

Online Supplement

Examining Four Blood Biomarkers for the Detection of Acute Intracranial Abnormalities Following Mild Traumatic Brain Injury in Older Adults

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Brain Imaging Result			GFAP (pg/mL)	UCH-L1 (pg/mL)	NF-L (pg/mL)	Tau (pg/mL)
Normal	N	Valid	61	61	61	61
		Missing	0	0	0	0
	Mean		376.90190	57.47449	44.56353	2.22394
	Median		274.27034	40.87659	29.60972	1.81073
	Std. Deviation		431.278908	46.367746	41.261301	1.666803
	Skewness		5.835	1.386	2.394	2.159
	Std. Error of Skewness		.306	.306	.306	.306
	Kurtosis		40.384	1.429	7.380	5.931
	Std. Error of Kurtosis		.604	.604	.604	.604
	Minimum		87.404	7.119	9.055	.171
	Maximum		3382.409	197.634	237.303	9.448
	Percentiles	25	192.65426	24.01897	19.32586	1.18961
		50	274.27034	40.87659	29.60972	1.81073
		75	447.72125	78.62643	51.67228	2.64838
Abnormal	N	Valid	22	22	22	22
		Missing	0	0	0	0
	Mean		1108.19498	114.21624	49.23325	2.63026
	Median		787.84394	73.71261	34.71695	1.84893
	Std. Deviation		872.309275	155.542353	56.465960	2.707729
	Skewness		.642	3.193	3.731	2.453
	Std. Error of Skewness		.491	.491	.491	.491
	Kurtosis		-1.124	11.136	15.550	6.989
	Std. Error of Kurtosis		.953	.953	.953	.953
	Minimum		114.444	15.073	17.451	.563
	Maximum		2640.746	713.444	284.068	12.200
	Percentiles	25	353.51860	30.17497	19.83301	.91570
		50	787.84394	73.71261	34.71695	1.84893
		75	2096.63146	119.92074	60.77546	3.39462

GFAP (pg/mL)						
Brain Imaging Result			Frequency	Percent	Valid Percent	Cumulative Percent
Normal	Valid	87.404	1	1.6	1.6	1.6
		90.265	1	1.6	1.6	3.3
		92.736	1	1.6	1.6	4.9
		94.557	1	1.6	1.6	6.6
		98.566	1	1.6	1.6	8.2
		105.283	1	1.6	1.6	9.8
		106.699	1	1.6	1.6	11.5
		135.817	1	1.6	1.6	13.1
		145.567	1	1.6	1.6	14.8
		146.852	1	1.6	1.6	16.4
		166.290	1	1.6	1.6	18.0
		169.771	1	1.6	1.6	19.7
		170.991	1	1.6	1.6	21.3
		190.954	1	1.6	1.6	23.0
		192.155	1	1.6	1.6	24.6
		193.154	1	1.6	1.6	26.2
		210.562	1	1.6	1.6	27.9
		215.777	1	1.6	1.6	29.5
		218.441	1	1.6	1.6	31.1
		219.909	1	1.6	1.6	32.8
		221.865	1	1.6	1.6	34.4
		233.167	1	1.6	1.6	36.1
		235.187	1	1.6	1.6	37.7
		243.461	1	1.6	1.6	39.3
		245.478	1	1.6	1.6	41.0
		260.781	1	1.6	1.6	42.6
		262.556	1	1.6	1.6	44.3
		263.371	1	1.6	1.6	45.9
		267.663	1	1.6	1.6	47.5
		272.902	1	1.6	1.6	49.2
		274.270	1	1.6	1.6	50.8
		292.916	1	1.6	1.6	52.5
		294.218	1	1.6	1.6	54.1
		306.735	1	1.6	1.6	55.7
		308.590	1	1.6	1.6	57.4
		322.340	1	1.6	1.6	59.0
		323.188	1	1.6	1.6	60.7
		330.417	1	1.6	1.6	62.3
		332.453	1	1.6	1.6	63.9
		387.479	1	1.6	1.6	65.6
		403.082	1	1.6	1.6	67.2
		422.222	1	1.6	1.6	68.9
		424.888	1	1.6	1.6	70.5
		433.279	1	1.6	1.6	72.1
		434.286	1	1.6	1.6	73.8
		434.825	1	1.6	1.6	75.4

