.2011.05.073

Wisniewski MF, 2003, J AM MED INFORM ASSN, V10, P454, DOI 10.1197/jamia.M1299

Wong K, 2010, RADIOTHER ONCOL, V95, P339, DOI 10.1016/j.radonc.2010.03.015

NR 38

TC 44

Z9 44

U1 0

U2 17

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD JUL

PY 2013

VL 108

IS 1

BP 174

EP 179

DI 10.1016/j.radonc.2012.09.019

PG 6

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA 214SK

UT WOS:000324155900028

PM 23394741

OA Green Accepted, Green Published

DA 2022-08-24

ER

PT J

AU Chen, M

Wang, ZM

Jiang, SP

Sun, J

Wang, L

Sahoo, N

Gunn, GB

Frank, SJ

Xu, C

Chen, JY

Nguyen, QN

Chang, JY

Liao, ZX

Zhu, XR

Zhang, XD

AF Chen, Mei

Wang, Zeming

Jiang, Shengpeng

Sun, Jian

Wang, Li

Sahoo, Narayan

Gunn, G. Brandon

Frank, Steven J.

Xu, Cheng

Chen, Jiayi

Quynh-Nhu Nguyen

Chang, Joe Y.

Liao, Zhongxing

Zhu, X. Ronald

Zhang, Xiaodong

TI Predictive performance of different NTCP techniques for

radiation-induced esophagitis in NSCLC patients receiving proton

radiotherapy

SO SCIENTIFIC REPORTS

LA English

DT Article

ID MODEL-BASED APPROACH; COMPLICATION PROBABILITY; LEARNING-METHODS;

TUMOR-CONTROL; DOSE-VOLUME; THERAPY; CANCER; REDUCTION; OUTCOMES; TRIALS

AB This study aimed to compare the predictive performance of different modeling methods in developing normal tissue complication probability (NTCP) models for predicting radiation-induced esophagitis (RE) in non-small cell lung cancer (NSCLC) patients receiving proton radiotherapy. The dataset was composed of 328 NSCLC patients receiving passive-scattering proton therapy and 41.6% of the patients experienced >= grade 2 RE. Five modeling methods were used to build NTCP models: standard Lyman-Kutcher-Burman (sLKB), generalized LKB (gLKB), multivariable logistic regression using two variable selection procedures-stepwise forward selection (Stepwise-MLR), and least absolute shrinkage and selection operator (LASSO-MLR), and support vector machines (SVM). Predictive performance was internally validated by a bootstrap approach for each modeling method. The overall performance, discriminative ability, and calibration were assessed using the Negelkerke R-2, area under the receiver operator curve (AUC), and Hosmer-Lemeshow test, respectively. The LASSO-MLR model showed the best discriminative ability with an AUC value of 0.799 (95% confidence interval (CI): 0.763-0.854), and the best overall performance with a Negelkerke R-2 value of 0.332 (95% CI: 0.266-0.486). Both of the optimism-corrected Negelkerke R-2 values of the SVM and sLKB models were 0.301. The optimism-corrected AUC of the gLKB model (0.796) was higher than that of the SVM model (0.784). The sLKB model had the smallest optimism in the model variation and discriminative ability. In the context of classification and probability estimation for predicting the NTCP for radiation-induced esophagitis, the MLR model developed with LASSO provided the best predictive results. The simplest LKB modeling had similar or even better predictive performance than the most complex SVM modeling, and it was least likely to overfit the training data. The advanced machine learning approach might have limited applicability in clinical settings with a relatively small amount of data.

C1 [Chen, Mei; Xu, Cheng; Chen, Jiayi] Shanghai Jiao Tong Univ, Ruijin Hosp, Dept Radiat Oncol, Sch Med, Shanghai 200025, Peoples R China.

[Chen, Mei; Wang, Zeming; Jiang, Shengpeng; Sahoo, Narayan; Zhu, X. Ronald; Zhang, Xiaodong] Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Unit 1150,1515 Holcombe Blvd, Houston, TX 77030 USA.

[Jiang, Shengpeng; Sun, Jian] Tianjin Med Univ, Dept Radiat Oncol, Canc Inst & Hosp, Tianjin 30060, Peoples R China.

[Sun, Jian; Gunn, G. Brandon; Frank, Steven J.; Quynh-Nhu Nguyen; Chang, Joe Y.; Liao, Zhongxing] Univ Texas MD Anderson Canc Ctr, Dept Radiat Oncol, Houston, TX 77030 USA.

[Wang, Li] Univ Texas MD Anderson Canc Ctr, Dept Expt Radiat Oncol, Houston, TX 77030 USA.

RP Zhang, XD (通讯作者)，Univ Texas MD Anderson Canc Ctr, Dept Radiat Phys, Unit 1150,1515 Holcombe Blvd, Houston, TX 77030 USA.

EM xizhang@mdanderson.org

FU National Cancer Institute Cancer Center Support Grant [P30 CA016672];

National Key Research and Development Program of China [2016YFC0105409];

MD Anderson, Texas Advanced Computing Center, Oden Institute for

Computational and Engineering Sciences initiative in Oncological Data

and Computational Science

FX The University of Texas MD Anderson Cancer Center was supported in part

by the National Cancer Institute Cancer Center Support Grant P30

CA016672. This study was supported in part by the National Key Research

and Development Program of China (Grant 2016YFC0105409). We acknowledge

financial support from the MD Anderson, Texas Advanced Computing Center,

Oden Institute for Computational and Engineering Sciences initiative in

Oncological Data and Computational Science.

CR Brodin NP, 2019, INT J RADIAT ONCOL, V104, P540, DOI 10.1016/j.ijrobp.2018.11.039

Cella L, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-224

Chang C.-C., 2011, ACM T INTEL SYST TEC, V2, DOI DOI 10.1145/1961189.1961199

Chen S, 2007, MED PHYS, V34, P3808, DOI 10.1118/1.2776669

CORTES C, 1995, MACH LEARN, V20, P273, DOI 10.1023/A:1022627411411

Cox D. R, 1989, ANAL BINARY DATA, VSecond

Defraene G, 2012, INT J RADIAT ONCOL, V82, P1233, DOI 10.1016/j.ijrobp.2011.03.056

El Naqa I, 2006, INT J RADIAT ONCOL, V64, P1275, DOI 10.1016/j.ijrobp.2005.11.022

El Naqa I., 2018, GUIDE OUTCOME MODELI, DOI [10.1201/9780429452659, DOI 10.1201/9780429452659]

El Naqa I, 2018, INT J RADIAT ONCOL, V100, P335, DOI 10.1016/j.ijrobp.2017.10.005

El Naqa I, 2009, PHYS MED BIOL, V54, pS9, DOI 10.1088/0031-9155/54/18/S02

JACKSON A, 1993, MED PHYS, V20, P613, DOI 10.1118/1.597056

KALLMAN P, 1992, INT J RADIAT BIOL, V62, P249, DOI 10.1080/09553009214552071

Keerthi SS, 2003, NEURAL COMPUT, V15, P1667, DOI 10.1162/089976603321891855

Klement RJ, 2014, INT J RADIAT ONCOL, V88, P732, DOI 10.1016/j.ijrobp.2013.11.216

