



A Meta-Analysis of Randomized Controlled Trials Concerning the Efficacy of Transversus Abdominis Plane Block for Pain Control After Laparoscopic Cholecystectomy

Weihua Wang¹, Lishan Wang² and Yan Gao^{1*}

OPEN ACCESS

Edited by:

Stefano Pontone, Sapienza University of Rome, Italy

Reviewed by:

Claude Bertrand, CHU UCL Namur Site Godinne, Belgium Kenan Yusif-zade, Independent Researcher, Baku, Azerbaijan

*Correspondence:

Yan Gao m15165603456@163.com

Specialty section:

This article was submitted to Visceral Surgery, a section of the journal Frontiers in Surgery

Received: 26 April 2021 Accepted: 08 July 2021 Published: 04 August 2021

Citation:

Wang W, Wang L and Gao Y (2021) A Meta-Analysis of Randomized Controlled Trials Concerning the Efficacy of Transversus Abdominis Plane Block for Pain Control After Laparoscopic Cholecystectomy. Front. Surg. 8:700318. doi: 10.3389/fsurg.2021.700318 ¹ Department of Thoracic Surgery, Weifang Second People's Hospital, Weifang, China, ² Department of Oral and Maxillofacial Surgery, Weifang Second People's Hospital, Weifang, China

Background and Purpose: Transverse abdominis plane (TAP) block has been suggested to reduce post-operative pain after laparoscopic cholecystectomy (LC). However, the literature is divided on whether ultrasound (USG)-guided TAP block is effective for pain control after LC. The present meta-analysis therefore evaluated the efficacy of USG-guided TAP block vs. controls and port site infiltration for pain control after LC.

Methods: A comprehensive literature search of online academic databases was performed for published randomized controlled trials (RCTs) for studies published to January 31, 2021. The primary outcome analyzed was post-operative pain score at 0, 6, 12, and 24 h post-surgery, both during rest and while coughing. Secondary outcomes included morphine consumption and post-operative nausea and vomiting (PONV) incidence.

Results: A total of 23 studies with data on 1,450 LC patients were included in our meta-analysis. A reduction in pain intensity at certain post-operative timepoints was observed for USG-guided TAP block patients compared to control group patients. No reduction in pain intensity was observed for patients receiving USG-guided TAP block patients vs. conventional Port site infiltration.

Conclusion: This meta-analysis concludes that TAP block is more effective than a conventional pain control, but not significatively different from another local incisional pain control that is port site infiltration. Additional prospective randomized controlled trials are required to further validate our findings.

Keywords: laparoscopic cholecystectomy, analgesia, transverse abdominis plane block, ultrasound, pain control

1

INTRODUCTION

Laparoscopic cholecystectomy (LC) is currently the gold standard treatment for symptomatic gall bladder disorders, including cholelithiasis and cholecystitis (1, 2). However, LC, while minimally invasive, is associated with post-operative pain, especially within the first 24 h. This pain is routinely managed using opiates, which are associated with a number of side effects, including excessive sedation and post-operative nausea and vomiting (PONV). As these side effects may increase hospital stay durations, proper pain control and management are therefore critical for improving clinical outcomes and promoting earlier ambulation post-surgery (3–5).

Transversus abdominis plane (TAP) block is a regional anesthetic technique that has gradually become an alternative for post-operative pain control. It involves the infusion of local anesthetic into the fascial plane of the abdominal wall where the T6 to L1 nerves are found (5). Conventionally, TAP block was performed using anatomical landmarks, but ultrasound (USG)-guided TAP block has become more popular in recent years (6–10).

A previously published meta-analysis detailing seven randomized controlled trials (RCTs) showed TAP block to be effective when compared with standard analgesia in adults undergoing LC (11). However, they lacked evidence to compare the efficacy of TAP block against conventional port site infiltration for post-LC pain control. The current study aims to systematically review all available RCTs to evaluate the efficacy of USG-guided TAP block against conventional analgesia and port site infiltration in LC patients.

MATERIALS AND METHODS

Search Strategy

This meta-analysis was performed using Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) guidelines (12). A comprehensive literature search for RCTs published prior to January 31, 2021 was conducted using the following electronic databases: PubMed, Google scholar, Cochrane Library, Scopus, and TRIP. The following search terms were employed: "Transabdominal abdominis plane block" OR "Tap block" OR "Plane Block" OR "Ultrasound guided TAP block" AND "Laparoscopic cholecystectomy" AND "Pain Control" AND "Analgesic" OR "Local Anesthesia" OR "Infiltration anesthesia." Literature cited by included studies were also manually searched for additional eligible studies. The literature search did not restrict for language.

Study Eligibility Criteria

RCTs involving adult patients undergoing elective LC that compared the efficacy of USG-guided TAP block against either control or port-site infiltration groups were included. Studies that did not report pain outcomes were not included. Studies where full-texts were not available were not included.

Data Collection and Analysis

All eligible studies were screened by two independent reviewers using the selection criteria listed above. Screening first entailed abstract review, followed by full-text review. Any discrepancies were settled through discussion with a third reviewer. Articles published in a language other than English were machine translated using Google Translate and considered for inclusion. The following information was extracted from each included study: number of patients, investigation groups, types of analgesia used, outcome measurements, treatments, interventions, and adverse effects.

Primary Outcome

The primary outcome evaluated in this study was pain control in LC patients, as measured using 1–10 rating scales such as the visual analog scale (VAS) or numerical rating scale (NRS). Measurements at 0, 6, 12, and 24 h post-operation, both at rest and while coughing, were noted.

Secondary Outcomes

Secondary outcomes in this study included morphine consumption and post-operative nausea and vomiting (PONV) incidence.

Quality Assessment

Studies were assessed for quality using a modified JADAD score (13) that evaluated study methods, randomization approaches, blinding, withdrawals and dropouts, inclusion and exclusion criteria, approaches used to assess adverse effects, and statistical analysis. Scores ranged from 0 (lowest quality) to 8 (highest quality). Study quality was assessed independently by two reviewers. All discrepancies were resolved through discussion.

Publication Bias

Publication bias was assessed using funnel plot analysis. Funnel plot asymmetry was assessed using Egger's regression test (14, 15).

Statistical Analysis

Mean difference (MDs) with 95% confidence intervals (CIs) was calculated for the continuous outcome. Risk ratios (RR) with 95% CIs were calculated for categorical outcomes to estimate pooled findings. Study heterogeneity was evaluated using the I^2 statistic. For I^2 values >50%, a random-effects model was applied. For I^2 values below 50%, a fixed-effect model was applied. Statistical analyses were conducted using Review Manager software (Version 5.3, Copenhagen: The Nordic Cochrane Center, The Cochrane Collaboration 2014).

RESULTS

Literature Search

Primary screening yielded 118 candidate articles. Of these, 47 underwent full-text screening and review. Ultimately, 23 studies containing data on 1,450 patients met inclusion criteria (**Figure 1**).



Characteristics of Included Studies

A full summary of extracted data from included studies is presented in **Table 1**. Included studies were published between 2009 and 2020, with individual study samples ranging from 40 to 120 individuals. All included studies were of moderate or high quality based on JADAD Score (**Table 2**). Out of 23 included studies, 14 studies (16–18, 23–25, 27, 30, 31, 34–38, 40) were conducted in Caucasian individuals, with the remaining nine studies (19–22, 26, 28, 29, 32, 33) were conducted on an Asian population.

For the primary outcome of pain control at rest and during coughing, out of 23 studies, 22 studies were included in the analysis for which references have been provided in **Table 3**. Some of the included studies had reported data only for one or two timepoints for post-operative pain score either for 0 or 6 or 12 or 24 h at rest or during coughing (17, 18, 20, 22–24, 26, 28, 30,

36–38). A single study by El-Dawlatly et al. (27) only provided the data for morphine consumption. PONV data was available for 12 studies (16, 18, 19, 21, 23, 25, 28, 29, 31, 33, 36, 37) (750 LC patients). Information on morphine consumption up to 24 h post-operation was reported by seven studies (16, 17, 23, 27–29, 31) (348 LC subjects).

Clinical Outcomes

Post-operative Pain Intensity at Rest

Analysis of the included studies suggested significantly reduced pain intensity in patients receiving USG-guided TAP block relative to control group patients at 0, 6, 12, and 24 h postoperation (**Figures 2A–D**). However, no such reduction was noted when USG-guided TAP block patients were compared to Port site infiltration group patients (**Table 3**). A high degree of heterogeneity was present in all included studies at all timepoints TABLE 1 | Baseline and clinical characteristic of the included studies in the meta-analysis for the efficacy of transversus abdominis plane block for pain control after laparoscopic cholecystectomy.

S. No	References	Country	Ethnicity	Groups investigated	TAP approach	Comparator	Treatment	Anesthesia	Post-operative analgesia
1	Arik et al. (16)	Turkey	Caucasian	TAP Block ($n = 24$) Control ($n = 24$) Port Site Infiltration ($n = 24$)	Patients received unilateral subcostal TAP block	Patients received intravenously patient-controlled analgesia (IV PCA) or local anesthetic infiltration at port sites	0.25% bupivacaine	Propofol, fentanyl, and rocuronium	Paracetamol IV, 1 mg/kg tramadol IV, and ondansetron 0.1 mg/kg IV
2	Tulgar et al. (17)	Turkey	Caucasian	Subcostal TAP Block ($n = 20$) Control ($n = 20$)	OSTAP blocks	Control as standard analgesia plan with no block	No details provided	Propofol 2–3 mg/kg, fentanyl 100 µg, and rocuronium bromide 0.6 mg/kg. 0.6 minimum alveolar concentration sevoflurane and 0.08 µg/kg/min remifentanil infusion	1 gm paracetamol and 20 mg tenoxicam.
3	Houben et al. (18)	Belgium	Caucasian	Subcostal TAP Block ($n = 26$) Control ($n = 26$)	USG guided bilateral subcostal TAP block with 20 ml of levobupivacaine 0.375% and epinephrine 5 mg/ml_	Patients receiving 0.9% saline with epinephrine 5 mg/ml	levobupivacaine 0.375% and epinephrine 5 mg/ml	Propofol 2 mg/kg and sufentanil 0.1 mg/kg. Rocuronium 0.6mg/kg	Paracetamol and morphine in addition to the pre-operative NSAID and intra-operative ketamine and dexamethasone
4	Baral and Poudel (19)	Nepal	Asian	Subcostal TAP Block ($n = 30$) Port Site Infiltrate ($n = 30$)	Bilateral USG guided subcostal TAP block with 10 mL of 0.25% bupivacaine after the completion of surgery.	Patients receiving similar amount of local anesthetic infiltrated over all the laparoscopic port sites	0.25% bupivacaine	Fentanyl (2 mcg/kg), propofol (2 mg/kg), and vecuronium (0.8 mg/kg).	Injection Paracetamol 1 gm 6 hourly
ō	Bava et al. (20)	India	Asian	TAP Block $(n = 21)$ Port Site Infiltration (n = 21)	USG bilateral mid-axillary TAP blocks with 0.375% ropivacaine	Local anesthetic infiltration of the port site	0.375% ropivacaine	intravenously (IV)-administered propofol 2 mg/kg, fentanyl 2 μg/kg, and atracurium 0.5 mg/kg	0.5 μg/kg IV fentanyl
6	Khandelwal et al. (21)	India	Asian	TAP Block ($n = 40$) Control ($n = 40$)	USG guided STA block with 0.25% levobupivacaine both sides	Patients received 0.25% levobupivacaine through intraperitoneal route.	0.25% levobupivacaine	Propofol 2–3 mg/kg, fentanyl 2 μg/kg, and vecuronium 0.1 mg/kg	Paracetamol 15 mg/kg
7	Suseela et al. (22)	India	Asian	TAP Block ($n = 40$ Port Site Infiltration ($n = 40$)	USG guided bilateral subcostal TAP block (T) with 0.25% bupivacaine 20 ml each side	Port-site infiltration with 0.5% bupivacaine 5 ml each at 4 ports (I)	0.5% bupivacaine	Propofol 2 mg/kg IV and injection fentanyl 2 μg/kg IV.	Tramadol 1 mg/kg intravenous bolus and diclofenac 1 mg/kg intravenous infusion
8	Ortiz et al. (23)	USA	Caucasian	TAP Block ($n = 39$) Port Site Infiltration ($n = 35$)	Bilateral USG guided TAP blocks	Preincisional infiltration of the 4-trocar insertion	15 mL of ropivacaine 0.5%	fentanyl 2 Kg/kg and propofol 2.5 mg/kg.	Morphine, Fentanyl, Hydrocodone

(Continued)

Pain Control After Laparoscopic Cholecystectomy

Wang et al.