GFAP (pg/mL)						
Brain Imaging Result		Frequency	Percent	Valid Percent	Cumulative Percent	
		460.618	1	1.6	1.6	77.0
		477.162	1	1.6	1.6	78.7
		501.701	1	1.6	1.6	80.3
		504.937	1	1.6	1.6	82.0
		529.588	1	1.6	1.6	83.6
		532.299	1	1.6	1.6	85.2
		557.109	1	1.6	1.6	86.9
		560.016	1	1.6	1.6	88.5
		567.810	1	1.6	1.6	90.2
		610.401	1	1.6	1.6	91.8
		627.396	1	1.6	1.6	93.4
		753.972	1	1.6	1.6	95.1
		788.310	1	1.6	1.6	96.7
		853.919	1	1.6	1.6	98.4
		3382.409	1	1.6	1.6	100.0
		Total	61	100.0	100.0	
Abnormal	Valid	114.444	1	4.5	4.5	4.5
		188.588	1	4.5	4.5	9.1
		195.592	1	4.5	4.5	13.6
		323.110	1	4.5	4.5	18.2
		349.994	1	4.5	4.5	22.7
		354.694	1	4.5	4.5	27.3
		386.933	1	4.5	4.5	31.8
		492.604	1	4.5	4.5	36.4
		533.145	1	4.5	4.5	40.9
		657.108	1	4.5	4.5	45.5
		729.044	1	4.5	4.5	50.0
		846.644	1	4.5	4.5	54.5
		1064.121	1	4.5	4.5	59.1
		1191.149	1	4.5	4.5	63.6
		1372.245	1	4.5	4.5	68.2
		1382.719	1	4.5	4.5	72.7
		2057.879	1	4.5	4.5	77.3
		2212.887	1	4.5	4.5	81.8
		2331.838	1	4.5	4.5	86.4
		2340.981	1	4.5	4.5	90.9
		2613.821	1	4.5	4.5	95.5
		2640.746	1	4.5	4.5	100.0
		Total	22	100.0	100.0	

UCH-L1 (pg/mL)					
Brain Imaging Result			Frequency	Percent	Cumulative Percent
Normal	Valid	7.119	1	1.6	1.6
		8.237	1	1.6	3.3
		9.860	1	1.6	4.9
		10.236	1	1.6	6.6
		10.376	1	1.6	8.2
		16.049	1	1.6	9.8
		16.674	1	1.6	11.5
		17.360	1	1.6	13.1
		17.762	1	1.6	14.8
		20.162	1	1.6	16.4
		20.315	1	1.6	18.0
		21.441	1	1.6	19.7
		22.706	1	1.6	21.3
		23.859	1	1.6	23.0
		23.982	1	1.6	24.6
		24.056	1	1.6	26.2
		24.390	1	1.6	27.9
		25.743	1	1.6	29.5
		26.802	1	1.6	31.1
		27.986	1	1.6	32.8
		29.421	1	1.6	34.4
		30.515	1	1.6	36.1
		30.670	1	1.6	37.7
		30.721	1	1.6	39.3
		31.590	1	1.6	41.0
		31.717	1	1.6	42.6
		35.917	1	1.6	44.3
		37.743	1	1.6	45.9
		38.680	1	1.6	47.5
		40.316	1	1.6	49.2
		40.877	1	1.6	50.8
		42.728	1	1.6	52.5
		43.798	1	1.6	54.1
		46.483	1	1.6	55.7
		47.981	1	1.6	57.4
		49.105	1	1.6	59.0
		49.901	1	1.6	60.7
		50.455	1	1.6	62.3
		57.073	1	1.6	63.9
		59.750	1	1.6	65.6
		60.608	1	1.6	67.2
		65.819	1	1.6	68.9
		65.977	1	1.6	70.5
		67.890	1	1.6	72.1
		72.476	1	1.6	73.8
		74.218	1	1.6	75.4