KUTCHER GJ, 1989, INT J RADIAT ONCOL, V16, P1623, DOI 10.1016/0360-3016(89)90972-3

KUTCHER GJ, 1991, INT J RADIAT ONCOL, V21, P137, DOI 10.1016/0360-3016(91)90173-2

Langendijk JA, 2013, RADIOTHER ONCOL, V107, P267, DOI 10.1016/j.radonc.2013.05.007

Li XA, 2012, MED PHYS, V39, P1386, DOI 10.1118/1.3685447

LYMAN JT, 1985, RADIAT RES, V104, pS13, DOI 10.2307/3576626

Lynam Anita L, 2020, Diagn Progn Res, V4, P6, DOI 10.1186/s41512-020-00075-2

McDonald John H, 2009, HDB BIOL STAT, V2

McNamara AL, 2020, RADIOTHER ONCOL, V147, P8, DOI 10.1016/j.radonc.2020.02.022

Mizutani T, 2017, INT J RADIAT ONCOL, V99, pE698, DOI 10.1016/j.ijrobp.2017.06.2285

Niemierko A, 1997, MED PHYS, V24, P1325, DOI 10.1118/1.598154

Peeters STH, 2006, INT J RADIAT ONCOL, V66, P11, DOI 10.1016/j.ijrobp.2006.03.034

Pella A, 2011, MED PHYS, V38, P2859, DOI 10.1118/1.3582947

ROBERTS SA, 1993, RADIOTHER ONCOL, V29, P69, DOI 10.1016/0167-8140(93)90175-8

Scherman J, 2019, INT J PART THER, V5, P24, DOI 10.14338/IJPT-18-00038.1

SCHULTHEISS TE, 1983, MED PHYS, V10, P410, DOI 10.1118/1.595312

Steyerberg EW, 2019, CLIN PREDICTION MODE, P329, DOI [10.1007/978-3-030-16399-0, DOI 10.1007/978-3-030-16399-0]

Tucker SL, 2013, INT J RADIAT ONCOL, V85, P251, DOI 10.1016/j.ijrobp.2012.02.021

Verma V, 2017, CANCERS, V9, DOI 10.3390/cancers9090120

Wang ZM, 2020, RADIOTHER ONCOL, V146, P200, DOI 10.1016/j.radonc.2020.03.003

Widder J, 2016, INT J RADIAT ONCOL, V95, P30, DOI 10.1016/j.ijrobp.2015.10.004

Xu CJ, 2012, INT J RADIAT ONCOL, V82, pE677, DOI 10.1016/j.ijrobp.2011.09.036

NR 36

TC 0

Z9 0

U1 0

U2 0

PU NATURE PORTFOLIO

PI BERLIN

PA HEIDELBERGER PLATZ 3, BERLIN, 14197, GERMANY

SN 2045-2322

J9 SCI REP-UK

JI Sci Rep

PD JUN 2

PY 2022

VL 12

IS 1

AR 9178

DI 10.1038/s41598-022-12898-8

PG 8

WC Multidisciplinary Sciences

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Science & Technology - Other Topics

GA 1U7AQ

UT WOS:000805561200031

PM 35655073

OA gold, Green Published

DA 2022-08-24

ER

PT J

AU Moriya, S

Tachibana, H

Kitamura, N

Sawant, A

Sato, M

AF Moriya, Shunsuke

Tachibana, Hidenobu

Kitamura, Nozomi

Sawant, Amit

Sato, Masanori

TI Dose warping performance in deformable image registration in lung

SO PHYSICA MEDICA-EUROPEAN JOURNAL OF MEDICAL PHYSICS

LA English

DT Article

DE Deformable image registration; Generalized equivalent uniform dose;

Four-dimensional computed tomography; Lung cancer

ID COMPUTED-TOMOGRAPHY; CONTOUR PROPAGATION; RADIATION-THERAPY; PROSTATE;

VALIDATION; ACCURACY; CANCER; MOTION; SPECT

AB Purpose: It is unclear that spatial accuracy can reflect the impact of deformed dose distribution. In this study, we used dosimetric parameters to compare an in-house deformable image registration (DIR) system using NiftyReg, with two commercially available systems, MIM Maestro (MIM) and Velocity AI (Velocity).

Methods: For 19 non-small-cell lung cancer patients, the peak inspiration (0%)-4DCT images were deformed to the peak expiration (50%)-4DCT images using each of the three DIR systems, which included computation of the deformation vector fields (DVF). The 0%-gross tumor volume (GTV) and the 0%-dose distribution were also then deformed using the DVFs. The agreement in the dose distributions for the GTVs was evaluated using generalized equivalent uniform dose (gEUD), mean dose (D-mean), and three-dimensional (3D) gamma index (criteria: 3 mm/3%). Additionally, a Dice similarity coefficient (DSC) was used to measure the similarity of the GTV volumes.

Results: D-mean and gEUD demonstrated good agreement between the original and deformed dose distributions (differences were generally less than 3%) in 17 of the patients. In two other patients, the Velocity system resulted in differences in gEUD of 50.1% and 29.7% and in D-mean of 11.8% and 4.78%. The gamma index comparison showed statistically significant differences for the in-house DIR vs. MIM, and MIM vs. Velocity.

Conclusions: The finely tuned in-house DIR system could achieve similar spatial and dose accuracy to the commercial systems. Care must be taken, as we found errors of more than 5% for D-mean and 30% for gEUD, even with a commercially available DIR tool. (C) 2017 Associazione Italiana di Fisica Medica. Published by Elsevier Ltd. All rights reserved.

C1 [Moriya, Shunsuke; Sato, Masanori] Komazawa Univ, Grad Div Hlth Sci, Radiol Sci, Tokyo 1548525, Japan.

[Tachibana, Hidenobu] Natl Canc Ctr, Res Ctr Innovat Oncol, Particle Therapy Div, Chiba 2778577, Japan.

[Kitamura, Nozomi] Japanese Fdn Canc Res, Canc Inst Hosp, Dept Radiat Oncol, Tokyo 1358550, Japan.

[Sawant, Amit] Univ Texas Southwestern Med Ctr Dallas, Dept Radiat Oncol, 5801 Forest Pk Rd, Dallas, TX 75390 USA.

RP Tachibana, H (通讯作者)，Natl Canc Ctr, Res Ctr Innovat Oncol, Particle Therapy Div, Chiba 2778577, Japan.

EM smoriya0718@gmail.com; htachiba@east.ncc.go.jp;

nozomi.kitamura@jfcr.or.jp; Amit.Sawant@UTSouthwestern.edu;

masasato@komazawa-u.ac.jp

FU JSPS KAKENHI [26713022]

FX This work was supported by JSPS KAKENHI Grant Number 26713022.