TABLE 1 | Continued

S. No	References	Country	Ethnicity	Groups investigated	TAP approach	Comparator	Treatment	Anesthesia	Post-operative analgesia
9	Saliminia et al. (24)	Iran	Caucasian	Control $(n = 18)$ TAP Block $(n = 18)$ Bupivacaine, sufentanil TAP Block $(n = 18)$ Bupivacaine	TAP block with bupivacaine and TAP block with bupivacaine plus sufentanil	TAP block with normal saline	bupivacaine 0.5% /2 mL (10 mg) sufentanil	50 mg fentanyl with lockout at 8-min	2 mg/kg intravenous (IV) propofol and 3 mg/kg IV fentanyl, tracheal intubation was facilitated by 0.6 mg/kg IV atracurium and anesthesia was maintained with 80e100 mg/kg/min propofol and 1 mg/kg IV fentanyl and 0.3 mg/kg IV atracurium administrated every 30 min.
10	Basaran et al. (25)	Turkey	Caucasian	Subcostal TAP group ($n = 38$) control group ($n = 38$).	Bilateral ultrasound-guided OSTAP blocks	Control Group	20 ml 0.25% bupivacaine	propofol 1–1.5 mg/kg and fentanyl 2 µg/kg.	tenoxicam, Morphine, Fantanyl, Tremadol
11	Ra et al. (26)	Korea	Asian	Control $(n = 18)$ TAP block 0.25% (n = 18) TAP block 0.5% (n = 18)	USG guided TAP block	Standard general anesthetic as control	Bilateral 15 ml of 0.25 or 0.5% L-bupivacaine after induction	Midazolam/propofol/ remifentanil	Ketorolac 30 mg and fentanyl 20 µg in the recovery room if needed, ketorolac 30 mg every 8 h on the ward
12	El-Dawlatly et al. (27)	Austria	Caucasian	TAP Block ($n = 21$) Control ($n = 21$)	USG guided bilateral TAP block	Standard general anesthetic as control	Bilateral 15 ml of 0.5 % Bupivacaine after induction	Propofol/sufentanil/ sevoflurane	PCA morphine bolus 1.5 mg IV with no basic infusion and 15 min lock out time
13	Chen et al. (28)	Malaysia	Asian	Control ($n = 20$) Subcostal TAP block ($n = 20$)	Bilateral OSTAP block using 1.5 mg/kg ropivacaine on each side	IV morphine 0.1 mg/kg	Bilateral 20 ml of 0.375% ropivacaine after induction	Propofol /fentanyl/ sevoflurane	Morphine 0.05 mg/kg, i.v., if needed
14	Shin et al. (29)	South Korea	Asian	Control ($n = 15$) TAP block ($n = 15$) Subcostal STAP block ($n = 15$)	TAP block or OSTAP block	Standard postoperative pain control alone	Bilateral 20 ml of 0.375% ropivacaine after induction	Propofol/ fentanyl/ sevoflurane	Fentanyl 25 μ g, i.v. + ketorolac 30 mg in the recovery room and nalbuphine 10 mg on the ward if needed
15	Dost et al. (30)	Turkey	Caucasian	TAP block ($n = 25$) 0.25% levobupivacaine TAP block ($n = 25$) 0.5% levobupivacaine Control group ($n = 25$)	20 mL of levobupivacaine 0.5% and 30 mL 0.25% levobupivacaine was applied with a USG-guided TAP block	No TAP block or LAI was applied to the control group	levobupivacaine 0.5%/0.25%	IV propofol and 1 mcg / kg IV fentanyl	Mephridine, fentanyl, tremadol

(Continued)

Pain Control After Laparoscopic Cholecystectomy

TABLE 1 | Continued

S. No	References	Country	Ethnicity	Groups investigated	TAP approach	Comparator	Treatment	Anesthesia	Post-operative analgesia
16	Petersen et al. (31)	Denmark	Caucasian	Control ($n = 37$) TAP block ($n = 37$)	Bilateral USG guided posterior TAP blocks (20 mL 0.5% ropivacaine)	placebo blocks	Bilateral 20 ml of 0.5% ropivacaine after induction	Propofol/ remifentanil/ sufentanil	Oral acetaminophen 1 g and ibuprofen 400 mg every 6 h, morphine 2.5 mg, i.v., in the recovery room and oral ketobernidone 2.5 mg on the ward if needed
17	Venkatraman et al. (32)	India	Asian	Subcostal TAP block ($n = 40$) Control ($n = 40$)	USG guided Subcostal TAP block	Laparoscopy-guided subcostal TAP block	20 mL of 0.2%ropivacaine and 8 mg dexamethasone.	Propofol 2 mg/kg and cisatracurium 1.5 mg/kgwas	Fentanyl 2 µg/kg
18	Bhatia et al. (33)	India	Asian	Control $(n = 20)$ TAP block $(n = 20)$ Subcostal TAP block (n = 20)	Patients received an USG guided posterior TAP block using 15 mL of 0.375% ropivacaine on each side; and patients underwent a subcostal TAP block with 15 mL of 0.375% ropivacaine on each side	Patients received standard general anesthesia (control group);	Bilateral 15 ml of 0.375% ropivacaine	Propofol/morphine/ nitrous oxide/ isoflurane	Acetaminophen 1 g, i.v., every 6 h, tramadol 2 mg/kg, i.v., as an initial dose and 1 mg/kg if needed
19	Breazu et al. (34)	Romania	Caucasian	Subcostal TAP-Placebo $(n = 25)$ OSTAP-Bupivacaine (n = 25) OSTAP-Pethidine (n = 25)	OSTAP-Bupivacaine (treated with 0.25% bupivacaine) and OSTAP-Pethidine (treated with 1% pethidine).	OSTAP-Placebo (treated with normal saline);	Bilateral 0.25% bupivacaine/ 20 ml of 1% pethidine	7.5 mg of midazolam, 60 min before the surgery, followed by the induction with 2 mcg/kg of fentanyl, 2 mg/kg of propofol, 0.6 mg/kg of rocuronium or 0.5 mg/kg of atracurium	1 g of IV acetaminophen at 8 h
20	Breazu et al. (35)	Romania	Caucasian	Subcostal TAP block (n =30) Subcoastal Placebo (n = 30)	Bilateral OSTAP Block receiving preoperatively with 0.25% bupivacaine.	Bilateral OSTAP Placebo receiving preoperatively with sterile normal saline	Bilateral 0.25% bupivacaine	Midazolam 7.5 mg orally 60 min before surgery, fentanyl 2 μg/kg, propofol 2 mg/kg, rocuronium 0.6 mg/kg or atracurium 0.5 mg/kg	Acetaminofen 15–20 mg/kg
21	Vrsajkov et al. (36)	Serbia	Caucasian	Subcostal TAP ($n = 36$) Control ($n = 36$)	USG guided subcostal TAP block	Control receiving standard postoperative analgesia	0.33% bupivacaine	Propofol (2.5 mg/kg), fentanyl (3 mcg/kg) and rocuronium (0.6–0.8 mg/kg)	Tramadol 1 mg/kg per 6 h
22	Tor et al. (37)	Turkey	Caucasian	TAP Block ($n = 50$) Port Site Infiltrate ($n = 50$)	USG guided TAP block with 30 ml 0.25% bupivacaine solution	20 ml 0.25% bupivacaine solution injected in three port incision sites.	Bilateral 15 ml of 0.5% bupivacaine	Propofol/fentanyl /Rocuronium	50 mg Tramadol and 800 mg Ibuprofen
23	Tolchard et al. (38)	UK	Caucasian	Subcostal STAP ($n = 21$) Port Site Infiltrate ($n = 22$)	USG guided STA block	port-site infiltration of local anesthetic	1 mg/kg bupivacaine	Propofol (2.5 mg/kg), fentanyl (3 mcg/kg), and atracurium (0.6 mg/kg),	Paracetamol(15–20 mg/kg) and diclofenac (0.5 mg/kg)

TABLE 2 | Quality assessment using modified Jadad scores (Points 1–8) for the included studies in the meta-analysis.

References	Was the research described as randomized?	Was the approach of randomization appropriate?	Was the research described as blinding?	Was the approach of blinding appropriate?	Was the approach used to assess adverse effects described?	Was there a presentation of the inclusion/exclusion criteria?#	Was there a presentation of withdrawals and dropouts? [#]	Was the approach of statistical analysis described?	Total score (max-8)
Arik et al. (16)	1	1	0	0	0	1	1	1	5
Tulgar et al. (17)	1	1	1	1	0	1	1	1	7
Vindal et al. (39)	1	1	1	1	1	1	1	1	8
Houben et al. (18)	1	1	1	1	1	1	1	1	8
Baral and Poudel (19)	1	1	1	1	1	1	0	1	7
Bava et al. (20)	1	1	1	1	1	1	0	1	7
Khandelwal et al. (21)	1	1	1	1	1	1	0	1	7
Suseela et al. (22)	1	1	1	1	1	1	0	1	7
Ortiz et al. (23)	1	1	0	0	1	1	1	1	6
Saliminia et al. (24)	1	1	1	1	1	1	1	1	8
Basaran et al. (25)	1	1	1	1	1	1	1	1	8
Ra et al. (26)	1	1	0	0	0	1	0	1	4
El-Dawlatly et al. (27)	1	1	0	0	0	1	0	0	3
Chen et al. (28)	1	1	0	0	0	1	1	1	5
Shin et al. (29)	1	1	0	0	1	1	0	1	5
Dost et al. (30)	1	1	0	0	0	1	0	0	3
Baytar et al. (40)	1	1	0	0	0	1	1	1	5
Petersen et al. (31)	1	1	0	0	0	1	0	0	3
Venkatraman et al. (32)	1	1	1	1	1	1	0	1	7
Bhatia et al. (33)	1	1	0	0	1	1	1	1	6
Breazu et al. (34)	1	1	0	0	1	1	1	1	6
Breazu et al. (35)	1	1	0	0	1	1	1	1	6
Vrsajkov et al. (36)	1	1	1	1	1	1	0	1	7
Tor et al. (37)	1	1	1	1	1	1	1	1	8
Tolchard et al. (38)	1	1	1	1	1	1	0	1	7

#"1" means "Yes", "0" means "Not described".

φ
aff
0
Ę.
ğ
0
a:
Q
5
đ
-
충
ŏ
òld
Ē
<1
ď
2
ିତ
fficac
ö
÷
ē
÷
D
Ĕ
÷=
at
Ö
sti
/est
Ľ,
dies
udie
9
St
0
Ō
Ö
.⊆
e
누
ğ
-
8
Ĕ
di.
2
÷
of
>
ā
Ъ
Ĩ
5
Sul
e
Щ
L.
ē
◄
TABL

Ċ.

<u>ل</u>

Timepoint after surgery	Groups	Status	No. of studies	Total participants	MD (95% CI)	<i>p</i> -value	P ² (%)	References
Oh	USG TAP block vs. Control	Rest	13	850	-1.53 [-2.21, -0.84]	<0.0001	98	(16, 17, 21, 24, 25, 29–36)
		Coughing	თ	578	-1.72 [-2.48, -0.97]	<0.0001	92	(16, 17, 21, 29, 31–35)
	USG TAP block vs. Port site Infiltrate	Rest	9	385	-0.26 [-1.03, 0.51]	0.51	93	(16, 19, 20, 23, 37, 38)
		Coughing	ო	208	-1.28 [-2.73, 0.16]	0.08	84	(16, 20, 37)
6h	USG TAP block vs. Control	Rest	12	730	-1.19 [-1.62, -0.77]	<0.0001	94	(16, 21, 24–26, 29, 31–35)
		Coughing	Ø	582	-0.53 [-0.94, -0.13]	0.010	06	(16, 17, 21, 29, 31–35)
	USG TAP block vs. Port site Infiltrate	Rest	Q	322	-0.41 [-1.37, 0.56]	0.41	94	(16, 19, 20, 22, 23)
		Coughing	ო	168	-0.36 [-0.97, 0.25]	0.25	0	(16, 19, 20)
12 h	USG TAP block vs. Control	Rest	Ø	512	-0.75 [-1.24, -0.27]	0.002	85	(16, 17, 21, 24, 26, 32, 33, 36)
		Coughing	9	398	-0.49 [-1.06, 0.09]	0.10	79	(16, 17, 21, 30, 33, 35)
	USG TAP block vs. Port site Infiltrate	Rest	Q	322	-0.53 [-1.51, 0.45]	0.29	95	(16, 19, 20, 22, 23)
		Coughing	ო	168	-1.44 [-3.25, 0.37]	0.12	93	(16, 19, 20)
24 h	USG TAP block vs. Control	Rest	12	746	-0.53 [-0.83, -0.23]	0.0005	86	(16, 17, 21, 24, 25, 29, 31–35)
		Coughing	0	578	-0.37 [-0.66, -0.08]	0.01	87	(16, 17, 21, 25, 29–31, 33, 35)
	USG TAP block vs. Port site Infiltrate	Rest	5	322	0.22 [-1.12, 1.55]	0.75	97	(16, 19, 20, 22, 23)
		Coughing	ო	168	-0.36 [-0.85, 0.12]	0.14	0	(16, 19, 20)

(0 h: $I^2 = 98\%$, p < 0.0001; 6 h: $I^2 = 94\%$, p < 0.0001; 12 h: $I^2 = 85\%$, p < 0.0001; 24 h: $I^2 = 87\%$, p < 0.0001).

Post-operative Pain Intensity While Coughing

A significant reduction in pain intensity while coughing was observed at 0, 6, and 24 h post-operation in USG-guided TAP block patients relative to control group patients (**Figures 3A–D**). No significant change in pain intensity was noted at 12 h postoperation. No significant changes were noted when comparing USG-guided TAP block patients to Port site infiltration group patients at all post-operative time-point (**Table 3**).

Morphine Consumption During 24 h After Operation

Analysis of seven studies (16, 17, 23, 27–29, 31) involving 348 LC subjects showed a significant reduction in morphine consumption during the first 24 h after surgery (MD = -1.76 mg, 95% CI: -3.28 to -0.24) in patients receiving TAP blocks compared to control subjects (**Figure 4**). A high degree of heterogeneity was observed ($I^2 = 91\%$, p < 0.0001).

Post-operative Nausea and Vomiting (PONV) Incidence

Analysis of 12 studies (16, 18, 19, 21, 23, 25, 28, 29, 31, 33, 36, 37) involving 750 LC subjects showed a decreased incidence of PONV in patients receiving USG guided TAP blocks compared to control subjects (RR = 0.69, 95% CI: 0.54–0.89) (**Figure 5**). No significant heterogeneity between the studies was observed ($I^2 = 9\%$, p = 0.36).

Publication Bias

No significant publication bias was detected using Funnel plots or Egger's tests for (a) Post-Operative Pain Intensity at Rest for all timepoints (0 h: p = 0.54; 6 h: p = 0.32; 12 h: p = 0.98; 24 h: p = 0.63); (b) Post-Operative Pain Intensity during coughing for all timepoints (0 h: p = 0.12; 6 h: p = 0.76; 12 h; p = 0.91, 24 h: p = 0.17), (c) Morphine consumption during 24h after operation (p = 0.36), (d) Post-operative nausea and vomiting (PONV) incidence (p = 0.71). All funnel plots showed symmetric shape for all the comparison.

DISCUSSION

This study evaluated the efficacy of USG guided TAP block for reducing pain intensity at rest and while coughing in LC patients for up to 24h post-operation. We noted a significant reduction in pain intensity in patients who received USG-guided TAP block relative to control group patients, as well as reduced morphine consumption and incidence of PONV. However, no such reduction was noted when USG-guided TAP block patients were compared to Port site infiltration group patients at rest and during coughing at all post-operative timepoints upto 24 h.