UCH-L1 (pg/mL)						
Brain Imaging Result			Frequency	Percent	Valid Percent	Cumulative Percent
		83.035	1	1.6	1.6	77.0
		83.933	1	1.6	1.6	78.7
		96.265	1	1.6	1.6	80.3
		102.990	1	1.6	1.6	82.0
		103.772	1	1.6	1.6	83.6
		104.450	1	1.6	1.6	85.2
		107.582	1	1.6	1.6	86.9
		116.109	1	1.6	1.6	88.5
		127.456	1	1.6	1.6	90.2
		127.998	1	1.6	1.6	91.8
		133.234	1	1.6	1.6	93.4
		143.043	1	1.6	1.6	95.1
		183.169	1	1.6	1.6	96.7
		187.730	1	1.6	1.6	98.4
		197.634	1	1.6	1.6	100.0
		Total	61	100.0	100.0	
		Abnormal	Valid	15.073	1	4.5
17.039	1			4.5	4.5	9.1
18.268	1			4.5	4.5	13.6
23.281	1			4.5	4.5	18.2
29.540	1			4.5	4.5	22.7
30.386	1			4.5	4.5	27.3
42.706	1			4.5	4.5	31.8
48.201	1			4.5	4.5	36.4
49.188	1			4.5	4.5	40.9
58.248	1			4.5	4.5	45.5
63.553	1			4.5	4.5	50.0
83.872	1			4.5	4.5	54.5
89.672	1			4.5	4.5	59.1
92.724	1			4.5	4.5	63.6
100.462	1			4.5	4.5	68.2
110.735	1			4.5	4.5	72.7
114.594	1			4.5	4.5	77.3
135.899	1			4.5	4.5	81.8
138.220	1			4.5	4.5	86.4
151.345	1			4.5	4.5	90.9
386.304	1			4.5	4.5	95.5
713.444	1			4.5	4.5	100.0
Total	22			100.0	100.0	

NF-L (pg/mL)					
Brain Imaging Result			Frequency	Percent	Cumulative Percent
Normal	Valid	9.055	1	1.6	1.6
		9.632	1	1.6	3.3
		10.392	1	1.6	4.9
		11.916	1	1.6	6.6
		12.708	1	1.6	8.2
		14.843	1	1.6	9.8
		14.976	1	1.6	11.5
		15.103	1	1.6	13.1
		15.132	1	1.6	14.8
		15.252	1	1.6	16.4
		17.566	1	1.6	18.0
		17.919	1	1.6	19.7
		18.001	1	1.6	21.3
		18.281	1	1.6	23.0
		18.851	1	1.6	24.6
		19.801	1	1.6	26.2
		20.051	1	1.6	27.9
		20.353	1	1.6	29.5
		20.806	1	1.6	31.1
		20.950	1	1.6	32.8
		21.813	1	1.6	34.4
		22.368	1	1.6	36.1
		22.439	1	1.6	37.7
		22.874	1	1.6	39.3
		23.078	1	1.6	41.0
		24.739	1	1.6	42.6
		25.452	1	1.6	44.3
		25.808	1	1.6	45.9
		26.332	1	1.6	47.5
		26.716	1	1.6	49.2
		29.610	1	1.6	50.8
		30.608	1	1.6	52.5
		31.041	1	1.6	54.1
		31.277	1	1.6	55.7
		31.575	1	1.6	57.4
		31.925	1	1.6	59.0
		32.702	1	1.6	60.7
		36.157	1	1.6	62.3
		39.659	1	1.6	63.9
		40.205	1	1.6	65.6
		44.632	1	1.6	67.2
		45.553	1	1.6	68.9
		46.989	1	1.6	70.5
		47.272	1	1.6	72.1
		49.223	1	1.6	73.8
		49.444	1	1.6	75.4