CR Akbarzadeh A, 2013, J APPL CLIN MED PHYS, V14, P238, DOI 10.1120/jacmp.v14i4.4163

Akino Y, 2013, INT J RADIAT ONCOL, V87, P602, DOI 10.1016/j.ijrobp.2013.06.2054

Chan MKH, 2013, MED PHYS, V40, DOI 10.1118/1.4794505

Gay HA, 2007, PHYS MEDICA, V23, P115, DOI 10.1016/j.ejmp.2007.07.001

Gomez DR, 2011, J ONCOL, V2011, DOI 10.1155/2011/898391

Graf R, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-125

Gu XJ, 2013, PHYS MED BIOL, V58, P1889, DOI 10.1088/0031-9155/58/6/1889

Hardcastle N, 2013, RADIAT ONCOL, V8, DOI 10.1186/1748-717X-8-243

Harper J., 2013, DEFORMABLE IMAGE REG, P1

Jung SH, 2013, MED PHYS, V40, DOI 10.1118/1.4769427

Kadoya N, 2014, J RADIAT RES, V55, P175, DOI 10.1093/jrr/rrt093

Kim J, 2013, PHYS MED BIOL, V58, P8077, DOI 10.1088/0031-9155/58/22/8077

La Macchia M, 2012, RADIAT ONCOL, V7, DOI 10.1186/1748-717X-7-160

Latifi K, 2013, PHYS MED BIOL, V58, P7661, DOI 10.1088/0031-9155/58/21/7661

Li XA, 2012, MED PHYS, V39, P1386, DOI 10.1118/1.3685447

Li X, 2013, J APPL CLIN MED PHYS, V14, P195, DOI 10.1120/jacmp.v14i6.4370

Louie AV, 2010, RADIOTHER ONCOL, V95, P166, DOI 10.1016/j.radonc.2009.12.028

Manescu P, 2014, INT J COMPUT ASS RAD, V9, P449, DOI 10.1007/s11548-013-0935-2

Men CH, 2010, PHYS MED BIOL, V55, P4309, DOI 10.1088/0031-9155/55/15/008

Michalski A, 2012, J MED IMAG RADIAT ON, V56, P499, DOI 10.1111/j.1754-9485.2012.02434.x

Modat M., MED IMAGE ANAL CLIN, V2010, P33

Modat M, 2010, COMPUT METH PROG BIO, V98, P278, DOI 10.1016/j.cmpb.2009.09.002

Peroni M, 2013, TECHNOL CANCER RES T, V12, P501, DOI 10.7785/tcrt.2012.500347

Suga K, 2002, ANN NUCL MED, V16, P303, DOI 10.1007/BF02988614

van de Bunt L, 2006, INT J RADIAT ONCOL, V64, P189, DOI 10.1016/j.ijrobp.2005.04.025

Yamamoto T, 2014, INT J RADIAT ONCOL, V90, P414, DOI 10.1016/j.ijrobp.2014.06.006

Yeo UJ, 2013, MED PHYS, V40, DOI 10.1118/1.4819945

Yeo UJ, 2012, MED PHYS, V39, P5065, DOI 10.1118/1.4736534

Yeo UJ, 2012, MED PHYS, V39, P2203, DOI 10.1118/1.3694107

Zhong HL, 2012, PHYS MED BIOL, V57, P3499, DOI 10.1088/0031-9155/57/11/3499

Zhong HL, 2010, MED PHYS, V37, P970, DOI 10.1118/1.3302141

NR 31

TC 12

Z9 13

U1 0

U2 2

PU ELSEVIER SCI LTD

PI OXFORD

PA THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

SN 1120-1797

EI 1724-191X

J9 PHYS MEDICA

JI Phys. Medica

PD MAY

PY 2017

VL 37

BP 16

EP 23

DI 10.1016/j.ejmp.2017.03.016

PG 8

WC Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Radiology, Nuclear Medicine & Medical Imaging

GA EW4PU

UT WOS:000402484200003

PM 28535910

DA 2022-08-24

ER

PT J

AU Ankolekar, A

van der Heijden, B

Dekker, A

Roumen, C

De Ruysscher, D

Reymen, B

Berlanga, A

Oberije, C

Fijten, R

AF Ankolekar, Anshu

van der Heijden, Britt

Dekker, Andre

Roumen, Cheryl

De Ruysscher, Dirk

Reymen, Bart

Berlanga, Adriana

Oberije, Cary

Fijten, Rianne

TI Clinician perspectives on clinical decision support systems in lung

cancer: Implications for shared decision-making

SO HEALTH EXPECTATIONS

LA English

DT Article

DE clinical decision support systems; lung cancer; multidisciplinary tumour

board; patient-centred care; patient preferences; shared decision-making

ID TUMOR BOARD; PULMONARY NODULES; TRAINING-PROGRAM; PREDICTION MODEL; TEAM

MEETINGS; QUALITY; PATIENT; CARE; COMMUNICATION; RADIOTHERAPY

AB Background Lung cancer treatment decisions are typically made among clinical experts in a multidisciplinary tumour board (MTB) based on clinical data and guidelines. The rise of artificial intelligence and cultural shifts towards patient autonomy are changing the nature of clinical decision-making towards personalized treatments. This can be supported by clinical decision support systems (CDSSs) that generate personalized treatment information as a basis for shared decision-making (SDM). Little is known about lung cancer patients' treatment decisions and the potential for SDM supported by CDSSs. The aim of this study is to understand to what extent SDM is done in current practice and what clinicians need to improve it. Objective To explore (1) the extent to which patient preferences are taken into consideration in non-small-cell lung cancer (NSCLC) treatment decisions; (2) clinician perspectives on using CDSSs to support SDM. Design Mixed methods study consisting of a retrospective cohort study on patient deviation from MTB advice and reasons for deviation, qualitative interviews with lung cancer specialists and observations of MTB discussions and patient consultations. Setting and Participants NSCLC patients (N = 257) treated at a single radiotherapy clinic and nine lung cancer specialists from six Dutch clinics. Results We found a 10.9% (n = 28) deviation rate from MTB advice; 50% (n = 14) were due to patient preference, of which 85.7% (n = 12) chose a less intensive treatment than MTB advice. Current MTB recommendations are based on clinician experience, guidelines and patients' performance status. Most specialists (n = 7) were receptive towards CDSSs but cited barriers, such as lack of trust, lack of validation studies and time. CDSSs were considered valuable during MTB discussions rather than in consultations. Conclusion Lung cancer decisions are heavily influenced by clinical guidelines and experience, yet many patients prefer less intensive treatments. CDSSs can support SDM by presenting the harms and benefits of different treatment options rather than giving single treatment advice. External validation of CDSSs should be prioritized. Patient or Public Contribution This study did not involve patients or the public explicitly; however, the study design was informed by prior interviews with volunteers of a cancer patient advocacy group. The study objectives and data collection were supported by Dutch health care insurer CZ for a project titled 'My Best Treatment' that improves patient-centeredness and the lung cancer patient pathway in the Netherlands.

C1 [Ankolekar, Anshu; van der Heijden, Britt; Dekker, Andre; Roumen, Cheryl; De Ruysscher, Dirk; Reymen, Bart; Berlanga, Adriana; Fijten, Rianne] Maastricht Univ, GROW Sch Oncol, Dept Radiat Oncol MAASTRO, Med Ctr, Paul Henri Spaaklaan 1, NL-6229 EN Maastricht, Netherlands.

[Oberije, Cary] Maastricht Univ, Med Ctr, GROW Sch Oncol, D Lab, Maastricht, Netherlands.

RP Fijten, R (通讯作者)，Maastricht Univ, GROW Sch Oncol, Dept Radiat Oncol MAASTRO, Med Ctr, Paul Henri Spaaklaan 1, NL-6229 EN Maastricht, Netherlands.