Severe pain for LC patients generally occurs during the first 24 h post-surgery, and is thought to arise mainly from visceral tissue damage and the surgical incision (with the latter taking precedent) (41). As such, analgesic planning must focus on incisional pain rather than visceral pain. The absence of significant difference of pain control after port site infiltration

			AP Bloc		Cont			Mean Difference	Mean Difference
	y or Subgroup et al 2020	Mean 3.2	SD T 2.1	otal 1 24			al Weigh 24 5.6	t IV, Random, 95% Cl % -2.50 [-3.78, -1.22]	IV, Random, 95% Cl
	an et al 2015 a et al 2014	2.5 0.85	1 0.87	38 20	3.8 2.35 1			% -1.30 [-2.01, -0.59] % -1.50 [-2.19, -0.81]	-
	a et al 2014	1.2	1.1	20	2.3 1	.3 2	6.4	% -1.10 [-1.85, -0.35]	-
	u et al 2016 u et al 2017	1.3 1	1.1	30 25				% -1.60 [-2.18, -1.02] % -2.00 [-2.55, -1.45]	
Dost	et al 2018	5	1	25	4	1 2	25 6.6	% 1.00 [0.45, 1.55]	-
	delwal et al 2019 sen et al 2012	2.3 1.86	0.8 2.13		1.82 0.1 3.99 1.1		40 6.8 37 6.3	% 0.48 [0.14, 0.82] % -2.13 [-2.91, -1.35]	- 1
	nia et al 2015 et al 2014	1.33 2.3	1 0.5	18 15	1.33 1. 6.6 0		L8 6.3 L5 6.8	% 0.00 [-0.77, 0.77] % -4.30 [-4.66, -3.94]	. †
Shin e	et al 2014	4.3	0.5	15	6.6 0	.5 .5	15 6.8	% -2.30 [-2.66, -1.94]	-
	ar et al 2019 ar et al 2019	1.5 1.5	2.1 2.4	20 20				% -2.40 [-3.80, -1.00] % -2.40 [-3.89, -0.91]	
	atraman et al 2020 ijkov et al 2018	0.28	0.03 4.75	40 38	0.98 0.0 5.2 2		40 6.9	% -0.70 [-0.71, -0.69] % -2.30 [-3.96, -0.64]	
		2.9			J.2 2				
	l (95% Cl) rogeneity: Tau ² = 1.77	7; Chi ² =		425 9, df =	15 (P < 0			% -1.53 [-2.21, -0.84] %	-10 -5 0 5 10
Test f	for overall effect: Z =	4.36 (P	< 0.000)1)					Favours USG TAP Block Favours Control
в									
_	y or Subgroup	USG T Mean	AP Bloc SD T	k otal I	Cont Aean S		al Weigl	Mean Difference t IV, Random, 95% CI	Mean Difference IV, Random, 95% Cl
Arik e	et al 2020	1.7	1.8	24	2.6 1	.6 2	24 6.1	% -0.90 [-1.86, 0.06]	
Bhatia	an et al 2015 a et al 2014	3.8 0.9	0.5 1.1	38 20				% -3.40 [-4.06, -2.74] % -1.10 [-1.78, -0.42]	
	a et al 2014 :u et al 2016	1.6 0.67	1.3 0.72	20 30	2 1 2.5 0.3		20 7.0 30 8.3	% -0.40 [-1.15, 0.35] % -1.83 [-2.23, -1.43]	_T
Breaz	u et al 2017	1	1	25	2	1 2	25 7.8	% -1.00 [-1.55, -0.45]	-
	delwal et al 2019 sen et al 2012	3.2 3	1.1 2.1	40 37			40 8.0 37 6.4	% -0.50 [-1.00, 0.00] % -1.40 [-2.29, -0.51]	-
	al 2010 nia et al 2015	3.1 3.6	1.5 2.2	18 18				% -3.00 [-4.12, -1.88] % -2.80 [-4.24, -1.36]	<u> </u>
Shin e	et al 2014	3.6	0.3	15	3.3 0	.3 .	15 8.8	% 0.30 [0.09, 0.51]	•
	ar et al 2019 ar et al 2019	1.7 1.6	0.9 1.3	20 20			20 7.2 20 6.8		-
Venka	atraman et al 2020	0.28	0.03	40	0.98 0.0)3 4	40 8.9	% -0.70 [-0.71, -0.69]	
	l (95% CI) rogeneity: Tau ² = 0.53	2. Ch:2		365	12 (0 (% -1.19 [-1.62, -0.77]	
	for overall effect: $Z =$				12 (1 / 1	.00001	L), I - 94	0	-10 -5 0 5 10
		5.10 (1	< 0.000)01)					Favours USG TAP Block Favours Control
		5.10 (1	< 0.000)01)					
с									Favours USG TAP Block Favours Control
	y or Subgroup		AP Bloc	k	Contr Mean SI		l Weight	Mean Difference IV, Random, 95% Cl	
Study Arik e	et al 2020	USG T Mean 1.2	AP Bloc SD T 1.2	k <u>fotal 1</u> 24	Aean SE	Tota	4 9.5%	IV, Random, 95% CI	Favours USG TAP Block Favours Control Mean Difference
Study Arik e Bhatia Bhatia	et al 2020 a et al 2014 a et al 2014	USG T Mean 1.2 1.8 0.8	SD T 1.2 2 1.5	k Total 1 24 20 20	Mean SI 2.2 1.1 1.9 1.1 1.9 1.1	Tota 7 24 5 20 5 20	4 9.5% 0 7.8% 0 8.9%	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17]	Favours USG TAP Block Favours Control Mean Difference
Study Arik e Bhatia Bhatia Khand	et al 2020 a et al 2014 a et al 2014 delwal et al 2019	USG T Mean 1.2 1.8 0.8 2.4	SD T 1.2 2 1.5 1.1	k Total 1 20 20 40	Mean SI 2.2 1.7 1.9 1.7 1.9 1.7 2.7 1.7	Tota 7 24 5 20 5 20 1 40	4 9.5% 0 7.8% 0 8.9% 0 11.7%	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18]	Favours USG TAP Block Favours Control Mean Difference
Study Arik e Bhatia Bhatia Khand Ra et s Salmir	et al 2020 a et al 2014 a et al 2014 delwal et al 2019 al 2010 nia et al 2015	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.9	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3	k 24 20 20 40 18 18	Mean SI 2.2 1.1 1.9 1.1 1.9 1.1 2.7 1.1 5.1 1.1 3.4 1.1	Tota 7 24 5 20 5 20 5 20 6 20 1 40 2 14 2 14	4 9.5% 0 7.8% 0 8.9% 0 11.7% 8 7.7% 8 8.0%	IV, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44]	Favours USG TAP Block Favours Control Mean Difference
Study Arik e Bhatia Bhatia Khanc Ra et : Salmin Tulga Tulga	at al 2020 a et al 2014 a et al 2014 delwal et al 2019 al 2010 nia et al 2015 r et al 2019 r et al 2019	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.9 1.7 2.2	AP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.9 0.89	k 24 20 20 40 18 18 20 20	Mean SI 2.2 1.1 1.9 1.2 1.9 1.2 5.1 1.2 3.4 1.2 2.3 0.2	Tota 7 24 5 20 5 20 6 20 6 20 1 40 2 14 2 14 2 14 2 14 2 14 2 14 2 14 2 14 2 14 2 14 2 20 2 20 2 20	4 9.5% 0 7.8% 0 8.9% 0 11.7% 8 7.7% 8 8.0% 0 11.2% 0 11.3%	V, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.10 [-0.65, 0.45]	Favours USG TAP Block Favours Control Mean Difference
Study Arik e Bhatia Bhatia Khand Ra et Salmin Tulgau Tulgau Venka	at al 2020 a et al 2014 a et al 2014 delwal et al 2019 al 2010 nia et al 2015 r et al 2019	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.9 1.7	AP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.9	k 24 20 20 40 18 18 20 20	Mean SI 2.2 1.1 1.9 1.1 1.9 1.1 2.7 1.1 5.1 3.4 2.3 0.9	Tota 7 24 5 20 5 20 5 20 5 20 6 20 1 40 2 14 9 20 9 20 4 40	4 9.5% 0 7.8% 0 8.9% 0 11.7% 8 7.7% 8 8.0% 0 11.2% 0 11.3% 0 13.0%	V, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.10 [-0.65, 0.45]	Favours USG TAP Block Favours Control Mean Difference
Study Arik e Bhatia Bhatia Khanc Ra et : Salmin Tulga Tulga Venka Vrasaj	et al 2020 a et al 2014 de tal 2014 delwal et al 2019 al 2010 nia et al 2015 r et al 2019 r et al 2019 trtaman et al 2020 jkov et al 2018	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.9 1.7 2.2 2.2	AP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.9 0.89 0.4 1.2	k otal 1 24 20 40 18 18 20 20 40 36	Mean SI 2.2 1.7 1.9 1.8 1.9 1.8 2.7 1.7 5.1 3.4 2.3 0.9 2.35 0.9	Tota 7 24 5 20 5 20 5 20 5 20 6 20 1 20 20 20 4 40 4 30	4 9.59 0 7.89 0 8.99 0 11.79 8 7.79 8 8.09 0 11.29 0 11.39 0 13.09 5 11.09	V, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.10 [-0.65, 0.45] 0.15 [-0.03, 0.33] -1.00 [-1.60, -0.40]	Favours USG TAP Block Favours Control Mean Difference
Study Arik e Bhatia Bhatia Khand Salmir Tulgai Tulgai Venka Vrasaj Total Hetero	et al 2020 a et al 2014 delwal et al 2019 al 2010 nia et al 2015 r et al 2015 r et al 2019 r et al 2019 traman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.9 1.7 2.2 2.2 1.4 5; Chi ² =	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.9 0.89 0.4 1.2 = 60.54,	k otal 1 24 20 40 18 18 20 20 40 36 256 df = 9	Mean SI 2.2 1 1.9 1 1.9 1 2.7 1 5.1 3.4 2.3 0 2.3 0 2.4 1	Tota 7 24 5 26 5 26 14 2 14 20 20 26 44 36 256 26	4 9.59 0 7.89 0 8.99 0 11.79 8 7.79 8 8.09 0 11.29 0 11.39 0 13.09 5 110.09	V, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.10 [-0.65, 0, 45] 0.15 [-0.03, 0, 33]	Favours USG TAP Block Favours Control Mean Difference
Study Arik e Bhatia Bhatia Khand Salmir Tulgai Tulgai Venka Vrasaj Total Hetero	et al 2020 a et al 2014 delwal et al 2019 al 2010 nia et al 2015 r et al 2015 r et al 2019 r et al 2019 straman et al 2020 jkov et al 2018 (95% CI)	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.9 1.7 2.2 2.2 1.4 5; Chi ² =	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.9 0.89 0.4 1.2 = 60.54,	k otal 1 24 20 40 18 18 20 20 40 36 256 df = 9	Mean SI 2.2 1 1.9 1 1.9 1 2.7 1 5.1 3.4 2.3 0 2.3 0 2.4 1	Tota 7 24 5 26 5 26 14 2 14 20 20 26 44 36 256 26	4 9.59 0 7.89 0 8.99 0 11.79 8 7.79 8 8.09 0 11.29 0 11.39 0 13.09 5 110.09	V, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.10 [-0.65, 0.45] 0.15 [-0.03, 0.33] -1.00 [-1.60, -0.40]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Study Arik e Bhatia Bhatia Khand Salmir Tulgai Tulgai Venka Vrasaj Total Hetero	et al 2020 a et al 2014 delwal et al 2019 al 2010 nia et al 2015 r et al 2015 r et al 2019 r et al 2019 traman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.9 1.7 2.2 2.2 1.4 5; Chi ² = 3.07 (P	AP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.9 0.89 0.4 1.2 = 60.54, = 0.002	k otal 1 24 20 20 40 18 20 20 40 36 256 df = 9 20 40 36	Mean SI 2.2 1.1 1.9 1.2 1.9 1.2 2.7 1.5 3.4 1.2 2.3 0.4 2.3 0.4 2.4 1.4 2.4 1.4	Tota 7 24 5 20 5 20 5 20 5 20 6 20 2 14 9 20 9 20 4 40 4 30 256 00001);	4 9.59 0 7.89 0 8.99 0 11.79 8 7.79 8 8.09 0 11.29 0 11.39 0 13.09 5 110.09	IV, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.10 [-0.65, 0.45] 0.15 [-0.03, 0.33] -1.00 [-1.60, -0.40] -0.75 [-1.24, -0.27]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Study Arik e Bhatia Bha	et al 2020 a et al 2014 a et al 2014 delwal et al 2019 al 2010 in a et al 2015 r et al 2019 ttraman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z =	USG T <u>Mean</u> 1.2 1.8 0.8 2.4 2.1 1.9 1.7 2.2 1.4 5; Chi ² = 3.07 (P USG T <u>Mean</u>	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.9 0.4 1.2 = 60.54, = 60.54, SD TAP Bloc	k 1 2d 2 20 2 40 18 18 20 20 40 36 256 df = 5 2 ck Total	Mean SI 2.2 1.' 1.9 1.' 1.9 1.' 2.7 1.' 5.1 .' 3.4 1.' 2.3 0.' 2.4 1.' 0.