NF-L (pg/mL)						
Brain Imaging Result			Frequency	Percent	Valid Percent	Cumulative Percent
		53.901	1	1.6	1.6	77.0
		55.782	1	1.6	1.6	78.7
		68.159	1	1.6	1.6	80.3
		69.423	1	1.6	1.6	82.0
		85.437	1	1.6	1.6	83.6
		86.047	1	1.6	1.6	85.2
		86.380	1	1.6	1.6	86.9
		90.539	1	1.6	1.6	88.5
		93.206	1	1.6	1.6	90.2
		99.755	1	1.6	1.6	91.8
		99.772	1	1.6	1.6	93.4
		133.355	1	1.6	1.6	95.1
		135.883	1	1.6	1.6	96.7
		142.353	1	1.6	1.6	98.4
		237.303	1	1.6	1.6	100.0
		Total	61	100.0	100.0	
Abnormal	Valid	17.451	1	4.5	4.5	4.5
		18.326	1	4.5	4.5	9.1
		19.128	1	4.5	4.5	13.6
		19.463	1	4.5	4.5	18.2
		19.594	1	4.5	4.5	22.7
		19.913	1	4.5	4.5	27.3
		21.106	1	4.5	4.5	31.8
		26.612	1	4.5	4.5	36.4
		27.766	1	4.5	4.5	40.9
		29.823	1	4.5	4.5	45.5
		33.862	1	4.5	4.5	50.0
		35.572	1	4.5	4.5	54.5
		35.672	1	4.5	4.5	59.1
		36.954	1	4.5	4.5	63.6
		38.454	1	4.5	4.5	68.2
		38.783	1	4.5	4.5	72.7
		60.286	1	4.5	4.5	77.3
		62.243	1	4.5	4.5	81.8
		73.089	1	4.5	4.5	86.4
		74.804	1	4.5	4.5	90.9
		90.163	1	4.5	4.5	95.5
		284.068	1	4.5	4.5	100.0
		Total	22	100.0	100.0	

Tau (pg/mL)					
Brain Imaging Result			Frequency	Percent	Valid Percent
Normal	Valid	.171	1	1.6	1.6
		.533	1	1.6	3.3
		.627	1	1.6	4.9
		.721	1	1.6	6.6
		.814	1	1.6	8.2
		.826	1	1.6	9.8
		.846	1	1.6	11.5
		.894	1	1.6	13.1
		.911	1	1.6	14.8
		.919	1	1.6	16.4
		.969	1	1.6	18.0
		1.004	1	1.6	19.7
		1.004	1	1.6	21.3
		1.074	1	1.6	23.0
		1.176	1	1.6	24.6
		1.203	1	1.6	26.2
		1.207	1	1.6	27.9
		1.234	1	1.6	29.5
		1.287	1	1.6	31.1
		1.312	1	1.6	32.8
		1.321	1	1.6	34.4
		1.329	1	1.6	36.1
		1.395	1	1.6	37.7
		1.399	1	1.6	39.3
		1.531	1	1.6	41.0
		1.598	1	1.6	42.6
		1.661	1	1.6	44.3
		1.684	1	1.6	45.9
		1.706	1	1.6	47.5
		1.766	1	1.6	49.2
		1.811	1	1.6	50.8
		1.820	1	1.6	52.5
		1.909	1	1.6	54.1
		1.912	1	1.6	55.7
		1.948	1	1.6	57.4
		2.013	1	1.6	59.0
		2.019	1	1.6	60.7
		2.104	1	1.6	62.3
		2.178	1	1.6	63.9
		2.232	1	1.6	65.6
		2.233	1	1.6	67.2
		2.305	1	1.6	68.9
		2.416	1	1.6	70.5
		2.439	1	1.6	72.1
		2.500	1	1.6	73.8
		2.577	1	1.6	75.4

Tau (pg/mL)					
Brain Imaging Result		Frequency	Percent	Valid Percent	Cumulative Percent
		2.720	1	1.6	77.0
		2.789	1	1.6	78.7
		2.802	1	1.6	80.3
		2.880	1	1.6	82.0
		3.226	1	1.6	83.6
		3.306	1	1.6	85.2
		3.594	1	1.6	86.9
		3.866	1	1.6	88.5
		4.534	1	1.6	90.2
		4.794	1	1.6	91.8
		5.216	1	1.6	93.4
		5.261	1	1.6	95.1
		5.401	1	1.6	96.7
		7.286	1	1.6	98.4
		9.448	1	1.6	100.0
		Total	61	100.0	
Abnormal	Valid	.563	1	4.5	4.5
		.708	1	4.5	9.1
		.767	1	4.5	13.6
		.774	1	4.5	18.2
		.890	1	4.5	22.7
		.924	1	4.5	27.3
		1.021	1	4.5	31.8
		1.133	1	4.5	36.4
		1.189	1	4.5	40.9
		1.208	1	4.5	45.5
		1.745	1	4.5	50.0
		1.953	1	4.5	54.5
		1.968	1	4.5	59.1
		2.036	1	4.5	63.6
		2.385	1	4.5	68.2
		3.300	1	4.5	72.7
		3.366	1	4.5	77.3
		3.481	1	4.5	81.8
		3.503	1	4.5	86.4
		6.328	1	4.5	90.9
		6.424	1	4.5	95.5
		12.200	1	4.5	100.0
		Total	22	100.0	