EM rianne.fijten@maastro.nl

RI ; Oberije, Cary/I-4018-2013

OI Roumen, Cheryl/0000-0002-2941-4632; Oberije, Cary/0000-0003-0749-5117;

Dekker, Andre/0000-0002-0422-7996; Ankolekar, Anshu/0000-0001-7681-1254

FU [201500255]

FX CZ, Grant/Award Number: 201500255

CR Beauchemin M, 2019, INT J MED INFORM, V130, DOI 10.1016/j.ijmedinf.2019.07.019

Braun V., 2013, SUCCESSFUL QUALITATI

CLINE ME, 1992, NURS RES, V41, P378

Collins GS, 2015, CIRCULATION, V131, P211, DOI [10.1161/CIRCULATIONAHA.114.014508, 10.7326/M14-0697, 10.1016/j.jclinepi.2014.11.010, 10.1186/s12916-014-0241-z, 10.1136/bmj.g7594, 10.1002/bjs.9736]

De Ruysscher D, 2012, RADIOTHER ONCOL, V102, P228, DOI 10.1016/j.radonc.2011.10.010

Deist TM, 2020, RADIOTHER ONCOL, V144, P189, DOI 10.1016/j.radonc.2019.11.019

Devlin N., 2020, METHODS ANALYSING RE, P1, DOI [10.1007/978-3-030-47622-9%5F1, DOI 10.1007/978-3-030-47622-9%5F1, 10.1007/978-3-030-47622-9\_1, DOI 10.1007/978-3-030-47622-9\_1]

Fagerlin A, 2011, JNCI-J NATL CANCER I, V103, P1436, DOI 10.1093/jnci/djr318

Fayers P, 2002, EUR J CANCER, V38, pS125

Fujimori M, 2014, J CLIN ONCOL, V32, P2166, DOI 10.1200/JCO.2013.51.2756

Gaissmaier W, 2008, Z EVIDENZ FORTBILD Q, V102, P411, DOI 10.1016/j.zefq.2008.08.013

Gandara DR, 2017, CLIN LUNG CANCER, V18, P1, DOI 10.1016/j.cllc.2016.12.011

Gartner FR, 2019, BMJ OPEN, V9, DOI 10.1136/bmjopen-2019-032483

Gaspar LE., 2018, PATIENT EXP J, V5, P50

Hahlweg P, 2017, BMC CANCER, V17, DOI 10.1186/s12885-017-3768-5

Herder GJ, 2005, CHEST, V128, P2490, DOI 10.1378/chest.128.4.2490

Heus P, 2018, BMC MED, V16, DOI 10.1186/s12916-018-1099-2

Hirsch FR, 2017, LANCET, V389, P299, DOI 10.1016/S0140-6736(16)30958-8

Hollunder S, 2018, BMC CANCER, V18, DOI 10.1186/s12885-018-4841-4

Howlader N, 2015, SEER CANC STAT REV 1

Ichikawa M, 2014, J RADIAT RES, V55, P305, DOI 10.1093/jrr/rrt104

Joseph-Williams N, 2014, PATIENT EDUC COUNS, V94, P291, DOI 10.1016/j.pec.2013.10.031

Kostaras X, 2012, J CANCER EDUC, V27, P42, DOI 10.1007/s13187-011-0263-6

Lamb BW, 2011, ANN SURG ONCOL, V18, P2116, DOI 10.1245/s10434-011-1675-6

Liberati EG, 2017, IMPLEMENT SCI, V12, DOI 10.1186/s13012-017-0644-2

Liu ZT, 2017, CIKM'17: PROCEEDINGS OF THE 2017 ACM CONFERENCE ON INFORMATION AND KNOWLEDGE MANAGEMENT, P1169, DOI 10.1145/3132847.3132859

Mahadevaiah G, 2020, MED PHYS, V47, pE228, DOI 10.1002/mp.13562

Marlow LAV, 2015, LUNG CANCER, V88, P104, DOI 10.1016/j.lungcan.2015.01.024

McWilliams A, 2013, NEW ENGL J MED, V369, P910, DOI 10.1056/NEJMoa1214726

Mokhles S, 2018, BMC CANCER, V18, DOI 10.1186/s12885-018-3986-5

Mokhles S, 2017, INTERACT CARDIOV TH, V25, P278, DOI 10.1093/icvts/ivx103

Nemoto K, 2013, INT J CLIN ONCOL, V18, P574, DOI 10.1007/s10147-012-0420-x

Oberije C, 2014, RADIOTHER ONCOL, V112, P37, DOI 10.1016/j.radonc.2014.04.012

Perla Rocco J, 2012, Qual Manag Health Care, V21, P169, DOI 10.1097/QMH.0b013e31825e8806

Revesz D, 2017, BMC MED INFORM DECIS, V17, DOI 10.1186/s12911-017-0542-1

Revesz D, 2020, J CANCER EDUC, V35, P345, DOI 10.1007/s13187-019-1471-8

Riley RD, 2016, BMJ-BRIT MED J, V353, DOI 10.1136/bmj.i3140

Rosell L, 2018, BMC HEALTH SERV RES, V18, DOI 10.1186/s12913-018-2990-4

Schmidt HM, 2015, ANN THORAC SURG, V99, P1719, DOI 10.1016/j.athoracsur.2014.11.019

Shen MJ, 2019, J HEALTH COMMUN, V24, P711, DOI 10.1080/10810730.2019.1665757

Siontis GCM, 2015, J CLIN EPIDEMIOL, V68, P25, DOI 10.1016/j.jclinepi.2014.09.007

Sittig DF, 2008, J BIOMED INFORM, V41, P387, DOI 10.1016/j.jbi.2007.09.003

Sorensen K, 2015, EUR J PUBLIC HEALTH, V25, P1053, DOI 10.1093/eurpub/ckv043

Soukup T, 2021, JCO ONCOL PRACT, V17, P591, DOI 10.1200/OP.20.00588

Specchia ML, 2020, BMC HEALTH SERV RES, V20, DOI 10.1186/s12913-020-4930-3

Stacey D, 2017, STUD HEALTH TECHNOL, V240, P263, DOI 10.3233/978-1-61499-790-0-263

Stiggelbout AM, 2012, BMJ-BRIT MED J, V344, DOI 10.1136/bmj.e256

Sullivan DR, 2019, LUNG CANCER, V131, P47, DOI 10.1016/j.lungcan.2019.03.009

Torre LA, 2016, ADV EXP MED BIOL, V893, P1, DOI 10.1007/978-3-319-24223-1\_1

Tulsky JA, 2011, ANN INTERN MED, V155, P593, DOI 10.7326/0003-4819-155-9-201111010-00007

Yang Q., 2019, P 2019 CHI C HUMAN F, P111

Zappa C, 2016, TRANSL LUNG CANCER R, V5, P288, DOI 10.21037/tlcr.2016.06.07

NR 52

TC 0

Z9 0

U1 3

U2 3

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1369-6513

EI 1369-7625

J9 HEALTH EXPECT

JI Health Expect.