(P < 0.0)	Tota 7 24 7 24 5 26 6 26 14 26 2 14 2 14 2 14 2 26 4 44 30 256 00001); 30	4 9.5% 0 7.8% 0 8.9% 0 11.7% 8 8.0% 0 11.2% 0 11.2% 0 11.3% 0 11.2% 0 11.3% 0 11.2% 1 1.3% 0 13.0% 5 100.0% 1 ² = 85%	IV, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.03, 0.33] -1.00 [-1.60, -0.40] -0.75 [-1.24, -0.27] -0.75 [Mean Difference t/V, Random, 95% Cl	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Study Arik e Bhatia Khanon Ra et a Salmin Tulga Venka Venka Venka Venka Total Hetero Total Metero Total Matrix et	et al 2020 a et al 2014 delwal et al 2019 al 2010 nia et al 2015 r et al 2015 r et al 2019 yest al 2019 yest al 2019 yest al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup t al 2020	USG T Mean 1.2 1.8 2.4 2.1 1.9 1.7 2.2 2.2 2.2 2.2 1.4 5; Chi ² = 3.07 (P USG T Mean 0.8	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.89 0.4 1.2 0.89 0.4 1.2 = 60.54, = = 50.54, = TAP Bloc SD 1 1	k otal 1 24 20 20 40 18 18 20 40 36 256 df = 5 256 ck Total 24	Mean SI 2.2 1. 1.9 1. 1.9 1. 2.7 1. 5.1 3.4 1. 2.3 0. 2.3 0. 2.4 1. 9 (P < 0.0	Tota 7 24 7 24 5 26 6 26 2 14 3 26 4 30 2 26 4 30 2 256 00001); 256 00001); 256 00001); 256	4 9.5% 0 7.8% 0 8.9% 0 11.7% 8 7.7% 8 8.0% 0 11.2% 0 11.3% 0 11.3% 5 100.0% 1 ² = 85% 1 ² = 85%	IV, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.65 [-4.54] -0.15 [-0.05, 0.45] 0.15 [-0.03, 0.33] -1.00 [-1.60, -0.40] -0.75 [-1.24, -0.27] -0.75 [-1.24, -0.27] -0.76 [-1.24, -0.27]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -10 Mean Difference IV, Random, 95% Cl
Study Arik e Bhatia Bhatia Bhatia Bhatia Bhatia Bhatia Bhatia Salmin Tulga Venka Vrasaj Venka Vrasaj D	et al 2020 et al 2014 et al 2014 delwal et al 2019 al 2010 in a et al 2015 r et al 2019 et al 2019 et al 2019 et al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup tal 2020 an et al 2015 et al 2015 et al 2014	USG T <u>Mean</u> 1.2 1.8 0.8 2.4 2.1 1.9 1.7 2.2 2.2 1.4 5; Chi ² = 3.07 (P USG T <u>Mean</u> 0.8 2.4 0.5 5, Chi ² = 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	CAP Bloc SD T 1.2 2 1.5 1.1 1.4 1.3 0.9 0.4 1.2 50 1.1 1.4 1.2 0.89 0.4 1.2 0.89 0.4 0.20 1.2 0.36	k 7 24 20 40 18 18 20 20 40 36 6df = 5 20 56 df = 5 5 ck Total 24 38 20 24 21 20 40 36 20 20 40 36 20 20 40 36 20 20 40 36	Mean SI 2.2 1.' 1.9 1.' 1.9 1.' 2.7 1.' 5.1 ' 3.4 1.' 2.3 0.' 2.3 0.' 2.4 1.' $0.'(P < 0.0)$ ' $O(P < 0.0)$ ' $O(P < 1.')$ ' $O(P < 1.')$ ' $O(P < 1.')$ ' $O(P = 1.')$ '	Tota 7 2-4 5 2 (2) 5 2 (2) 6 2 (2) 9 2 (2) 9 2 (2) 9 2 (2) 9 2 (2) 9 2 (2) 9 2 (2) 9 2 (2) 9 2 (2) 1 3 (2) 000001); 1 1 1	$\begin{array}{c} 4 & 9.59\\ 0 & 7.88\\ 0 & 8.99\\ 0 & 11.79\\ 8 & 7.79\\ 8 & 7.79\\ 8 & 8.09\\ 0 & 11.29\\ 0 & 11.29\\ 0 & 11.29\\ 0 & 11.39\\ 0 & 13.09\\ 5 & 110.09\\ 5 & 100.09\\ 1^2 = 85\% \end{array}$	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.10 [-0.50, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.15 [-0.05, 0.45] -0.16 [-0.02, 0.23] -0.05 [-1.02, 0.02] -0.40 [-1.02, 0.22] -0.50 [-1.02, 0.02] -0.50 [-1.02, 0.02]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Study Arik e Bhatia Khanci Ra et a Salmin Tulga Venka Venka Venka Venka Venka Venka Varsaj Total Arik et Basara Bhatia Bhatia	et al 2020 a et al 2014 delwal et al 2019 al 2010 nia et al 2015 r et al 2019 r et al 2019 r et al 2019 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup t al 2020 n et al 2015	USG T Mean 1.2 1.8 0.8 0.8 2.4 2.1 1.9 1.7 2.2 2.2 1.4 5; Chi ² = 5; Chi ² = 0.8 3.07 (P	TAP Bloc SD T 1.2 1.5 1.1 1.4 1.3 0.9 0.4 1.2 = 60.54, = 0.9 0.4 1.2 TAP Bloc SD 1.2	k otal 1 24 20 20 40 18 18 20 40 36 20 40 36 256 df = 9 20 40 36 20 20 20 40 36 20 20 20 20 20 20 20 20 20 20 20 20 20	Mean SI 2.2 1.' 1.9 1.' 1.9 1.' 2.7 1.' 5.1 ' 3.4 1.' 2.3 0.' 2.3 0.' 2.4 1.' $0.'(P < 0.0)$ ' $O(P < 0.0)$ ' $O(P < 1.')$ ' $O(P < 1.')$ ' $O(P < 1.')$ ' $O(P = 1.')$ '	Tota 7 2-4 5 22 5 22 6 2 9 24 4 30 256 2000001); 0 20000001); 1 1 1 1 1 1	$\begin{array}{c} 4 & 9.59\\ 0 & 7.88\\ 0 & 8.99\\ 0 & 11.79\\ 8 & 7.79\\ 8 & 7.79\\ 8 & 8.09\\ 0 & 11.29\\ 0 & 11.29\\ 0 & 11.29\\ 0 & 11.39\\ 0 & 13.09\\ 5 & 110.09\\ 5 & 110.09\\ 5 & 100.09\\ 1^2 = 85\%\\ \hline \end{array}$	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.20] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.10 [-0.65, 0.45] -0.05 [-1.24, -0.27] -0.75 [-1.24, -0.27] -0.75 [-1.24, -0.27] -0.50 [-1.02, 0.20] % -0.50 [-1.02, 0.02] % -0.50 [-1.02, 0.02] % -0.50 [-1.02, 0.06] % -0.50 [-1.02, 0.06] % -0.50 [-1.02, 0.06]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -20 -20 -20 -20 -20 -20 -20 -20
Study Arik e Bhatia Bhatia Bhatia Salmin Tulga Venka Vrasaj Venka Vrasaj Venka Vrasaj Total Hetere Test fr D <u>Study</u> Arik et Basara Bhatia Bhatia Bhatia	et al 2020 et al 2014 et al 2014 delwal et al 2019 al 2010 r et al 2015 r et al 2019 r et al 2019 rtaman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup t al 2020 nn et al 2015 et al 2014 et al 2014 et al 2014 et al 2016 elwal et al 2019	USG T <u>Mean</u> 1.2 1.8 0.8 0.8 2.4 2.1 1.7 2.2 1.4 5; Chi ² = 5; Chi ² = 0.15 0.8 2.9 0.15 0.8 0.23 2.9	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 0.9 0.89 0.4 1.2 = 60.54, = 0.74P Bloc SD 1 1.2 1 0.4 1.2 1 0.4 1.2 1 0.4 0.36 0.36 0.4 1.5	k otal 1 24 20 20 40 18 18 20 40 36 256 df = 5 256 df = 5 24 36 20 20 20 20 20 20 20 20 20 20 20 20 20	Mean SI 2.2 1.4 1.9 1.4 1.9 1.4 2.7 1.5 3.4 1.4 2.3 0.2 2.3 0.2 2.3 0.2 2.3 0.2 2.05 0.6 2.05 0.6 0 (P < 0.0)	Tota 7 2:2 5 2:0 6 2:4 9 1:4 9 1:4 9 2:1 9 2:0 1 3:0 0:00001); 1 0:00001); 1 0:00001); 1 0:00001); 1 1:0 1 1:0 .6 .5 .5	$\begin{array}{c} 4 & 9.59\\ 0 & 7.89\\ 0 & 8.99\\ 0 & 11.79\\ 8 & 7.79\\ 8 & 8.09\\ 0 & 11.29\\ 0 & 11.39\\ 0 & 13.09\\ 5 & 11.09\\ 5 & 11.09\\ 5 & 100.09\\ 1^2 = 85\%\\ \end{array}$	IV, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.16 [-1.6, -0.04] -0.10 [-0.5, 0.45] -0.15 [-0.65, 0.45] -0.15 [-0.03, 0.33] -1.00 [-1.60, -0.40] -0.75 [-1.24, -0.27] -0.75 [-1.24, -0.27] -0.50 [-1.02, 0.02] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.24] -0.50 [-1.02, 0.26] -0.50 [-1.02, 0.27]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl
Study Arik e Bhatia Bhatia Bhatia Bhatia Salmir Tulgaa Venka Vrasaj Total Heterr Test fr D <u>Study</u> Arik et Basara Bhatia Bhatia Bhatia	tt al 2020 a et al 2014 a et al 2014 delwal et al 2019 al 2010 in a et al 2015 r et al 2019 triaman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup tal 2020 n et al 2015 et al 2014 et al 2014 u et al 2016	USG T <u>Mean</u> 1.2 1.8 0.8 2.4 2.1 1.9 1.7 2.2 2.2 1.4 5; Chi ² = 5; Chi ² = 0.15 5; Chi ² = 0.05 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	TAP Bloc SD T 1.2 2. 1.1 1.4 1.3 0.9 0.4 1.2 TAP Bloc SD T 1.2 1.2 1.2 1.3 1.4 1.4 1.2 1.5 1.1 1.4 1.2 1.5 1.1 1.4 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.5 1.1 1.2 1.2 1.2 1.5 1.1 1.2 1.2 1.2 1.2 1.2 1.2 1.2	k oten in the image of the imag	Mean SI 2.2 $1.^{\circ}$ 1.9 $1.^{\circ}$ 1.9 $1.^{\circ}$ 2.7 $1.^{\circ}$ 2.7 $1.^{\circ}$ 5.1 $3.^{\circ}$ 2.3 $0.^{\circ}$ 2.3 $0.^{\circ}$ 2.3 $0.^{\circ}$ 2.3 $0.^{\circ}$ 2.3 $0.^{\circ}$ 2.4 $1.^{\circ}$ 0 $P < 0.0$ Control Mean 1.2 $1.^{\circ}$ 1.2 $1.^{\circ}$ 1.3 1.3 1.3 1.2	Tota 7 2:2 5 2:0 6 2:2 1 3:0 0 256 0 2:0 0 2:0 1 1 1 1 1 5 5 5 7 5	$\begin{array}{c} 4 & 9.59\\ 0 & 7.89\\ 0 & 8.99\\ 0 & 11.79\\ 8 & 7.79\\ 8 & 8.09\\ 0 & 11.29\\ 0 & 11.29\\ 0 & 11.39\\ 0 & 13.09\\ 5 & 11.09\\ 5 & 100.09\\ 1^2 = 85\% \end{array}$	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.10 [-0.65, 0.45] -0.15 [-0.36, 0.33] -1.00 [-1.60, -0.40] -0.75 [-1.24, -0.27] -0.75 [-1.24, -0.27] -0.50 [-1.10, 0.04] -0.75 [-1.24, -0.27] -0.50 [-1.02, 0.02] -0.50 [-1.02, 0.02] -0.50 [-1.02, 0.02] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] -0.50 [-1.06, 0.66] <td< td=""><td>Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI -10 Mean Difference IV, Random, 95% CI</td></td<>	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI -10 Mean Difference IV, Random, 95% CI
Study Arik e Bhatia Khanon Ra et a Salmin Tulga Venka	et al 2020 et al 2014 et al 2014 delwal et al 2019 al 2010 r et al 2015 r et al 2019 r et al 2019 rtaman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup t al 2015 et al 2014 et al 2014 et al 2014 et al 2016 elwal et al 2019 en et al 2015 en et al 2015	USG T Mean 1.2 1.8 0.8 0.8 0.4 2.4 2.4 1.7 2.2 1.4 5; Chi ² = 0.8 0.8 0.23 0.8 0.25 0.8 0.25 1.6 0.8 0.25 0.8 0.25 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 0.89 0.4 1.2 = 60.54, = 0.89 0.4 1.2 TAP Bloc SD 1 1.2 0.36 0.36 0.4 1.5 1.3 0.4 1.5 1.3 0.4	k otal 1 24 20 20 20 40 18 18 20 20 40 36 256 df = 2 20 20 40 36 256 df = 2 20 20 40 36 256 df = 2 20 20 40 36 256 20 20 20 20 20 20 20 20 20 20 20 20 20	Mean SI 2.2 1.19 1.9 1.19 1.9 1.1 1.9 1.1 1.9 1.1 1.9 1.1 1.9 1.1 3.4 1.1 2.3 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 1.2 1 1.2 1 1.3 1.3 1.3 1.2 2.7 1 4.4 1 1.4 4.4	Tota 7 2:2 5 2:0 6 2:1 44 3 9 2:0 2 4:4 4 3 0 2:0 0 2:0 0 2:0 0 2:0 1 3:1 1 5: .5 7: .6 1	$\begin{array}{c} 4 & 9.59\\ 0 & 7.89\\ 0 & 7.89\\ 0 & 8.99\\ 0 & 11.79\\ 8 & 7.79\\ 8 & 8.00\\ 0 & 11.29\\ 0 & 11.30\\ 0 & 11.30\\ 0 & 11.30\\ 0 & 11.09\\ 5 & 11.09\\ 5 & 100.09\\ 1^2 = 85\%\\ \begin{array}{c} 100.09\\ 1^2 = 85\%$	IV, Random, 95% Cl -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.16 [-1.6, -0.04] -0.10 [-1.60, -0.40] -0.10 [-0.55, 0.45] 0.15 [-0.03, 0.33] -1.00 [-1.60, -0.40] -0.75 [-1.24, -0.27] -0.50 [-1.60, -0.40] -0.50 [-1.26, -0.68] -0.50 [-1.26, -0.68] -0.50 [-1.62, -0.68] -0.50 [-1.62, -0.68] -0.50 [-1.62, -0.68] -0.50 [-1.62, -0.68] -0.50 [-1.28, -0.71] 0.10 [-0.56, 0.76] -0.20 [-0.89, 0.49] -2.80 [-3.78, -1.82] -0.60 [-1.22, 0.02]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl
