

Supplementary Materials

Liver-Support Therapies in Critical Illness—A Comparative Analysis of Procedural Characteristics and Safety

Supplemental Tables

Table S1. Relative and absolute changes of laboratory parameters in response to CytoSorb, MARS and TPE treatments (all treatments).

CytoSorb				MARS			TPE			p Value
Relative changes [%]	n	Median	IQR	n	Median	IQR	n	Median	IQR	
Total bilirubin	51	-32.0	-38.1 – -19.6	63	-7.5	-4.7 – +23.0	77	-17.9	-26.2 – -4.3	<0.001
Lactate	44	-5.7	-24.6 – +38.9	53	-30.9	+15.0 – +48.0	22	-40.6	-50.2 – -25.0	<0.001
LDH	46	-5.5	-15.8 – +6.2	63	-7.0	-3.7 – +18.4	76	-6.5	-19.1 – +1.2	0.415
P-Amylase	26	-7.4	-21.0 – +15.6	61	-2.5	-14.3 – +36.4	23	-5.0	-10.9 – +2.3	0.778
Lipase	26	-6.5	-22.9 – +3.2	61	-9.1	-9.1 – +31.0	24	-1.6	-15.9 – +8.3	0.540
AST	49	-13.3	-20.4 – +15.8	62	-15.3	-3.0 – +30.0	76	-17.4	-36.9 – +4.0	0.120
ALT	48	-14.0	-23.8 – +5.5	62	-18.0	-2.7 – +26.0	76	-16.1	-37.0 – -1.6	0.215
AP	48	-3.1	-9.6 – +11.8	62	-9.3	-5.7 – +19.0	76	-13.1	-29.0 – -2.6	<0.001
GGT	50	-5.0	-10.5 – +10.4	62	-6.9	-6.3 – +22.0	76	-12.7	-34.6 – +3.2	0.002
CRP	44	-4.6	-26.7 – +18.7	55	-12.4	-22.8 – +26.2	67	-16.7	-34.0 – 0	0.117
SCr	46	-11.0	.27.3 – +0.3	62	-22.4	-36.0 – 0.0	77	0.0	-8.1 – +3.7	<0.001
Urea	46	-19.1	-34.2 – +7.0	62	-9.6	-20.1 – +7.9	77	0.0	-9.6 – +12.9	0.001
Absolute changes	n	Median	IQR	n	Median	IQR	n	Median	IQR	p Value
Total bilirubin [mg/dl]	51	-6.9	-9.5 – -4.2	63	-0.7	-3.2 – +0.5	77	-1.6	-0.3 – -3.9	<0.001
Lactate [mmol/l]	44	+0.6	-5.0 – +5.0	53	-7.3	-12.0 – +2.3	22	-12.7	-8.2 – -18.1	<0.001
LDH [U/l]	46	-24.0	-65.5 – +15.5	63	-18.0	-74.0 – +13.0	76	-22.0	-84.0 – +1.0	0.655
P-Amylase [U/l]	26	-1.0	-7.5 – +1.0	61	-1.0	-29.0 – +6.0	23	-1.0	-5.5 – +0.5	0.934
Lipase [mg/dl]	26	-2.0	-9.5 – +1.5	61	-2.0	-26.0 – +5.0	24	-0.5	-5.5 – +1.8	0.660
AST [U/l]	49	-9.0	-21.8 – +14.8	62	-19.0	-107.0 – +3.0	76	-13.0	-92.0 – +3.0	0.117
ALT [U/l]	48	-10.0	-29.0 – +4.0	62	-14.0	-44.0 – +3.5	76	-10.0	-58.0 – -1.0	0.5133
AP [U/l]	48	-7.0	-40.0 – +35.0	62	-21.0	-56.0 – +6.8	76	-18.0	-43.0 – -3.0	0.047
GGT [U/l]	50	1.0	-14.5 – +11.5	62	-9.5	-54.0 – +4.0	76	-9.0	-27.0 – +1.0	0.031
CRP [mg/l]	44	-2.2	-9.2 – +4.2	55	-4.3	-22.0 – +8.9	67	-1.0	-5.9 – 0	0.934
SCr [mg/dl]	46	-0.1	-0.3 – 0.0	62	-0.2	-0.5 – 0.0	77	0.0	-0.1 – 0.0	<0.001
Urea [mg/dl]	46	-6.5	-23.3 – +3.3	62	-8.0	-20.5 – +5.3	77	0.0	-5.0 – +4.5	0.007

Molecular Adsorbent Recirculating System (MARS); Therapeutic Plasma Exchange (TPE); Lactate Dehydrogenase (LDH); Pancreas-Amylase (P-Amylase); Aspartate transaminase (AST); Alanine transaminase (ALT); Alkaline phosphatase (AP); Gamma-glutamyl Transpeptidase (GGT); C-reactive Protein (CRP); Interquartile range (IQR); Serum creatinine (SCr). *n* indicates available datasets for each parameter before and after treatment.