PD AUG

PY 2022

VL 25

IS 4

BP 1342

EP 1351

DI 10.1111/hex.13457

EA MAY 2022

PG 10

WC Health Care Sciences & Services; Health Policy & Services; Public,

Environmental & Occupational Health

WE Science Citation Index Expanded (SCI-EXPANDED); Social Science Citation Index (SSCI)

SC Health Care Sciences & Services; Public, Environmental & Occupational

Health

GA 3F4DP

UT WOS:000792580200001

PM 35535474

OA Green Published

DA 2022-08-24

ER

PT J

AU Zindler, JD

Jochems, A

Lagerwaard, FJ

Beumer, R

Troost, EGC

Eekers, DBP

Compter, I

van der Toorn, PP

Essers, M

Oei, B

Hurkmans, CW

Bruynzeel, AME

Bosmans, G

Swinnen, A

Leijenaar, RTH

Lambin, P

AF Zindler, Jaap D.

Jochems, Arthur

Lagerwaard, Frank J.

Beumer, Rosemarijne

Troost, Esther G. C.

Eekers, Danielle B. P.

Compter, Inge

van der Toorn, Peter-Paul

Essers, Marion

Oei, Bing

Hurkmans, Coen W.

Bruynzeel, Anna M. E.

Bosmans, Geert

Swinnen, Ans

Leijenaar, Ralph T. H.

Lambin, Philippe

TI Individualized early death and long-term survival prediction after

stereotactic radiosurgery for brain metastases of non-small cell lung

cancer: Two externally validated nomograms

SO RADIOTHERAPY AND ONCOLOGY

LA English

DT Article

DE Individualized brain metastases; Stereotactic radiosurgery; Prognostic

models

ID LEARNING HEALTH-CARE; PROGNOSTIC-FACTORS; BODY RADIOTHERAPY; RADIOMICS;

SYSTEMS; ONCOLOGY; INDEXES; MODELS

AB Introduction: Commonly used clinical models for survival prediction after stereotactic radiosurgery (SRS) for brain metastases (BMs) are limited by the lack of individual risk scores and disproportionate prognostic groups. In this study, two nomograms were developed to overcome these limitations.

Methods: 495 patients with BMs of NSCLC treated with SRS for a limited number of BMs in four Dutch radiation oncology centers were identified and divided in a training cohort (n = 214, patients treated in one hospital) and an external validation cohort n = 281, patients treated in three other hospitals). Using the training cohort, nomograms were developed for prediction of early death (<3 months) and long-term survival (>12 months) with prognostic factors for survival. Accuracy of prediction was defined as the area under the curve (AUC) by receiver operating characteristics analysis for prediction of early death and long term survival. The accuracy of the nomograms was also tested in the external validation cohort.

Results: Prognostic factors for survival were: WHO performance status, presence of extracranial metastases, age, GTV largest BM, and gender. Number of brain metastases and primary tumor control were not prognostic factors for survival. In the external validation cohort, the nomogram predicted early death statistically significantly better (p < 0.05) than the unfavorable groups of the RPA, DS-GPA, GGS, SIR, and Rades 2015 (AUC = 0.70 versus range AUCs = 0.51-0.60 respectively). With an AUC of 0.67, the other nomogram predicted 1 year survival statistically significantly better (p < 0.05) than the unfavorable groups of four models (range AUCs = 0.57-0.61), except for the SIR (AUC = 0.64, p = 0.34). The models are available on www.predictcancer.org.

Conclusion: The nomograms predicted early death and long-term survival more accurately than commonly used prognostic scores after SRS for a limited number of BMs of NSCLC. Moreover these nomograms enable individualized probability assessment and are easy into use in routine clinical practice. (C) 2017 Elsevier B.V. All rights reserved.

C1 [Zindler, Jaap D.; Jochems, Arthur; Beumer, Rosemarijne; Troost, Esther G. C.; Eekers, Danielle B. P.; Compter, Inge; Bosmans, Geert; Swinnen, Ans; Leijenaar, Ralph T. H.; Lambin, Philippe] Maastricht Univ, Med Ctr, GROW Sch Oncol & Dev Biol, Dept Radiat Oncol,MAASTRO Clin, Maastricht, Netherlands.

[Lagerwaard, Frank J.; Bruynzeel, Anna M. E.] Vrije Univ Amsterdam, Med Ctr, Dept Radiat Oncol, Amsterdam, Netherlands.

[Troost, Esther G. C.] Helmholtz Zentrum Dresden Rossendorf, Inst Radiooncol, Dresden, Germany.

[van der Toorn, Peter-Paul; Hurkmans, Coen W.] Catharina Hosp, Dept Radiat Oncol, Eindhoven, Netherlands.

[Essers, Marion; Oei, Bing] Verbeeten Inst, Dept Radiat Oncol, Tilburg, Netherlands.

RP Zindler, JD (通讯作者)，MAASTRO Clin, POB 3035, NL-6202 NA Maastricht, Netherlands.

EM jaap.zindler@maastro.nl

OI Lagerwaard, Frank (J)/0000-0002-8740-2517; Compter,

Inge/0000-0002-6155-1565; Lambin, Philippe/0000-0001-7961-0191

FU ERC [ERC-ADG-2015, 694812]; Dutch technology Foundation STW [10696,

P14-19]; EU [257144, 601826]; European Program [H2020-2015-17, 733008];

Kankeronderzoekfonds Limburg from Health Foundation Limburg;

Zuyderland-MAASTRO; Alpe d'HuZes-KWF

FX Authors acknowledge financial support from ERC advanced grant

(ERC-ADG-2015, no 694812 - Hypoximmuno) and the Dutch technology

Foundation STW (grant no 10696 DuCAT & no P14-19 STRaTegy), which is the

applied science division of NWO, and the Technology Programme of the

Ministry of Economic Affairs. Authors also acknowledge financial support

from the EU 7th framework program (ARTFORCE - no 257144, REQUITE - no

601826), SME Phase 2 (EU proposal 673780 - RAIL), the European Program

H2020-2015-17 (ImmunoSABR - no 733008), Kankeronderzoekfonds Limburg

from the Health Foundation Limburg, Alpe d'HuZes-KWF (DESIGN), the

Zuyderland-MAASTRO grant.

CR Aerts HJWL, 2014, NAT COMMUN, V5, DOI 10.1038/ncomms5006

[Anonymous], [No title captured]

Coroller TP, 2015, RADIOTHER ONCOL, V114, P345, DOI 10.1016/j.radonc.2015.02.015

DELONG ER, 1988, BIOMETRICS, V44, P837, DOI 10.2307/2531595

Gaspar L, 1997, INT J RADIAT ONCOL, V37, P745, DOI 10.1016/S0360-3016(96)00619-0

Gijtenbeek J M M Anja, 2011, Ned Tijdschr Geneeskd, V155, pA4141

Golden DW, 2008, J NEUROSURG, V109, P77, DOI 10.3171/JNS/2008/109/12/S13

Iasonos A, 2008, J CLIN ONCOL, V26, P1364, DOI 10.1200/JCO.2007.12.9791

Lagerwaard FJ, 1999, INT J RADIAT ONCOL, V43, P795, DOI 10.1016/S0360-3016(98)00442-8