Study Arik e Bhatia Bhatia Bhatia Bhatia Salmin Tulga Venka Vrasaj Venka Vrasaj Venka Vrasaj Rotal Heters Bhatia Bhatia Bhatia Bhatia Bhatia Bhatia Simuri Peters Ra et a Salmin	tt al 2020 et al 2014 et al 2014 delwal et al 2019 al 2010 in at al 2015 r et al 2019 ttraman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup tal 2020 an et al 2015 et al 2014 et al 2014 et al 2016 lelwal et al 2019 en et al 2015 tal 2020 an et al 2014 et al 2014 et al 2014 et al 2015 tal 2020 in at al 2015 tal 2014 r et al 2015 tal 2014 r et al 2015 tal 2014 r et al 2015 tal 2014 r et al 2015 tal 2014	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.7 2.2 2.2 1.4 5; Chi ² = 5; Chi ² = 5; Chi ² = 0.8 0.8 0.23 2.15 0.8 0.23 2.9 2.5 5.6 0.8 0.23 2.9 2.5 0.8 0.23 2.9 2.5 0.8 0.23 1.6 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 0.9 0.4 1.2 = 60.54, = 0.74 Bloc 0.89 0.4 1.2 1 0.2 1.2 0.4 1.2 0.30 0.36 0.36 0.4 1.5 1.4 0.9 0.2 0.6	k 7 24 20 20 20 40 18 8 20 20 40 36 256 df = 5 256 df = 5 20 20 20 40 36 256 20 40 36 256 36 20 20 40 40 36 256 30 20 20 20 20 20 20 20 20 20 20 20 20 20	Mean SI 2.2 1.1 1.9 1.1 1.9 1.1 1.9 1.1 1.9 1.1 1.9 1.1 1.9 1.1 2.7 1.1 2.3 0.1 2.30 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 1.2 1 1.3 1.3 1.3 1.2 1.2 1.2 2.7 1 1.4 1 1.4 1 1.4 1 1.4 1	Tota 7 2:5 2 5 2 1 44 11 9 2:6 0 2:0 1 3:1 2 14 4 3:1 2 1 1 2:5 0 2:1 1 1 1 5 .6 1 1 .6 1 .6 .6 1 .6 .7	$\begin{array}{c} 4 & 9.59\\ 0 & 7.89\\ 0 & 7.89\\ 0 & 8.99\\ 0 & 11.79\\ 8 & 7.79\\ 8 & 7.79\\ 8 & 8.00\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.29\\ 0 & 11.39\\ 0 & 11.29\\ $	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.66, -0.04] -0.10 [-0.65, 0.45] -0.15 [-0.03, 0.33] -1.00 [-1.60, -0.40] -0.75 [-1.24, -0.27] -0.40 [-1.02, 0.02] -0.50 [-1.26, -0.68] -0.50 [-1.23, -0.71] -0.50 [-1.22, 0.02] -1.5 [-1.62, -0.68] -0.30 [-0.78, 1.23] -0.30 [-0.27, 0.47]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Study Arik e Bhatia Bhatia Bhatia Salmin Tulgay Venka	et al 2020 et al 2014 et al 2014 delwal et al 2019 al 2010 ni at al 2015 r et al 2019 r et al 2019 r traman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46 for overall effect: Z = or Subgroup t al 2015 et al 2014 et al 2014 et al 2014 et al 2015 en et al 2015 en et al 2015 t al 2015 t al 2015 t al 2015 t al 2019 er et al 2019 er et al 2019	USG T Mean 1.2 1.8 2.4 2.1 1.7 2.2 1.4 5; Chi ² = 5; Chi ² = 0.15 0.8 0.23 0.15 0.8 0.23 2.9 2.5 1.6 0.8 0.24 0.12 0.15 0.8 0.8 0.2 0.15 0.8 0.8 0.15 0.8 0.8 0.2 0.15 0.8 0.8 0.8 0.15 0.8 0.8 0.8 0.8 0.8 0.15 0.8 0.8 0.8 0.8 0.8 0.8 0.15 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	TAP Bloc sb T 1.2 2 1.5 1.1 1.3 0.9 0.4 1.2 = 60.54, = 0.36 0.8 0.4 1.2 0.36 0.8 0.4 1.2 0.36 0.8 0.4 1.2 0.36 0.4 1.2 0.36 0.4 1.5 1.3 1.4 0.9 0.2 0.6	k otal 1 24 20 40 18 8 20 20 40 36 256 df = 2 256 df = 2 256 df = 2 24 38 20 20 30 30 20 30 30 30 37 18 8 18 20 20 40 37 20 40 37 20 20 20 20 20 20 20 20 20 20 20 20 20	Mean SI 1.2 1. 1.9 1. 1.9 1. 1.9 1. 1.9 1. 2.7 1. 3.4 1. 2.3 0. 2.3 0. 2.3 0. 2.3 0. 2.3 0. 2.3 0. 2.3 0. 2.3 0. 2.3 0. 2.3 0. 2.3 0. 2.4 1. 0 (P < 0.0	Tota 7 22.5 2 20.5 2 20.5 2 20.5 2 20.5 2 20.2 2 20.2 2 20.2 2 20.2 2 20.0 2 20.0 0<	$\begin{array}{c} 4 & 9.59\\ 0 & 7.89\\ 0 & 7.89\\ 0 & 8.99\\ 0 & 11.79\\ 8 & 7.79\\ 8 & 8.00\\ 0 & 11.29\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.29\\$	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.50 [-1.6, -0.04] -0.10 [-0.65, 0.45] -0.15 [-0.26, 0.44] -0.10 [-1.6, -0.04] -0.10 [-1.64, -0.27] -0.75 [-1.24, -0.27] -0.75 [-1.24, -0.27] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.22] -0.50 [-1.02, 0.22] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.23] -0.50 [-1.02, 0.23] -0.50 [-1.23, 0.33] -0.50 [-1.23, 0.33] -0.50 [-1.23, 0.33] -0.50 [-1.23, 0.33] 0.02 [-0.58, 0.49] -0.20 [-0.28, 0.23] 0.03 [-0.27, 0.47] 0.30 [-0.27, 0.47]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -10 -10 -10 -10 -10 -10 -10 -10
Study Arik e Bhatia Bhatia Bhatia Bhatia Vrasaj Tulgay Vrasaj Tulgay Vrasaj D Study Arik et Basara Bhatia Breazz, Khand Peters- Ra et a Salmin Shin et	tt al 2020 et al 2014 et al 2014 delwal et al 2019 al 2010 in at al 2015 r et al 2019 ttraman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup tal 2020 an et al 2015 et al 2014 et al 2014 et al 2016 lelwal et al 2019 en et al 2015 tal 2020 an et al 2014 et al 2014 et al 2014 et al 2015 tal 2020 in at al 2015 tal 2014 r et al 2015 tal 2014 r et al 2015 tal 2014 r et al 2015 tal 2014 r et al 2015 tal 2014	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.7 2.2 2.2 1.4 5; Chi ² = 5; Chi ² = 5; Chi ² = 0.8 0.8 0.23 2.15 0.8 0.23 2.9 2.5 5.6 0.8 0.23 2.9 2.5 0.8 0.23 2.9 2.5 0.8 0.23 1.6 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8 0.8	TAP Bloc SD T 1.2 2 1.5 1.1 1.4 0.9 0.4 1.2 = 60.54, = 0.74 Bloc 0.89 0.4 1.2 1 0.2 1.2 0.4 1.2 0.30 0.36 0.36 0.4 1.5 1.4 0.9 0.2 0.6	k 7 24 20 20 20 40 18 8 20 20 40 36 256 df = 5 256 df = 5 20 20 20 40 36 256 20 40 36 256 36 20 20 40 40 36 256 30 20 20 20 20 20 20 20 20 20 20 20 20 20	Mean SI 2.2 1.1 1.9 1.1 1.9 1.1 1.9 1.1 1.9 1.1 1.9 1.1 1.9 1.1 2.7 1.1 2.3 0.1 2.30 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 2.05 0.2 1.2 1 1.3 1.3 1.3 1.2 1.2 1.2 2.7 1 1.4 1 1.4 1 1.4 1 1.4 1	D Tota 7 2-1 7 2-1 7 2-1 6 2-1 9 2-1 9 2-1 9 2-1 9 2-1 9 2-1 9 2-1 9 2-1 9 2-1 9 2-1 9 2-1 9 2-1 10 1 11 1 15 5 .6 .7 .6 .5 .7 .6 .7 .6 .7 .6 .6 .5	$\begin{array}{c} 4 & 9.59\\ 0 & 7.89\\ 0 & 7.89\\ 0 & 8.99\\ 0 & 11.79\\ 8 & 7.79\\ 8 & 7.79\\ 8 & 8.00\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.39\\ 0 & 11.29\\ 0 & 11.39\\ 0 & 11.29\\ $	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, 0.18] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.44] -0.60 [-1.16, -0.04] -0.15 [-0.36, 0.45] -0.15 [-0.30, 0.33] -1.00 [-1.64, -0.04] -0.75 [-1.24, -0.27] -0.40 [-1.02, 0.02] -0.40 [-1.02, 0.02] -0.50 [-1.66, -0.64] -0.50 [-1.02, 0.02] -0.50 [-1.22, 0.02] -0.50 [-1.02, 0.02] -0.50 [-1.66, 0.66] -0.50 [-1.68, 0.49] -0.50 [-1.68, 0.49] -0.50 [-1.68, 0.49] -0.50 [-1.02, 0.02] -0.50 [-1.68, 0.49] -0.50 [-1.68, 0.49] -0.50 [-1.68, 0.49] -0.60 [-1.22, 0.02] -0.60 [-1.22, 0.02] 0.010 [-0.57, 0.28] 0.000 [-0.72, 0.28] 0.000 [-0.27, 0.23] 0.010 [-0.27, 0.23] 0.020 [-0.72, 0.28] 0.030 [-0.77, 0.27]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Study Arik e Bhatia Bhatia Bhatia Bhatia Salmin Tulga Venka Vrasaj Venka Vrasaj D <u>Study</u> Arik et Basara Bhatia Breazz Khand Peters Shin et Tulgar Venka Vrasaj	tt al 2020 a et al 2014 a et al 2014 delwal et al 2019 al 2010 in a et al 2015 r et al 2019 ttraman et al 2020 jkov et al 2018 (95% CI) ogeneity: Tau ² = 0.46 or overall effect: Z = or Subgroup tal 2020 n et al 2015 et al 2014 et al 2014 et al 2016 lelwal et al 2016 lelwal et al 2016 at 2014 r et al 2015 tal 2020 r et al 2016 r et al 2016 r et al 2016 r et al 2017 tal 2020 r et al 2017 r et al 2019 r et al 2019 r et al 2019 r et al 2019 r et al 2020	USG T Mean 1.2 1.8 0.8 2.4 2.1 1.7 2.2 2.2 1.4 5; Chi ² = 2.5 3.07 (P USG T Mean 0.8 8 2.1 5 0.8 2.2 1.4 0.8 8 2.2 1.4 0.8 8 2.1 0.8 8 2.9 1.7 1.7 2.2 2.2 1.4 5; Chi ² = 1.6 8 2.1 1.7 2.2 2.1 1.4 5; Chi ² = 1.6 8 2.1 1.7 2.2 2.2 1.4 5; Chi ² = 1.6 8 2.1 1.7 2.2 2.2 1.4 5; Chi ² = 1.6 8 2.1 1.7 1.7 2.2 2.2 1.4 5; Chi ² = 1.6 8 2.7 1.7 1.7 2.2 2.2 1.4 5; Chi ² = 1.6 8 2.7 1.7 1.7 2.2 2.2 1.4 5; Chi ² = 1.6 1.7 1.7 2.2 2.2 1.4 5; Chi ² = 1.6 1.7 1.7 2.2 2.2 1.4 5; Chi ² = 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6 1.6	TAP Bloc SD T 1.2 2 1.5 1.5 1.1 1.4 0.9 0.89 0.4 1.2 = 0.4 1.2 TAP Bloc SD - 1 2.2 0.36 0.36 0.4 1.5 1.3 1.4 0.9 0.2 0.6 0.5 1	k 10 124 20 40 20 40 20 40 36 256 df = 9 20 40 36 256 df = 9 20 40 36 256 df = 9 20 40 36 256 40 36 20 40 36 257 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 40 36 20 20 40 36 20 20 40 36 20 20 20 20 40 36 20 20 20 20 20 20 20 20 20 20	Mean SI 2.2 1. 1.9 1. 1.9 1. 1.9 1. 1.9 1. 1.9 1. 1.9 1. 1.9 1. 2.7 1. 2.3 0. 2.05 0. 2.4 1. (P < 0.0	D Tota 7 2 7 2 6 2 6 2 7 2 1 1 0 2 1 2 0 2 0 2 1 3 1 5 .6 5 .6 5 .6 5 .6 5 .4 3	4 9.59 0 7.89 0 7.89 0 11.79 8 8.00 0 11.79 8 8.00 0 11.29 0 11.39 5 100.09 5 100.09 1 ² 85% cal Weig 24 6. 38 7. 20 7. 20 7. 20 7. 20 7. 20 7. 20 7. 20 7. 20 7. 20 7. 20 7. 20 7. 40 8. 38 7. 78 100.6	IV, Random, 95% CI -1.00 [-1.83, -0.17] -0.10 [-1.20, 1.00] -1.10 [-2.03, -0.17] -0.30 [-0.78, -0.17] -3.00 [-4.13, -1.87] -1.50 [-2.56, -0.41] -0.60 [-1.16, -0.04] -0.10 [-1.05, 0.45] 0.15 [-0.03, 0.33] -1.00 [-1.66, -0.40] -0.75 [-1.24, -0.27] -0.40 [-1.02, 0.02] -0.50 [-1.26, -0.68] -0.50 [-1.26, -0.68] -0.50 [-3.78, -1.82] -0.60 [-3.7, 0.73] -0.50 [-1.22, 0.02] -0.50 [-1.22, 0.02] -0.50 [-1.22, 0.02] 0.10 [-0.58, 0.76] 0.00 [-0.28, 0.23] 0.10 [-0.27, 0.47] 0.30 [-0.70, 0.67] 0.30 [-0.77, 0.68] 0.10 [-0.27, 0.47] 0.30 [-0.77, 0.68] 0.30 [-0.77, 0.68] -1.20 [-1.75, -0.65] % -0.53 [-0.83, -0.23]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI -10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI -10 -10 -10 -10 -10 -10 -10 -10