Raw Data for Each Subject

	Brain Imaging Result	Age	Time between Injury and blood sampling (hours)	Time between injury and head CT (hours)	GFAP (pg/mL)	UCH-L1 (pg/mL)	NF-L (pg/mL)	Tau (pg/mL)
1	Normal	60.0	3.7	5.2	94.557	7.119	9.632	.171
2	Normal	61.0	3.5	6.8	434.286	107.582	9.055	1.531
3	Normal	63.0	3.7	4.2	193.154	17.360	133.355	.627
4	Normal	64.0	8.4	8.8	292.916	9.860	22.368	1.399
5	Normal	65.0	2.4	4.7	135.817	24.390	14.976	1.004
6	Normal	66.0	1.9	5.8	262.556	25.743	15.252	.919
7	Normal	66.0	3.3	6.3	92.736	8.237	44.632	1.909
8	Normal	66.0	.8	1.4	243.461	183.169	24.739	3.866
9	Normal	67.0	1.3	1.9	105.283	60.608	20.051	.826
10	Normal	68.0	.8	4.1	170.991	20.162	31.041	.533
11	Normal	68.0	2.1	2.3	146.852	35.917	12.708	2.789
12	Normal	68.0	2.8	5.2	322.340	17.762	30.608	2.720
13	Normal	69.0	1.3	3.3	245.478	42.728	31.575	1.766
14	Normal	69.0	3.1	3.1	218.441	10.236	15.132	.846
15	Normal	70.0	5.1	6.2	98.566	127.998	10.392	.814
16	Normal	70.0	3.4	5.7	190.954	24.056	14.843	1.074
17	Normal	70.0	1.4	2.3	145.567	83.035	25.808	1.811
18	Normal	71.0	2.4	4.5	90.265	22.706	22.874	1.598
19	Normal	72.0	1.6	1.7	169.771	72.476	15.103	3.594
20	Normal	72.0	4.3	5.6	219.909	16.674	49.444	2.233
21	Normal	73.0	9.1	10.0	308.590	10.376	11.916	2.178
22	Normal	74.0	1.2	2.4	567.810	83.933	32.702	3.226
23	Normal	75.0	1.4	1.8	166.290	65.977	17.919	2.019
24	Normal	75.0	3.6	5.0	504.937	26.802	23.078	3.306
25	Normal	76.0	1.2	1.5	529.588	21.441	22.439	1.004
26	Normal	77.0	2.1	2.2	210.562	31.717	18.851	1.912
27	Normal	77.0	4.7	4.8	192.155	47.981	20.806	1.661
28	Normal	77.0	1.7	3.1	477.162	23.982	18.281	1.287
29	Normal	77.0	5.7	5.7	233.167	96.265	39.659	1.207
30	Normal	78.0	5.2	6.0	260.781	67.890	19.801	2.802
31	Normal	78.0	6.1	5.5	106.699	74.218	31.925	1.948
32	Normal	78.0	5.4	5.6	323.188	37.743	21.813	5.261
33	Normal	78.0	1.4	1.4	422.222	104.450	90.539	5.216
34	Normal	80.0	1.0	4.6	263.371	29.421	17.566	1.176
35	Normal	81.0	3.1	3.2	215.777	103.772	25.452	1.706
36	Normal	81.0	11.7	16.4	627.396	30.670	86.047	.911
37	Normal	81.0	3.8	6.7	788.310	43.798	68.159	9.448
38	Normal	82.0	8.8	10.3	433.279	30.515	53.901	2.500
39	Normal	83.0	1.8	5.3	306.735	40.877	36.157	2.416
40	Normal	83.0	3.4	6.1	330.417	16.049	47.272	1.234
41	Normal	83.0	1.1	3.0	332.453	65.819	99.755	2.013
42	Normal	83.0	1.3	1.6	294.218	27.986	86.380	1.312
43	Normal	84.0	3.3	3.1	387.479	23.859	26.716	1.820