Lambin P, 2016, ADV DRUG DELIV REV

Lambin P, 2015, ACTA ONCOL, V54, P1289, DOI 10.3109/0284186X.2015.1062136

Lambin P, 2013, RADIOTHER ONCOL, V109, P159, DOI 10.1016/j.radonc.2013.07.007

Lambin P, 2013, NAT REV CLIN ONCOL, V10, P27, DOI 10.1038/nrclinonc.2012.196

Lambin P, 2012, EUR J CANCER, V48, P441, DOI 10.1016/j.ejca.2011.11.036

Leijenaar RTH, 2015, SCI REP-UK, V5, DOI 10.1038/srep11075

Lorenzoni J, 2004, INT J RADIAT ONCOL, V60, P218, DOI 10.1016/j.ijrobp.2004.02.017

Madsen AL, 2003, LECT NOTES ARTIF INT, V2711, P594

Nieder C, 2009, RADIAT ONCOL, V4, DOI 10.1186/1748-717X-4-10

Oberije C, 2014, RADIOTHER ONCOL, V112, P37, DOI 10.1016/j.radonc.2014.04.012

Panth KM, 2015, RADIOTHER ONCOL, V116, P462, DOI 10.1016/j.radonc.2015.06.013

Parmar C, 2015, SCI REP-UK, V5, DOI 10.1038/srep13087

Rades Dirk, 2015, Asian Pac J Cancer Prev, V16, P2967

Rekers NH, 2014, CANCER RADIOTHER, V18, P391, DOI 10.1016/j.canrad.2014.06.012

Rodrigues G, 2013, PRACT RADIAT ONCOL, V3, P101, DOI 10.1016/j.prro.2012.04.001

Seravalli E, 2015, RADIOTHER ONCOL, V116, P131, DOI 10.1016/j.radonc.2015.06.004

Sperduto PW, 2008, INT J RADIAT ONCOL, V70, P510, DOI 10.1016/j.ijrobp.2007.06.074

Sperduto PW, 2010, INT J RADIAT ONCOL, V77, P655, DOI 10.1016/j.ijrobp.2009.08.025

Tree AC, 2013, LANCET ONCOL, V14, pE28, DOI 10.1016/S1470-2045(12)70510-7

Weltman E, 2000, INT J RADIAT ONCOL, V46, P1155, DOI 10.1016/S0360-3016(99)00549-0

West C, 2014, CLIN ONCOL-UK, V26, P739, DOI 10.1016/j.clon.2014.09.008

Yamamoto M, 2014, LANCET ONCOL, V15, P387, DOI 10.1016/S1470-2045(14)70061-0

Zindler JD, 2016, JNCI-J NATL CANCER I, V108, DOI 10.1093/jnci/djv305

Zindler JD, 2013, RADIOTHER ONCOL, V106, P370, DOI 10.1016/j.radonc.2013.01.015

NR 33

TC 24

Z9 25

U1 1

U2 6

PU ELSEVIER IRELAND LTD

PI CLARE

PA ELSEVIER HOUSE, BROOKVALE PLAZA, EAST PARK SHANNON, CO, CLARE, 00000,

IRELAND

SN 0167-8140

EI 1879-0887

J9 RADIOTHER ONCOL

JI Radiother. Oncol.

PD MAY

PY 2017

VL 123

IS 2

BP 189

EP 194

DI 10.1016/j.radonc.2017.02.006

PG 6

WC Oncology; Radiology, Nuclear Medicine & Medical Imaging

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology; Radiology, Nuclear Medicine & Medical Imaging

GA EX2AV

UT WOS:000403028800004

PM 28237400

OA Green Published, Bronze

DA 2022-08-24

ER

PT J

AU Behera, M

Steuer, CE

Liu, Y

Fernandez, F

Fu, C

Higgins, KA

Gillespie, TW

Pakkala, S

Pillai, RN

Force, S

Belani, CP

Khuri, FR

Curran, WJ

Ramalingam, SS

AF Behera, Madhusmita

Steuer, Conor E.

Liu, Yuan

Fernandez, Felix

Fu, Chao

Higgins, Kristin A.

Gillespie, Theresa W.

Pakkala, Suchita

Pillai, Rathi N.

Force, Seth

Belani, Chandra P.

Khuri, Fadlo R.

Curran, Walter J.

Ramalingam, Suresh S.

TI Trimodality Therapy in the Treatment of Stage III N2-Positive Non-Small

Cell Lung Cancer: A National Cancer Database Analysis

SO ONCOLOGIST

LA English

DT Article

DE Trimodality therapy; National Cancer Database; Big data; Real-world data

ID SURGICAL RESECTION; RADIOTHERAPY; CHEMOTHERAPY; SURVIVAL

AB Background Significant controversy remains regarding the care of patients with clinical stage III (N2-positive) NSCLC. Although multimodality therapy is effective, the roles of surgery, chemotherapy, and radiotherapy are not fully defined and the optimal treatment approach is not firmly established. We analyzed outcomes and predictors associated with trimodality therapy (TT) in the National Cancer Database. Materials and Methods The NCDB was queried from 2004 to 2014 for patients with NSCLC diagnosed with stage III (N2) disease and treated with chemotherapy and radiation (CRT). Three cohorts of patients were studied: CRT only/no surgery (NS), CRT plus lobectomy (LT), and CRT plus pneumonectomy (PT). The univariate and multivariable analyses (MVA) were conducted using Cox proportional hazards model and log-rank tests. Results A total of 29,754 patients were included in this analysis: NS 90.1%, LT 8.4%, and PT 1.5%. Patient characteristics: median age 66 years; male 56% and white 85%. Patients treated at academic centers were more likely to receive TT compared with those treated at community centers (odds ratio: 1.85 [1.53-2.23]; p < .001). On MVA, patients that received TT were associated with better survival than those that received only CRT (hazard ratio: 0.59 [0.55-0.62]; p < .001). The LT group was associated with significantly better survival than the PT and NS groups (median survival: 62.8 months vs. 51.8 months vs. 34.2 months, respectively). In patients with more than two nodes involved, PT was associated with worse survival than LT and NS (median survival: 51.4 months in LT and 39 months in NS vs. 37 months in PT). The 30-day and 90-day mortality rates were found to be significantly higher in PT patients than in LT. Conclusion TT was used in less than 10% of patients with stage III N2 disease, suggesting high degree of patient selection. In this selected group, TT was associated with favorable outcomes relative to CRT alone. Implications for Practice This analysis demonstrates that trimodality therapy could benefit a selected subset of patients with stage III (N2) disease. This plan should be considered as a treatment option following patient evaluation in a multidisciplinary setting in experienced medical centers with the needed expertise.

C1 [Behera, Madhusmita; Steuer, Conor E.; Pakkala, Suchita; Pillai, Rathi N.; Khuri, Fadlo R.; Ramalingam, Suresh S.] Emory Univ, Dept Hematol & Med Oncol, Atlanta, GA 30322 USA.

[Higgins, Kristin A.; Curran, Walter J.] Emory Univ, Dept Radiat Oncol, Atlanta, GA 30322 USA.

[Liu, Yuan; Fu, Chao] Emory Univ, Dept Biostat & Bioinformat, Atlanta, GA 30322 USA.

[Liu, Yuan; Fu, Chao] Emory Univ, Rollins Sch Publ Hlth, Atlanta, GA 30322 USA.

[Fernandez, Felix; Gillespie, Theresa W.; Force, Seth] Emory Univ, Dept Surg, Atlanta, GA 30322 USA.