after operation.

Α								
Charles and Carls and an		FAP Block		Contro		W	Mean Difference	Mean Difference
Study or Subgroup Arik et al 2020	Mean 3.2			6.3 2.3	10tai 24	8.0%	IV, Random, 95% CI -3.10 [-4.37, -1.83]	IV, Random, 95% Cl
Basaran et al 2015	6.2			7.1 2	38		-0.90 [-1.61, -0.19]	-
Bhatia et al 2014	1.3			3.4 1.5	20		-2.10 [-2.89, -1.31]	-
Bhatia et al 2014	2			3.4 1.5	20		-1.40 [-2.30, -0.50]	-
Breazu et al 2014	1.3			3.1 1.2	30		-1.80 [-2.38, -1.22]	-
Breazu et al 2017	1.5		25	3 1	25		-2.00 [-2.55, -1.45]	-
Khandelwal et al 2019	3.7			2.5 1.5	40	9.6%	1.20 [0.54, 1.86]	-
Petersen et al 2012	1.2			2.3 1.3	37		-1.10 [-1.65, -0.55]	-
Shin et al 2014	4.7			7.5 0.5	15		-2.80 [-3.20, -2.40]	-
Tulgar et al 2019 Tulgar et al 2019	1.5 1.9			4.5 2.5 4.5 2.5	20 20		-3.00 [-4.43, -1.57] -2.60 [-4.15, -1.05]	<u> </u>
Total (95% CI)	1.9		89	4.5 2.5			-1.72 [-2.48, -0.97]	
Heterogeneity: $Tau^2 =$	1 43 [.] Chi ²			10 (P <			-	······
Test for overall effect:				10 (1 <	0.0000	1), 1 = 57	270	
			/					Favours USG TAP Block Favours Control
В								
Study or Subgroup	USG T Mean	AP Block SD Tot	al Me	Contro an SD		Weight	Mean Difference IV, Random, 95% CI	Mean Difference IV, Random, 95% Cl
Arik et al 2020	1.7			2.6 1.6				-
Bhatia et al 2014	2.8			3.3 1.8				-+
Bhatia et al 2014	1.7		20	2 1.1				+
Breazu et al 2016	0.7			2.6 0.9			-1.90 [-2.33, -1.47]	-
Breazu et al 2017	1		25	2 1				*
Khandelwal et al 2019	2.4			1.4 1.5			• • •	*
Petersen et al 2012	2.5			3.2 1				-
Shin et al 2014	4.7			4.3 0.4				
Tulgar et al 2019 Tulgar et al 2019	2.1 1.6		20 20	3 1.6 2.3 1.3				-
Venkatraman et al 2020				1.2 0.05				
Total (95% CI)		29	91		291	100.0%	-0.53 [-0.94, -0.13]	•
Heterogeneity: $Tau^2 = 0$.		= 105.22, 0	df = 1	0 (P < 0.	00001);	$I^2 = 90\%$		
Test for overall effect: Z		= 105.22, 0	df = 1	0 (P < 0.	00001);	$l^2 = 90\%$		-10 -5 0 5 10 Favours USG TAP Block Favours Control
Test for overall effect: Z	= 2.58 (P	= 105.22, o = 0.010)		Contro	I		Mean Difference	Favours USG TAP Block Favours Control Mean Difference
Test for overall effect: Z C Study or Subgroup	= 2.58 (P USG T, <u>Mean</u>	= 105.22, d = 0.010) AP Block SD Tot	al Me	Contro an SD	l Total	Weight	IV, Random, 95% CI	Favours USG TAP Block Favours Control
Test for overall effect: Z C Study or Subgroup Arik et al 2020	= 2.58 (P USG T, <u>Mean</u> 2.4	= 105.22, o = 0.010) AP Block <u>SD Tot</u> 1.5 2	al Me	Contro an SD 2.9 1.8	Total	Weight 11.7%	IV, Random, 95% CI -0.50 [-1.44, 0.44]	Favours USG TAP Block Favours Control Mean Difference
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014	= 2.58 (P USG T Mean 2.4 3	= 105.22, o = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2	al Me 24	Contro ean SD 2.9 1.8 3.4 2	l Total 24 20	Weight 11.7% 8.2%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04]	Favours USG TAP Block Favours Control Mean Difference
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014	= 2.58 (P USG T. <u>Mean</u> 2.4 3 1.4	= 105.22, 6 = 0.010) FAP Block SD Tot 1.5 2 2.6 2 1.8 2	al Me 24 : 20 :	Contro an SD 2.9 1.8 3.4 2 3.4 2	Total 24 20 20	Weight 11.7% 8.2% 9.9%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82]	Favours USG TAP Block Favours Control Mean Difference
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016	= 2.58 (P USG T. <u>Mean</u> 2.4 3 1.4 0.5	AP Block SD Tot 1.5 2 2.6 2 1.8 2 0.7 3	al Me 24 20 30	Contro can SD 2.9 1.8 3.4 2 3.4 2 1.8 1	Total 24 20 20 30	Weight 11.7% 8.2% 9.9% 15.5%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86]	Favours USG TAP Block Favours Control Mean Difference
Test for overall effect: Z C <u>Study or Subgroup</u> Arik et al 2020 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018	= 2.58 (P USG T. Mean 2.4 3 1.4 0.5 2	AP Block SD Tot 1.5 2 1.8 2 0.7 3 1 2	al Me 24 : 20 : 30 : 25 :	Contro san SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2	Total 24 20 20 30 25	Weight 11.7% 8.2% 9.9% 15.5% 12.2%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88]	Favours USG TAP Block Favours Control Mean Difference
C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019	USG T. Mean 2.4 3 1.4 0.5 2 1.2	AP Block SD Tot 1.5 2 2.6 2 1.8 2 0.7 3 1 2 1.5 4	al Me 24 20 20 25 40	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5	Total 24 20 20 30 25 40	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66]	Favours USG TAP Block Favours Control Mean Difference
C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Breazu et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019	= 2.58 (P USG T, <u>Mean</u> 2.4 3 1.4 0.5 2 1.2 2.1	= 105.22, (= 0.010) AP Block SD Tot 1.5 2 2.6 2 1.8 2 0.7 3 1 2 1.5 4 0.5 2	al Me 24 20 30 25 40 20	Contro tan SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2	Total 24 20 20 30 25 40 20	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 14.6%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03]	Favours USG TAP Block Favours Control Mean Difference
C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019	USG T. Mean 2.4 3 1.4 0.5 2 1.2	= 105.22, (= 0.010) AP Block SD Tot 1.5 2 2.6 2 1.8 2 0.7 3 1 2 1.5 4 0.5 2	al Me 24 20 30 25 40 20	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5	Total 24 20 20 30 25 40	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66]	Favours USG TAP Block Favours Control Mean Difference
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2014 Dost et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI)	USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5	= 105.22, 6 = 0.010) AP Block SD Tot 1.5 2 2.6 2 1.8 2 0.7 3 1 2 1.5 4 0.5 2 1 2 1 2	al Me 24 : 20 : 30 : 25 : 40 : 20 : 20 : 20 : 20 : 20 :	Control san SD 2.9 1.8 3.4 2 1.8 1 1.2 1.5 2.7 1.2 2.7 1.2	Total 24 20 20 30 25 40 20 20 199	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 14.6% 13.7% 100.0%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03]	Favours USG TAP Block Favours Control Mean Difference
C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = C	USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ²	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 0.7 3 1.8 2 0.7 3 1.5 4 0.5 2 1 2 1.5 4 9 5 2 1 2 1 2 1 2 1 2	al Me 24 : 20 : 30 : 25 : 40 : 20 : 20 : 20 : 20 : 20 :	Control san SD 2.9 1.8 3.4 2 1.8 1 1.2 1.5 2.7 1.2 2.7 1.2	Total 24 20 20 30 25 40 20 20 199	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 14.6% 13.7% 100.0%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48]	Favours USG TAP Block Favours Control
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2014 Dost et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI)	USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ²	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 0.7 3 1.8 2 0.7 3 1.5 4 0.5 2 1 2 1.5 4 9 5 2 1 2 1 2 1 2 1 2	al Me 24 : 20 : 30 : 25 : 40 : 20 : 20 : 20 : 20 : 20 :	Control san SD 2.9 1.8 3.4 2 1.8 1 1.2 1.5 2.7 1.2 2.7 1.2	Total 24 20 20 30 25 40 20 20 199	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 14.6% 13.7% 100.0%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48]	Favours USG TAP Block Favours Control
C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = 0 Test for overall effect: 2	USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ²	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 0.7 3 1.8 2 0.7 3 1.5 4 0.5 2 1 2 1.5 4 9 5 2 1 2 1 2 1 2 1 2	al Me 24 : 20 : 30 : 25 : 40 : 20 : 20 : 20 : 20 : 20 :	Control san SD 2.9 1.8 3.4 2 1.8 1 1.2 1.5 2.7 1.2 2.7 1.2	Total 24 20 20 30 25 40 20 20 199	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 14.6% 13.7% 100.0%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl
C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = C	USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ²	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 0.7 3 1 2 1.5 4 0.5 2 1 2 19 = 32.71, 1 P = 0.10)	al Me 24 20 20 20 20 20 20 20 20 20 20 20 20 20	Control san SD 2.9 1.8 3.4 2 1.8 1 1.2 1.5 2.7 1.2 2.7 1.2	Total 24 20 20 25 40 20 20 199 001); 1 ²	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 14.6% 13.7% 100.0% = 79%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl
C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = 0 Test for overall effect: 2	USG T. <u>Mean</u> 2.4 3 1.4 0.5 2 1.2 2.5 0.50; Chi ² = 1.66 (f) USG TA <u>Mean</u>	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.5 4 0.7 3 1 2 1.5 4 0.5 2 1	al Me 24 : 20 : 20 : 99 : La	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2 (P < 0.0 p Contro n SD	Total 24 20 20 30 25 40 20 001); l ²	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.6% 13.7% 100.0% = 79%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% Cl) Heterogeneity: Tau ² = C Test for overall effect: Z D Study or Subgroup Arik et al 2020	= 2.58 (P USG T. <u>Mean</u> 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ² 2 = 1.66 (I USG TA <u>Mean</u> 1.4	= 105.22, 6 = 0.010) AP Block SD Tot 1.5 2 2.6 2 1.8 2 0.7 3 1 2 1.5 4 0.5 2 1	al Me 24 20 20 25 20 20 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 40 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1.2 1.2 2.7 1.2 (P < 0.0	Total 24 20 30 25 40 20 20 199 001); l ² If fotal 20	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 13.7% 100.0% = 79% Weight 7.6%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] Mean Difference V, Random, 95% Cl -0.40 [-1.06, 0.26]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = (Test for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2015	= 2.58 (P USG T. <u>Mean</u> 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ² 2 = 1.66 (I USG TA <u>Mean</u> 1.4 3	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 0.7 3 1 2 1.5 4 0.5 2 1 2 19 = 32.71, 0 P Block <u>SD Total</u> 1.3 24 1.3 24	al Me 24 20 20 20 20 20 40 20 40 99 99 40 41 7 40 1 1 3 3	Contro an SD 2.9 1.8 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2 (P < 0.0 p Contro n SD 8 1 8 1	Total 24 20 30 25 30 20 20 199 001); l ² 199 001); l ² 20 20 30 20 20 20 20 20 20 20 20 20 20 20 20 20	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.6% 13.7% 100.0% = 79% Veight 7.6% 9.0%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] Mean Difference V, Random, 95% Cl -0.40 [-1.06, 0.26] 0.80 [-1.30, -0.30]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Total (95% Cl) Heterogeneity: Tau ² = (Test for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014	USG T. <u>Mean</u> 2.4 3 1.4 0.5 2 2.1 2.5 0.50; Chi ² 2 = 1.66 (l USG TA <u>Mean</u> 1.4 <u>Mean</u> 1.4 <u>Mean</u>	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.5 2 0.7 3 1 2 1.5 2 1.8 2 0.7 3 1 2 1.5 2 1.8 2 0.7 3 1 2 1.5 2 1.8 2 0.7 3 1 2 1.8 2 1.8 2 0.7 3 1 2 1.8 2 1	al Me 24 20 20 20 20 20 20 40 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro can SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2 (P < 0.0 p Contro n SD 8 1 5 1.4	Total 24 20 30 25 40 20 20 199 001); 1 ² 10 10 10 10 10 10 10 10 10 10 10 10 10	Weight 11.7% 8.2% 9.3% 15.5% 12.2% 14.6% 13.7% 100.0% = 79% Veight 1.6% 9.0% 9.0% 7.1%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] Mean Difference V, Random, 95% Cl -0.40 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Breazu et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = 0 Test for overall effect: 2 D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Bhatia et al 2014	= 2.58 (P) USG T. Mean 2.4 3 1.4 3 1.2 2.5 0.50; Chi ² = 1.66 (f) USG TA Mean 1.4 3 0.5 1.9	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.8 2 1.5 4 0.7 3 1 2 1.5 4 0.5 2 1	al Me 24 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro an SD 2.9 1.8 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2 (P < 0.0 p Contro n SD 8 1 8 1 8 1 5 1.4	Total 24 20 20 30 25 40 20 20 199 0001); l ² 199 0001); l ² 24 38 20 20	Weight 11.7% 8.2% 9.55% 12.2% 14.6% 13.7% 100.0% = 79% Veight 7.6% 9.0% 7.1% 6.1%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] Mean Difference V, Random, 95% CI -0.40 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = C Test for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Bhatia et al 2014	= 2.58 (P USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ² 2 = 1.66 (I USG TA Mean 1.4 3 0.5 1.9 0.2	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 0.7 3 1 2 1.8 2 0.7 3 1 2 1.5 4 0.5 2 1 3 2.4 12 1.5 4 0.5 2 1.5 4 0.5 1.5 4 0.5 1.5 4 0.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1	al Me 24 : 20 : 20 : 20 : 20 : 20 : 20 : 20 : 20	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 2.7 1.2 (P < 0.0	Total 24 20 30 25 40 20 20 199 0011); 12 I 24 38 20 30 20	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 13.7% 100.0% = 79% Veight 7.6% 9.0% 7.1% 6.1% 10.8%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] Mean Difference V, Random, 95% Cl -0.40 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24] 1.00 [-1.31, -0.69]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Breazu et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = 0 Test for overall effect: 2 D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Bhatia et al 2014	= 2.58 (P USG T. <u>Mean</u> 2.4 3 1.4 0.5 2 2.1 2.5 0.50; Chi ² 2 = 1.66 (l USG TA <u>Mean</u> 1.4 3 0.5 1.9 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.5 4 0.5 2 1 2 1.5 4 0.5 2 1 2 19 = 32.71, 6 P = 0.10) P Block <u>SD Total</u> 1.3 24 1.2 38 0.8 20 1.3 24 0.5 30 0.13 25	al Me 24 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro can SD 2.9 1.8 3.4 2 3.4 2 1.2 1.5 2.7 1.2 (P < 0.0 p Contro n SD 8 1 5 1.4 5 1.4 5 1.4 5 1.4 5 1.4 5 1.4 5 1.4	Total 24 20 20 30 25 40 20 20 199 0001); l ² 199 0001); l ² 24 38 20 20	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.6% 13.7% 100.0% = 79% Veight 7.6% 9.0% 7.6% 9.0% 7.1% 6.1% 10.8% 12.1%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] Mean Difference V, Random, 95% CI -0.40 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Total (95% Cl) Heterogeneity: Tau ² = 0 Totst for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018	= 2.58 (P USG T. <u>Mean</u> 2.4 3 1.4 0.5 2 2.1 2.5 0.50; Chi ² 2 = 1.66 (l USG TA <u>Mean</u> 1.4 3 0.5 1.9 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.5 4 0.7 3 1 2 1.5 4 0.5 2 1	al Me 24 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2 (P < 0.0 p Contro n SD 8 1 5 1.4 5 1.4 5 1.4 2 0.7 1 0.2 1 2.2	Total 24 20 30 25 40 20 20 1001); 12 1 24 20 20 30 30 38 20 20 33 30 25	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.6% 13.7% 100.0% = 79% Veight 1. 7.6% 9.0% 7.1% 6.1% 10.8% 12.1% 5.2%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] -0.49 [-1.06, 0.09] -0.40 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24] 1.00 [-1.31, -0.69] 0.10 [-0.20, -0.00]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = (Test for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2014 Bhatia et al 2014 Standelwal et al 2019	= 2.58 (P USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ² 2 = 1.66 (f) USG TA Mean 1.4 3 0.5 2 1.2 2.1 2.5 0.50; Chi ² 2 = 1.66 (f) USG T. Mean 1.4 3 0.5 2 1.2 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.5 2 1.5 2 0.7 3 1 2 1.5 2 1.8 2 0.7 3 1 2 1.5 2 1.8 2 1.9 1 1.2 2 1.8 2 1.8 2 1.9 1 1.2 2 1.3 2 1.2 3 8 0.8 20 1.3 2 2 1.5 3 2 2 2.2 40 1.3 2 2 1.5 3 2.2 40 1.3 2 2.2 40 1.3 2 2.2 40 1.3 2 2.2 40 1.3 2 2.2 40 1.3 2 2.2 40 1.5 2 2.2 40 1.5 2 2.2 40 1.5 2 2.2 40 1.5 2 2.2 40 1.5 2 2.2 40	al Mee 24 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2 (P < 0.0 p Contro n SD 8 1 5 1.4 5 1.4 5 1.4 2 0.7 1 0.2 1 2.2	Total 24 20 20 20 20 20 20 199 0001); 1 ² 7011 7011 24 38 20 20 20 30 20 20 30 40	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 13.7% 100.0% = 79% Veight 7.6% 9.0% 7.1% 6.1% 10.8% 12.1% 5.2% 9.4%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] Mean Difference V, Random, 95% Cl -0.40 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24] 1.00 [-1.31, -0.69] 0.10 [-0.20, -0.00] 0.00 [-0.96, 0.96]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = C Test for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Bhatia et al 2014 Bhatia et al 2014 Bhatia et al 2018 Khandelwal et al 2019 Petersen et al 2012	= 2.58 (P USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ² 2 = 1.66 (I USG TA Mean 1.4 3 0.5 1.9 0.2 0.9 0 2.1 2.7 2.9	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.8 2 2.6 2 1.8 2 1.5 4 0.7 3 1 2 1.5 4 0.5 2 1 2 1 2 1.2 3 8 0.3 24 1.3 24 1	al Me 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2 (P < 0.0 (P < 0.0 (P < 0.0 (P < 0.0 1.2 1.5 2.7 1.2 (P < 0.0 1.2 1.2 2.7 1.2 (P < 0.0 (P < 0.0)) (P < 0.0 (P < 0.0)) (P < 0.0) (P < 0.0)) (P < 0.0) (P < 0.0)) (P < 0.0) (P < 0.0)) (P < 0.0)) (P < 0.0) (P < 0.0)) (P < 0.0))	Total 24 20 30 25 40 20 20 20 20 20 20 20 20 20 20 20 20 30 25 40 31	Weight 11.7% 8.2% 9.2% 15.5% 12.2% 14.6% 13.7% 100.0% = 79% Veight 1.6% 9.0% - 7.1% 6.1% 10.8% 12.1% 5.2% 9.4% 11.4%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] -0.49 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24] 1.00 [-1.31, -0.69] 0.10 [-0.20, -0.00] 0.00 [-0.96, 0.96] -0.10 [-0.56, 0.36]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Total (95% Cl) Heterogeneity: Tau ² = (Test for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Petersen et al 2012 Shin et al 2012	USG T. <u>Mean</u> 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ² 2 = 1.66 (l USG TA <u>Mean</u> 1.4 3 0.5 1.9 0.2 0.9 0 2.1 2.7 2.9 2 2	= 105.22, 6 = 0.010) AP Block SD Tot 1.5 2 2.6 2 0.7 3 1 2 1.5 2 0.7 3 1 2 1.5 4 0.5 2 1 2 1.5 4 1.5 4 1.5 4 1.2 1 9 Block SD Total 1.3 24 1.2 38 0.8 20 1.3 20 0.5 30 0.5 25 2.2 40 1.3 7 1.3 24 25 40 1.3 7 7 2.2	al Mee 24 20 30 20 30 20 30 20 20 30 20 30 20 30 20 30 20 30 20 30 30 20 30	Contro an SD 2.9 1.8 3.4 2 3.4 2 1.8 1 1 2 1.2 1.5 2.7 1.2 (P < 0.0 (P < 0.0 (P < 0.0 (P < 0.0 1.2 1.5 2.7 1.2 (P < 0.0 1.2 1.2 2.7 1.2 (P < 0.0 (P < 0.0)) (P < 0.0 (P < 0.0)) (P < 0.0) (P < 0.0)) (P < 0.0) (P < 0.0)) (P < 0.0) (P < 0.0)) (P < 0.0)) (P < 0.0) (P < 0.0)) (P < 0.0))	Total 24 20 20 30 20 20 199 001); l ² 20 199 001); l ² 20 20 38 20 20 30 25 40 37 15	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.6% 13.7% 100.0% = 79% Veight 1 10.8% 12.1% 10.8% 12.1% 9.9% 11.4%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] -0.49 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24] 1.00 [-1.31, -0.69] 0.10 [-0.20, -0.00] 0.00 [-0.96, 0.96] -0.10 [-0.56, 0.36] -0.10 [-0.33, 0.13]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = C Test for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Bhatia et al 2014 Bhatia et al 2014 Bhatia et al 2012 Shin et al 2019 Tulgar et al 2019	= 2.58 (P USG T. Mean 2.4 3 1.4 0.5 2 1.2 2.1 2.5 0.50; Chi ² 2 = 1.66 (I USG TA Mean 1.4 3 0.5 1.9 0.2 0.9 0 2.1 2.7 2.9 2	= 105.22, 6 = 0.010) AP Block SD Tot 1.5 2 2.6 2 0.7 3 1 2 1.5 2 4 0.5 2 1.5 4 0.5 2 1 2 1.5 4 0.5 2 1.5 2 1 2 1 9 Block SD Total 1 2 1.3 24 1.2 38 0.8 20 0.13 20 0.5 30 0.15 25 2.2 40 1 37 0.2 15 0.5 20 0.4 20 0.4 20 0.4 20 0.4 20 0.4 20 0.4 20 0	al Me 24 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro san SD 2.9 1.8 3.4 2 1.8 1 1.2 1.5 2.7 1.2 2.7 1.2 2.7 1.2 2.7 1.2 1.8 1 8 1 5 1.4 5 1.4 5 1.4 5 1.4 5 1.4 5 1.4 9 0.6	Total 24 20 30 25 40 20 199 001); 12 24 38 20 20 20 30 25 40 20 30 25 40 30 25 40 30 25 40 37 15 20 20	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.0% 13.7% 100.0% = 79% Veight 7.6% 9.0% 7.1% 6.1% 10.8% 9.4% 11.4% 10.5%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] -0.49 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24] 1.00 [-1.31, -0.69] 0.10 [-0.20, -0.00] 0.00 [-0.96, 0.96] -0.10 [-0.56, 0.36] -0.10 [-0.54, 0.44] 0.40 [0.08, 0.72]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = 0 Total (95% CI) Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Breazu et al 2015 Bhatia et al 2014 Breazu et al 2015 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Petersen et al 2012 Shin et al 2014 Tulgar et al 2019 Tulgar et al 2019 Tulgar et al 2019 Tulgar et al 2019 Tulgar et al 2014 Tulgar et al 2019	= 2.58 (P USG T. Mean 2.4 3 1.4 0.5 2 2.1 2.5 0.50; Chi ² 2 = 1.66 (l USG TA Mean 1.4 3 0.5 1.9 0.2 0.9 0.2 0.9 0 2.1 2.5 1.2 1.2 1.2 1.2 1.2 1.2 1.2 1.2	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.5 4 0.7 3 1 2 1.5 4 0.7 3 1 2 1.5 4 0.7 3 1 2 1.5 4 0.7 3 1 2 1.5 4 0.5 2 1	al Me 24 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro sn SD 2.9 1.8 3.4 2 1.8 1 1.2 1.5 2.7 1.2 2.7 1.2 (P < 0.0	Total 24 20 30 25 40 20 20 1001); 12 1 24 20 20 101); 12 1 24 20 20 20 20 38 20 20 20 20 21 22 40 30 25 40 37 15 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.6% 13.7% 100.0% = 79% % 10.1% 0.9% 1.1.4% 10.8% 12.1% 5.2% 9.4% 11.4% 10.5% 10.7% 400.0%	IV, Random, 95% CI -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] -0.40 [-1.06, 0.09] -0.40 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24] 1.00 [-1.31, -0.69] 0.10 [-0.20, -0.00] 0.00 [-0.96, 0.96] -0.10 [-0.33, 0.13] 0.10 [-0.24, 0.44]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl -10 -5 0 5 10 Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% Cl
Test for overall effect: Z C Study or Subgroup Arik et al 2020 Bhatia et al 2014 Bhatia et al 2014 Breazu et al 2016 Dost et al 2018 Khandelwal et al 2019 Tulgar et al 2019 Tulgar et al 2019 Total (95% CI) Heterogeneity: Tau ² = C Test for overall effect: Z D Study or Subgroup Arik et al 2020 Basaran et al 2015 Bhatia et al 2014 Bhatia et al 2014 Bhatia et al 2014 Bhatia et al 2012 Shin et al 2019 Tulgar et al 2019	USG T. <u>Mean</u> 2.4 3 1.4 0.5 2 2.1 2.5 0.50; Chi ² 2 = 1.66 (l USG TA <u>Mean</u> 1.4 3 0.5 1.9 0.2 2.1 2.5 2.5 1.9 0.2 1.9 0.2 1.9 0.2 1.9 0.2 1.9 0.5 1.9 0.2 1.9 0.5 1.9 0.2 1.9 0.5 1.9 0.2 1.9 0.5 1.9 0.2 1.9 0.5 1.9 0.5 1.9 0.2 1.9 0.5 1.9 0.2 1.9 0.5 1.9 1.4 1.4 3.5 1.9 0.2 1.9 0.2 1.5 1.9 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.9 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	= 105.22, 6 = 0.010) AP Block <u>SD Tot</u> 1.5 2 2.6 2 1.5 4 0.7 3 1 2 1.8 2 0.7 3 1 2 1.8 2 0.7 3 1 2 1.8 2 0.7 3 1 2 1.8 2 0.7 3 1 2 1.8 2 1.8 2 0.5 2 1.2 2 1.2 3 0.5 2 0.10) P Block <u>SD Total</u> 1.3 20 0.5 30 0.15 25 2.2 40 1.3 70 0.5 20 0.5	al Me 24 20 20 20 20 20 20 20 20 20 20 20 20 20	Contro sn SD 2.9 1.8 3.4 2 1.8 1 1.2 1.5 2.7 1.2 2.7 1.2 (P < 0.0	Total 24 20 30 25 40 20 20 1001); 12 1 24 20 20 101); 12 1 24 20 20 20 20 38 20 20 20 20 21 22 40 30 25 40 37 15 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20 20	Weight 11.7% 8.2% 9.9% 15.5% 12.2% 14.6% 13.7% 100.0% = 79% % 10.1% 0.9% 1.1.4% 10.8% 12.1% 5.2% 9.4% 11.4% 10.5% 10.7% 400.0%	IV, Random, 95% Cl -0.50 [-1.44, 0.44] -0.40 [-1.84, 1.04] -2.00 [-3.18, -0.82] -1.30 [-1.74, -0.86] 1.00 [0.12, 1.88] 0.00 [-0.66, 0.66] -0.60 [-1.17, -0.03] -0.20 [-0.88, 0.48] -0.49 [-1.06, 0.09] -0.49 [-1.06, 0.26] 0.80 [-1.30, -0.30] 2.00 [-2.71, -1.29] -0.60 [-1.44, 0.24] 1.00 [-1.31, -0.69] 0.10 [-0.20, -0.00] 0.00 [-0.96, 0.96] -0.10 [-0.56, 0.36] -0.10 [-0.54, 0.44] 0.40 [0.08, 0.72]	Favours USG TAP Block Favours Control Mean Difference IV, Random, 95% CI