	Brain Imaging Result	Age	Time between Injury and blood sampling (hours)	Time between injury and head CT (hours)	GFAP (pg/mL)	UCH-L1 (pg/mL)	NF-L (pg/mL)	Tau (pg/mL)
44	Normal	84.0	4.0	17.9	235.187	20.315	26.332	2.104
45	Normal	85.0	4.1	14.3	532.299	143.043	20.353	.969
46	Normal	86.0	2.9	1.6	87.404	102.990	18.001	1.321
47	Normal	86.0	9.0	9.1	501.701	57.073	46.989	1.329
48	Normal	88.0	2.9	4.5	853.919	197.634	93.206	2.577
49	Normal	88.0	1.8	3.4	403.082	127.456	40.205	7.286
50	Normal	88.0	4.7	4.9	560.016	38.680	29.610	5.401
51	Normal	88.0	5.2	5.4	753.972	59.750	69.423	2.232
52	Normal	89.0	1.5	1.6	434.825	49.901	49.223	2.439
53	Normal	89.0	3.6	3.8	3382.409	116.109	142.353	2.880
54	Normal	90.0	4.0	6.0	274.270	31.590	55.782	1.203
55	Normal	90.0	1.8	2.1	460.618	187.730	135.883	.721
56	Normal	91.0	2.3	2.4	221.865	30.721	20.950	1.395
57	Normal	93.0	5.3	5.6	424.888	133.234	99.772	4.534
58	Normal	93.0	1.9	9.9	557.109	49.105	237.303	4.794
59	Normal	94.0	2.3	2.7	267.663	40.316	45.553	2.305
60	Normal	94.0	2.7	4.6	272.902	46.483	31.277	.894
61	Normal	100.0	4.9	4.7	610.401	50.455	85.437	1.684
62	Abnormal	61.0	5.1	4.8	846.644	48.201	73.089	1.968
63	Abnormal	68.0	3.3	3.4	2057.879	151.345	19.913	3.481
64	Abnormal	71.0	8.7	10.0	533.145	30.386	33.862	.767
65	Abnormal	72.0	4.3	8.3	349.994	15.073	19.463	.708
66	Abnormal	72.0	3.8	4.2	2212.887	100.462	19.594	1.021
67	Abnormal	73.0	4.6	6.0	195.592	713.444	90.163	6.424
68	Abnormal	73.0	1.3	1.4	386.933	23.281	74.804	1.745
69	Abnormal	76.0	1.3	2.0	657.108	89.672	26.612	2.385
70	Abnormal	77.0	2.9	2.7	1191.149	63.553	29.823	3.300
71	Abnormal	80.0	1.3	2.6	2613.821	138.220	21.106	3.366
72	Abnormal	82.0	3.9	6.3	2331.838	58.248	18.326	.890
73	Abnormal	83.0	5.3	13.6	1382.719	110.735	19.128	1.953
74	Abnormal	85.0	2.6	2.3	729.044	18.268	35.572	1.133
75	Abnormal	86.0	2.9	3.6	354.694	17.039	35.672	.924
76	Abnormal	87.0	2.5	2.5	323.110	29.540	17.451	.774
77	Abnormal	88.0	4.5	5.4	492.604	49.188	38.454	.563
78	Abnormal	89.0	4.8	6.8	1372.245	135.899	36.954	1.208
79	Abnormal	89.0	8.3	7.6	2640.746	92.724	60.286	3.503
80	Abnormal	89.0	2.9	3.0	1064.121	114.594	284.068	12.200
81	Abnormal	92.0	1.4	2.8	188.588	42.706	27.766	6.328
82	Abnormal	95.0	5.9	5.9	2340.981	83.872	62.243	2.036
83	Abnormal	96.0	1.3	4.3	114.444	386.304	38.783	1.189