[Behera, Madhusmita; Steuer, Conor E.; Liu, Yuan; Fernandez, Felix; Higgins, Kristin A.; Gillespie, Theresa W.; Pakkala, Suchita; Pillai, Rathi N.; Force, Seth; Curran, Walter J.; Ramalingam, Suresh S.] Emory Univ, Winship Canc Inst, 1784 North Decatur Rd,NDB 405, Atlanta, GA 30322 USA.

[Belani, Chandra P.] Penn Univ, Penn State State Hershey Canc Inst, Hershey, PA USA.

[Khuri, Fadlo R.] Amer Univ Beirut, Beirut, Lebanon.

RP Behera, M (通讯作者)，Emory Univ, Winship Canc Inst, 1784 North Decatur Rd,NDB 405, Atlanta, GA 30322 USA.

EM mbehera@emory.edu

RI Gillespie, Theresa Wicklin/AAI-9713-2021; Ramalingam,

Suresh/AAV-7478-2020; Khuri, Fadlo R./AAU-4942-2020

OI Gillespie, Theresa Wicklin/0000-0001-8734-716X; Khuri, Fadlo

R./0000-0002-8638-7618

FU Biostatistics & Bioinformatics and Winship Research Informatics Shared

Resources of Winship Cancer Institute of Emory University; NIH/National

Cancer Institute [P30CA138292, P50CA217691]

FX Research reported in this publication was supported in part by the

Biostatistics & Bioinformatics and Winship Research Informatics Shared

Resources of Winship Cancer Institute of Emory University and

NIH/National Cancer Institute under award numbers P30CA138292 and

P50CA217691. The content is solely the responsibility of the authors and

does not necessarily represent the official views of the NIH. The data

used in the study are derived from a deidentified NCDB file. The NCDB is

a joint project of the Commission on Cancer of the American College of

Surgeons and the American Cancer Society. The American College of

Surgeons and the Commission on Cancer have not verified and are not

responsible for the analytic or statistical methodology employed, or the

conclusions drawn from these data by the investigator.

CR Albain KS, 2009, LANCET, V374, P379, DOI 10.1016/S0140-6736(09)60737-6

American Cancer Society, CANC FACTS FIG 2017

Amin MB., 2017, AJCC CANC STAGING MA

Andre F, 2000, J CLIN ONCOL, V18, P2981, DOI 10.1200/JCO.2000.18.16.2981

Antonia SJ, 2017, NEW ENGL J MED, V377, P1919, DOI 10.1056/NEJMoa1709937

Austin PC, 2007, STAT MED, V26, P734, DOI 10.1002/sim.2580

Bott MJ, 2015, ANN THORAC SURG, V99, P1921, DOI 10.1016/j.athoracsur.2015.02.033

Giobbie-Hurder A, 2013, J CLIN ONCOL, V31, P2963, DOI 10.1200/JCO.2013.49.5283

Koshy M, 2013, J THORAC ONCOL, V8, P915, DOI 10.1097/JTO.0b013e31828f68b4

Lewis J, 2018, FRONT ONCOL, V8, DOI 10.3389/fonc.2018.00005

LIN DY, 1989, J AM STAT ASSOC, V84, P1074, DOI 10.2307/2290085

Liu Y, 2019, PROCESSES, V7, DOI 10.3390/pr7040195

van Meerbeeck JP, 2007, JNCI-J NATL CANCER I, V99, P442, DOI 10.1093/jnci/djk093

NR 13

TC 7

Z9 7

U1 0

U2 1

PU WILEY

PI HOBOKEN

PA 111 RIVER ST, HOBOKEN 07030-5774, NJ USA

SN 1083-7159

EI 1549-490X

J9 ONCOLOGIST

JI Oncologist

PD JUN

PY 2020

VL 25

IS 6

BP E964

EP E975

DI 10.1634/theoncologist.2019-0661

EA JAN 2020

PG 12

WC Oncology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Oncology

GA LW8TY

UT WOS:000506933500001

PM 31943520

OA Green Published, Bronze

DA 2022-08-24

ER

PT J

AU Zhang, N

Wu, YY

Wu, YF

Wang, LH

Chen, JF

Wang, XS

Dunmall, LSC

Cheng, ZG

Wang, YH

AF Zhang, Na

Wu, Yangyang

Wu, Yifan

Wang, Lihong

Chen, Jingfei

Wang, Xiaosa

Dunmall, Louisa S. Chard

Cheng, Zhenguo

Wang, Yaohe

TI Ferroptosis-Related Genes Are Potential Therapeutic Targets and the

Model of These Genes Influences Overall Survival of NSCLC Patients

SO CELLS

LA English

DT Article

DE ferroptosis; lung adenocarcinoma; lung squamous cell carcinoma;

ferroptosis score model; drug therapy

ID CANCER-CELLS

AB Background: Lung adenocarcinoma (LUAD) and lung squamous cell carcinoma (LUSCC) are two of the most common subtypes of non-small cell lung cancer (NSCLC), with high mortality rates and rising incidence worldwide. Ferroptosis is a mode of programmed cell death caused by lipid peroxidation, the accumulation of reactive oxygen species, and is dependent on iron. The recent discovery of ferroptosis has provided new insights into tumor development, and the clinical relevance of ferroptosis for tumor therapy is being increasingly appreciated. However, its role in NSCLC remains to be explored. Methods: The clinical and molecular data for 1727 LUAD and LUSCC patients and 73 control individuals were obtained from the Gene Expression Omnibus (GEO) database and the Cancer Genome Atlas (TCGA) database. Gene expression profiles, copy number variations and somatic mutations of 57 ferroptosis-related genes in 1727 tumor samples from the four datasets were used in a univariate Cox analysis and consensus clustering analysis. The biological signatures of each pattern were identified. A ferroptosis score was generated by combining the univariate Cox regression analysis and random forest algorithm followed by principal component analysis (PCA) and further investigated for its predictive and therapeutic value in LUAD and LUSCC. Results: The expression of 57 ferroptosis-related genes in NSCLC patients differed significantly from that of normal subjects. Based on unsupervised clustering of ferroptosis-related genes, we divided all patients into three ferroptosis expression pattern groups, which showed differences in ferroptosis-associated gene expression patterns, immune cell infiltration levels, prognostic characteristics and enriched pathways. Using the differentially expressed genes in the three ferroptosis expression patterns, a set of 17 ferroptosis-related gene prognostic models was established, which clustered all patients in the cohort into a low score group and a high score group, with marked differences in prognosis (p < 0.001). The high ferroptosis score was significantly associated with positive response to radiotherapy (p < 0.001), high T stage (p < 0.001), high N stage (p < 0.001) and high-grade tumor (p < 0.001) characteristics. Conclusions: The 17 ferroptosis-associated genes show great potential for stratifying LUAD and LUSCC patients into high and low risk groups. Interestingly, a high ferroptosis score in LUAD patients was associated with a good prognosis, whereas a similar high ferroptosis score in LUSCC patients was associated with a poor prognosis. Familiarity with the mechanisms underlying ferroptosis and its implications for the treatment of NSCLC, as well as its effect on OS and PFS, may provide guidance and insights in developing new therapeutic targets for NSCLC.