	USG 1	AP BI	ock	С	ontrol			Mean Difference	Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI	IV, Random, 95% CI
Arik et al 2020	5.6	4.9	24	6.2	6.4	24	11.2%	-0.60 [-3.82, 2.62]	+
Chen et al 2013	0.4	1	20	0	0.01	20	22.1%	0.40 [-0.04, 0.84]	•
El-Dawlatly et al 2009	0.9	0.7	21	2.3	1	21	21.9%	-1.40 [-1.92, -0.88]	•
Ortiz et al 2012	16.1	9.9	39	15.4	9.2	35	7.9%	0.70 [-3.65, 5.05]	+
Petersen et al 2012	5	2.5	37	7.5	2.5	37	20.0%	-2.50 [-3.64, -1.36]	•
Shin et al 2014	1	1.5	15	5	4.1	15	15.2%	-4.00 [-6.21, -1.79]	-
Fulgar et al 2019	6.2	11.1	20	30.1	22.4	20	1.8%	-23.90 [-34.86, -12.94]	
Total (95% CI)			176			172	100.0%	-1.76 [-3.28, -0.24]	•
Heterogeneity: $Tau^2 = 2$.67; Chi	$^{2} = 66$.52, df	= 6 (P	< 0.00	001); l ²	$^{2} = 91\%$		
Test for overall effect: Z	= 2.27	(P=0.	02)						-100 -50 0 50 1 Favours USG TAP Block Favours Control

FIGURE 4 | Forest plot representing for morphine consumption in the recovery room USG guided TAP block vs. control group.



advocates too for an incisional pain control. Our results showed that USG-guided TAP block led to significantly reduced postoperative pain, as well as reduced morphine consumption and PONV incidence. These findings concur with a previous analysis of seven studies by Peng et al. (11). Recent RCTs have suggested that USG-guided TAP block plays an important role in multimodal pain therapy through proper visualization and improved accuracy. However, few studies have compared the effects of subcoastal TAP block with those of posterior TAP block. As such, our meta-analysis included RCTs that looked at both USG-guided TAP blocks and oblique subcostal TAP blocks. Nonetheless, we noted high heterogeneity between studies, suggesting that our meta-analysis results need to be treated with caution.