C1 [Zhang, Na; Wu, Yangyang; Wu, Yifan; Wang, Lihong; Chen, Jingfei; Wang, Xiaosa; Dunmall, Louisa S. Chard; Cheng, Zhenguo; Wang, Yaohe] Zhengzhou Univ, State Key Lab Esophageal Canc Prevent Treatment, Sch Basic Med Sci, Natl Ctr Int Res Cell & Gene Therapy,Acad Med Sci, Zhenzhou 450000, Peoples R China.

[Dunmall, Louisa S. Chard; Wang, Yaohe] Queen Mary Univ London, Ctr Canc Biomarkers & Biotherapeut, Barts Canc Inst, London EC1M 6BQ, England.

RP Cheng, ZG; Wang, YH (通讯作者)，Zhengzhou Univ, State Key Lab Esophageal Canc Prevent Treatment, Sch Basic Med Sci, Natl Ctr Int Res Cell & Gene Therapy,Acad Med Sci, Zhenzhou 450000, Peoples R China.; Wang, YH (通讯作者)，Queen Mary Univ London, Ctr Canc Biomarkers & Biotherapeut, Barts Canc Inst, London EC1M 6BQ, England.

EM nazhang0129@126.com; wuyangyang9737@163.com; yifanwu0805@163.com;

lhwang2017@163.com; ccalmokok@163.com; wxs10829@163.com;

l.chard@qmul.ac.uk; czgtown\_123@126.com; yaohe.wang@qmul.ac.uk

OI Wang, Yaohe/0000-0003-2367-6313

FU Nature Sciences Foundation of China [U1704282, 81771776]; Cancer

Research UK Centre of Excellence Award [C355/A25137, MR/V006053/1]

FX This study was supported by Nature Sciences Foundation of China

(U1704282 and 81771776). L.S.C.D. and Y.W. (Yaohe Wang) also acknowledge

the support from the Cancer Research UK Centre of Excellence Award to

Barts Cancer Centre (C355/A25137) and the MRC (MR/V006053/1).

CR Ahmad Sheraz, 2013, J Ayub Med Coll Abbottabad, V25, P71

Bo XB, 2020, CANCER SCI, V111, P817, DOI 10.1111/cas.14302

Castelli V, 2021, CANCERS, V13, DOI 10.3390/cancers13020328

Catarata MJ, 2020, CANCERS, V12, DOI 10.3390/cancers12061457

Cheng X, 2019, MOLECULES, V24, DOI 10.3390/molecules24030400

Cronin KA, 2018, CANCER-AM CANCER SOC, V124, P2785, DOI 10.1002/cncr.31551

Dixon SJ, 2012, CELL, V149, P1060, DOI 10.1016/j.cell.2012.03.042

Fan X, 2021, FRONT GENET, V12, DOI 10.3389/fgene.2021.732211

Gammella E, 2016, OXID MED CELL LONGEV, V2016, DOI 10.1155/2016/8629024

Gaut D, 2018, CLIN LUNG CANCER, V19, pE19, DOI 10.1016/j.cllc.2017.06.004

Ghoochani A, 2021, CANCER RES, V81, P1583, DOI 10.1158/0008-5472.CAN-20-3477

Hangauer MJ, 2017, NATURE, V551, P247, DOI 10.1038/nature24297

Jiang YF, 2020, BIOMED RES INT, V2020, DOI 10.1155/2020/5848493

Liang JY, 2020, INT J BIOL SCI, V16, P2430, DOI 10.7150/ijbs.45050

Liu HL, 2018, ONCOGENESIS, V7, DOI 10.1038/s41389-017-0016-4

Liu WR, 2021, FRONT CELL DEV BIOL, V9, DOI 10.3389/fcell.2021.725764

Mariathasan S, 2018, NATURE, V554, P544, DOI 10.1038/nature25501

Mou YH, 2019, J HEMATOL ONCOL, V12, DOI 10.1186/s13045-019-0720-y

Nicot C, 2019, MOL CANCER, V18, DOI 10.1186/s12943-019-1118-8

Pasipoularides A, 2017, INT J CARDIOL, V230, P384, DOI 10.1016/j.ijcard.2016.12.097

Qi LN, 2020, ANTIOXIDANTS-BASEL, V9, DOI 10.3390/antiox9020121

Rau KM, 2016, INT J MOL SCI, V17, DOI 10.3390/ijms17040524

Seiler A, 2008, CELL METAB, V8, P237, DOI 10.1016/j.cmet.2008.07.005

Senbabaoglu Y, 2016, GENOME BIOL, V17, DOI 10.1186/s13059-016-1092-z

Shen ZY, 2018, ADV MATER, V30, DOI 10.1002/adma.201704007

Siegel RL., 2020, CA-CANCER J CLIN, V70, P7, DOI [DOI 10.3322/caac.21551, 10.3322/caac.21590]

Taylor WR, 2019, SCI REP-UK, V9, DOI 10.1038/s41598-019-42251-5

Tu GX, 2021, PEERJ, V9, DOI 10.7717/peerj.11687

Viswanathan VS, 2017, NATURE, V547, P453, DOI 10.1038/nature23007

Wan RJ, 2021, CNS NEUROSCI THER, V27, P973, DOI 10.1111/cns.13654

Wang WQ, 2020, CANCER MANAG RES, V12, P9389, DOI 10.2147/CMAR.S269773

Wu CY, 2020, INT J MOL SCI, V21, DOI 10.3390/ijms21093227

Wu YN, 2020, FRONT ONCOL, V10, DOI 10.3389/fonc.2020.571127

Wylie B, 2019, CANCERS, V11, DOI 10.3390/cancers11040521

Xu S, 2021, CELL DEATH DIS, V12, DOI 10.1038/s41419-021-03559-1

Yang WS, 2014, CELL, V156, P317, DOI 10.1016/j.cell.2013.12.010

Yang ZY, 2020, INT J MOL MED, V45, P1397, DOI 10.3892/ijmm.2020.4526

Ye Z, 2020, CELL PROLIFERAT, V53, DOI 10.1111/cpr.12761

Yegya-Raman N, 2019, ADV RADIAT ONCOL, V4, P541, DOI 10.1016/j.adro.2019.03.005

Zhang B, 2020, MOL CANCER, V19, DOI 10.1186/s12943-020-01170-0

Zhang M, 2021, FRONT ONCOL, V11, DOI 10.3389/fonc.2021.698856

Zhao GJ, 2021, FRONT GENET, V12, DOI 10.3389/fgene.2021.650416

Zheng H, 2020, J CELL MOL MED, V24, P11030, DOI 10.1111/jcmm.15722

Zhou N, 2020, DATABASE-OXFORD, DOI 10.1093/database/baaa021

NR 44

TC 0

Z9 0

U1 2

U2 2

PU MDPI

PI BASEL

PA ST ALBAN-ANLAGE 66, CH-4052 BASEL, SWITZERLAND

EI 2073-4409

J9 CELLS-BASEL

JI Cells

PD JUL

PY 2022

VL 11

IS 14

AR 2207

DI 10.3390/cells11142207

PG 20

WC Cell Biology

WE Science Citation Index Expanded (SCI-EXPANDED)

SC Cell Biology

GA 3H2ME

UT WOS:000831873500001

PM 35883650

OA Green Published, gold

DA 2022-08-24

ER

EF