Our study has several limitations: (1) included studies had relatively small sample sizes; (2) extended follow-up data on chronic pain, long-term analgesic use, and adverse events was lacking; (3) multiple pain score scales were used; (4) a diverse range of anesthesia dosages were administered across the studies, and (5) insufficient study numbers for important factors such as laproscopic guided TAP block and fentanyl, tramadol, and opioid consumption, thereby precluding subgroup analysis.

CONCLUSION

This meta-analysis concludes that TAP block is more effective than a conventional pain control, but not significatively different from another local incisional pain control that is port site infiltration. Additional prospective randomized controlled trials are required to further validate our findings.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

AUTHOR CONTRIBUTIONS

WW conceived and designed the study. WW and LW literature search and analyzed did the data. YG the paper, wrote reviewed, and edited the manuscript. All authors have read and approved the final manuscript.

REFERENCES

- Keus F, de Jong JaF, Gooszen HG, van Laarhoven CJHM. Laparoscopic versus open cholecystectomy for patients with symptomatic cholecystolithiasis. *Cochrane Database Syst. Rev.* (2006) 2006:CD006231. doi: 10.1002/14651858.CD006231
- Bucher P, Pugin F, Buchs NC, Ostermann S, Morel P. Randomized clinical trial of laparoendoscopic single-site versus conventional laparoscopic cholecystectomy. *Br J Surg.* (2011) 98:1695–702. doi: 10.1002/bjs.7689
- Barczyński M, Herman RM. A prospective randomized trial on comparison of low-pressure (LP) and standard-pressure (SP) pneumoperitoneum for laparoscopic cholecystectomy. *Surg Endosc.* (2003) 17:533–8. doi: 10.1007/s00464-002-9121-2
- Bisgaard T. Analgesic treatment after laparoscopic cholecystectomy: a critical assessment of the evidence. *Anesthesiology*. (2006) 104:835–46. doi: 10.1097/0000542-200604000-00030
- Rozen WM, Tran TMN, Ashton MW, Barrington MJ, Ivanusic JJ, Taylor GI. Refining the course of the thoracolumbar nerves: a new understanding of the innervation of the anterior abdominal wall. *Clin Anat N Y N.* (2008) 21:325–33. doi: 10.1002/ca.20621
- Charlton S, Cyna AM, Middleton P, Griffiths JD. Perioperative transversus abdominis plane (TAP) blocks for analgesia after abdominal surgery. *Cochrane Database Syst. Rev.* (2010) 2010:CD007705. doi: 10.1002/14651858.CD007705.pub2
- Siddiqui MRS, Sajid MS, Uncles DR, Cheek L, Baig MK. A meta-analysis on the clinical effectiveness of transversus abdominis plane block. *J Clin Anesth.* (2011) 23:7–14. doi: 10.1016/j.jclinane.2010.05.008
- Johns N, O'Neill S, Ventham NT, Barron F, Brady RR, Daniel T. Clinical effectiveness of transversus abdominis plane (TAP) block in abdominal surgery: a systematic review and meta-analysis. *Colorectal Dis Off J Assoc Coloproctology G B Irel.* (2012) 14:e635–42. doi: 10.1111/j.1463-1318.2012.03104.x
- Champaneria R, Shah L, Geoghegan J, Gupta JK, Daniels JP. Analgesic effectiveness of transversus abdominis plane blocks after hysterectomy: a meta-analysis. *Eur J Obstet Gynecol Reprod Biol.* (2013) 166:1–9. doi: 10.1016/j.ejogrb.2012.09.012
- De Oliveira GS, Castro-Alves LJ, Nader A, Kendall MC, McCarthy RJ. Transversus abdominis plane block to ameliorate postoperative pain outcomes after laparoscopic surgery: a meta-analysis of randomized controlled trials. *Anesth Analg.* (2014) 118:454–63. doi: 10.1213/ANE.00000000000066
- Peng K, Ji F, Liu H, Wu S. Ultrasound-guided transversus abdominis plane block for analgesia in laparoscopic cholecystectomy: a systematic review and meta-analysis. *Med Princ Pract Int J Kuwait Univ Health Sci Cent.* (2016) 25:237–46. doi: 10.1159/000444688
- Moher D, Shamseer L, Clarke M, Ghersi D, Liberati A, Petticrew M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. Syst Rev. (2015) 4:1. doi: 10.1186/2046-4053-4-1
- Oremus M, Wolfson C, Perrault A, Demers L, Momoli F, Moride Y. Interrater reliability of the modified Jadad quality scale for systematic reviews of Alzheimer's disease drug trials. *Dement Geriatr Cogn Disord*. (2001) 12:232–6. doi: 10.1159/000051263
- Begg CB, Mazumdar M. Operating characteristics of a rank correlation test for publication bias. *Biometrics*. (1994) 50:1088–101. doi: 10.2307/2533446
- Egger M, Davey Smith G, Schneider M, Minder C. Bias in metaanalysis detected by a simple, graphical test. *BMJ.* (1997) 315:629–34. doi: 10.1136/bmj.315.7109.629
- Arik E, Akkaya T, Ozcifici S, Alptekin A, Balas S. Unilateral transversus abdominis plane block and port-site infiltration : comparison of postoperative analgesic efficacy in laparoscopic cholecystectomy. *Anaesthesist.* (2020) 69:270–6. doi: 10.1007/s00101-020-00746-1
- Tulgar S, Kapakli MS, Kose HC, Senturk O, Selvi O, Serifsoy TE, et al. Evaluation of ultrasound-guided erector spinae plane block and oblique subcostal transversus abdominis plane block in laparoscopic cholecystectomy: randomized, controlled, prospective study. *Anesth Essays Res.* (2019) 13:50–6. doi: 10.4103/aer.AER_194_18
- Houben AM, Moreau A-SJ, Detry OM, Kaba A, Joris JL. Bilateral subcostal transversus abdominis plane block does not improve the

postoperative analgesia provided by multimodal analgesia after laparoscopic cholecystectomy: a randomised placebo-controlled trial. *Eur J Anaesthesiol.* (2019) 36:772–7. doi: 10.1097/EJA.000000000001028

- Baral B, Poudel PR. Comparison of analgesic efficacy of ultrasound guided subcostal transversus abdominis plane block with port site infiltration following laparoscopic cholecystectomy. *J Nepal Health Res Counc.* (2019) 16:457–61. doi: 10.33314/jnhrc.v16i41.1486
- Bava EP, Ramachandran R, Rewari V, Chandralekha, Bansal VK, Trikha A. Analgesic efficacy of ultrasound guided transversus abdominis plane block versus local anesthetic infiltration in adult patients undergoing single incision laparoscopic cholecystectomy: a randomized controlled trial. *Anesth Essays Res.* (2016) 10:561–7. doi: 10.4103/0259-1162.186620
- Khandelwal H, Parag K, Singh A, Anand N, Govil N. Comparison of subcostal transversus abdominis block with intraperitoneal instillation of levobupivacaine for pain relief after laparoscopic cholecystectomy: a prospective study. *Anesth Essays Res.* (2019) 13:144–8. doi: 10.4103/aer.AER_3_19
- Suseela I, Anandan K, Aravind A, Kaniyil S. Comparison of ultrasound-guided bilateral subcostal transversus abdominis plane block and port-site infiltration with bupivacaine in laparoscopic cholecystectomy. *Indian J Anaesth.* (2018) 62:497–501. doi: 10.4103/ija.IJA_55_18
- 23. Ortiz J, Suliburk JW, Wu K, Bailard NS, Mason C, Minard CG, et al. Bilateral transversus abdominis plane block does not decrease postoperative pain after laparoscopic cholecystectomy when compared with local anesthetic infiltration of trocar insertion sites. *Reg Anesth Pain Med.* (2012) 37:188–92. doi: 10.1097/AAP.0b013e318244851b
- Saliminia A, Azimaraghi O, Babayipour S, Ardavan K, Movafegh A. Efficacy of transverse abdominis plane block in reduction of postoperation pain in laparoscopic cholecystectomy. Acta Anaesthesiol Taiwanica Off J Taiwan Soc Anesthesiol. (2015) 53:119–22. doi: 10.1016/j.aat.2015.07.003
- 25. Basaran B, Basaran A, Kozanhan B, Kasdogan E, Eryilmaz MA, Ozmen S. Analgesia and respiratory function after laparoscopic cholecystectomy in patients receiving ultrasound-guided bilateral oblique subcostal transversus abdominis plane block: a randomized double-blind study. *Med Sci Monit Int Med J Exp Clin Res.* (2015) 21:1304–12. doi: 10.12659/MSM.893593
- Ra YS, Kim CH, Lee GY, Han JI. The analgesic effect of the ultrasound-guided transverse abdominis plane block after laparoscopic cholecystectomy. *Korean J Anesthesiol.* (2010) 58:362–8. doi: 10.4097/kjae.2010.58.4.362
- 27. El-Dawlatly AA, Turkistani A, Kettner SC, Machata A-M, Delvi MB, Thallaj A, et al. Ultrasound-guided transversus abdominis plane block: description of a new technique and comparison with conventional systemic analgesia during laparoscopic cholecystectomy. *Br J Anaesth.* (2009) 102:763–7. doi: 10.1093/bja/aep067
- Chen CK, Tan PCS, Phui VE, Teo SC. A comparison of analgesic efficacy between oblique subcostal transversus abdominis plane block and intravenous morphine for laparascopic cholecystectomy. A prospective randomized controlled trial. *Korean J Anesthesiol.* (2013) 64:511–6. doi: 10.4097/kjae.2013.64.6.511
- Shin H-J, Oh A-Y, Baik J-S, Kim J-H, Han S-H, Hwang J-W. Ultrasoundguided oblique subcostal transversus abdominis plane block for analgesia after laparoscopic cholecystectomy: a randomized, controlled, observer-blinded study. *Minerva Anestesiol.* (2014) 80:185–93.
- 30. Dost B, Yalçin Sezen G, Iskender A, Özlü O. A comparison of transversus abdominis plane block guided with ultrasonography and local anesthetic infiltration in laparoscopic cholecystectomy operations. *Agri Agri Algoloji Derneginin Yayin Organidir J Turk Soc Algol.* (2018) 30:51–7. doi: 10.5505/agri.2018.45822
- Petersen PL, Stjernholm P, Kristiansen VB, Torup H, Hansen EG, Mitchell AU, et al. The beneficial effect of transversus abdominis plane block after laparoscopic cholecystectomy in day-case surgery: a randomized clinical trial. *Anesth Analg.* (2012) 115:527–33. doi: 10.1213/ANE.0b013e318261f16e
- Venkatraman R, Saravanan R, Dhas M, Pushparani A. Comparison of laparoscopy-guided with ultrasound-guided subcostal transversus abdominis plane block in laparoscopic cholecystectomy - a prospective, randomised study. *Indian J Anaesth.* (2020) 64:1012–7. doi: 10.4103/ija.IJA_ 528_20
- 33. Bhatia N, Arora S, Jyotsna W, Kaur G. Comparison of posterior and subcostal approaches to ultrasound-guided transverse abdominis plane block

for postoperative analgesia in laparoscopic cholecystectomy. J Clin Anesth. (2014) 26:294–9. doi: 10.1016/j.jclinane.2013.11.023

- 34. Breazu CM, Ciobanu L, Bartos A, Bodea R, Mircea PA, Ionescu D. Pethidine efficacy in achieving the ultrasound-guided oblique subcostal transversus abdominis plane block in laparoscopic cholecystectomy: a prospective study. *Bosn J Basic Med Sci.* (2017) 17:67–73. doi: 10.17305/bjbms.2016.1647
- 35. Breazu CM, Ciobanu L, Hadade A, Bartos A, Mitre C, Mircea PA, et al. The efficacy of oblique subcostal transversus abdominis plane block in laparoscopic cholecystectomy a prospective, placebo controlled study. *Romanian J Anaesth Intensive Care.* (2016) 23:12–8. doi: 10.21454/rjaic.7518.231.obq
- Vrsajkov V, Mančić N, Mihajlović D, Milićević ST, Uvelin A, Vrsajkov JP. O bloqueio do plano transverso abdominal subcostal pode melhorar a analgesia após colecistectomia laparoscópica. *Braz J Anesthesiol.* (2018) 68:149–53. doi: 10.1016/j.bjan.2017.10.006
- Tor IH, Çelik EC, Aydin ME. Analgesic effect of combined transversus abdominis plane block and rectus sheath block in laparoscopic cholecystectomy: prospective randomized study. *Ain-Shams J Anesthesiol.* (2020) 12:58. doi: 10.1186/s42077-020-00108-4
- Tolchard S, Davies R, Martindale S. Efficacy of the subcostal transversus abdominis plane block in laparoscopic cholecystectomy: comparison with conventional port-site infiltration. J Anaesthesiol Clin Pharmacol. (2012) 28:339–43. doi: 10.4103/0970-9185.98331
- 39. Vindal A, Sarda H, Lal P. Laparoscopically guided transversus abdominis plane block offers better pain relief after laparoscopic cholecystectomy: results of a triple blind randomized controlled trial. *Surg Endosc.* (2021) 35:1713–21. doi: 10.1007/s00464-020-07558-9

- Baytar Ç, YIlmaz C, Karasu D, Topal S. Comparison of ultrasound-guided subcostal transversus abdominis plane block and quadratus lumborum block in laparoscopic cholecystectomy: a prospective, randomized, controlled clinical study. *Pain Res Manage*. (2019) 2019:2815301. doi: 10.1155/2019/ 2815301
- Bisgaard T, Klarskov B, Rosenberg J, Kehlet H. Characteristics and prediction of early pain after laparoscopic cholecystectomy. *Pain.* (2001) 90:261–9. doi: 10.1016/S0304-3959(00)00 406-1

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2021 Wang, Wang and Gao. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.