Table S2. Relative and absolute changes after first treatment of CytoSorb, MARS and TPE therapy.

CytoSorb				MARS			TPE			p Value
Relative changes [%]	n	Median	IQR	n	Median	IQR	n	Median	IQR	
Total bilirubin	19	-33.2	-39.5 – -19.4	14	-8.9	-26.3 – +5.7	17	-24.6	-34.2 – -5.0	0.140
Lactate	19	-14.8	-42.8 – +36.0	10	-42.5	-64.0 – -0.35	9	-39.8	-45.6 – -23.3	0.280
LDH	19	-8.6	-17.3 – +6.4	14	-5.2	-11.4 – +34.8	17	-26.6	-40.0 – -8.6	0.002
P-Amylase	13	-7.7	-21.0 – +15.6	13	+0.0	-30.0 – +24.6	9	-9.5	-26.8 – -2.5	0.406
Lipase	13	-16.2	-27.8 – -0.9	13	+0.0	-7.9 – +12.7	10	-17.1	-28.6 – -7.7	0.033
AST	19	-16.9	-24.2 – +17.5	14	-14.2	-33.0 – +51.3	17	-44.8	-60.9 – -29.4	<0.001
ALT	18	-14.5	-26.1 – +9.7	14	-16.9	-27.0 – +9.6	17	-50.9	-59.4 – -37.1	<0.001
AP	16	+3.7	-9.0 – +15.0	14	-7.5	-21.1 – +15.2	17	-37.1	-49.3 – -24.3	<0.001

GGT	19	-2.2	-11.8 – +11.1	13	-11.8	-27.5 – +9.6	17	-42.3	-58.0 – -31.8	<0.001
CRP	19	-5.6	-29.9 – +7.9	11	+3.0	-26.9 – +50.8	12	-34.4	-52.0 – -3.8	0.037
SCr	20	-9.2	-26.7 – +0.8	13	-29.2	-34.9 – -20.5	17	-12.2	-20.0 – +5.2	0.011
Urea	20	-19.8	-31.9 – +6.7	13	-3.7	-27.8 – +8.7	17	-3.8	-15.9 – +10.2	0.558
Absolute changes	n	Median	IQR	n	Median	IQR	n	Median	IQR	p Value
Total bilirubin [mg/dl]	19	-6.0	-8.8 – -3.4	14	-0.9	-4.7 – +0.3	17	-3.7	-7.2 – -0.4	0.017
Lactate [mmol/l]	19	-2.8	-11.5 – +5.7	10	-8.1	-30.3 – +0.5	9	-12.7	-15.1 – -6.4	0.176
LDH [U/l]	19	-29.0	-116.0 – +18.0	14	-13.0	-62.5 – +140.5	17	-88.0	-191.0 – -54.5	0.011
P-Amylase [U/l]	13	-1.0	-10.0 – +1.0	13	+0.0	-12.5 – +37.0	9	-5.0	-20.5 – -0.5	0.244
Lipase [mg/dl]	13	-3.0	-15.0 – +30.0	13	+0.0	-4.0 – +30.0	10	-6.0	-15.0 – -1.0	0.086
AST [U/l]	19	-13.0	-42.0 – +19.0	14	-20.0	-144.8 – +56.0	17	-104.0	-640.0 – -36.0	0.004
ALT [U/l]	18	-13.0	-52.3 – +6.5	14	-12.0	-133.8 – +6.8	17	-120.0	-604.5 – -22.0	0.010
AP [U/l]	16	+0.5	-23.5 – +24.8	14	-21.5	-57.3 – +12.0	17	-83.0	-161.0 – -32.0	0.001
GGT [U/l]	19	-2.0	-13.0 – +9.0	13	-32.5	-104.8 – +1.8	17	-43.0	-167.0 – -15.5	0.001
CRP [mg/l]	19	-2.4	-27.8 – +7.5	11	+6.1	-22.0 – +24.5	12	-4.4	-26.5 – +1.4	0.178
SCr [mg/dl]	20	-0.1	-0.3 – 0.0	13	-0.5	-0.8 – -0.3	17	-0.2	-0.3 – 0.0	0.011
Urea [mg/dl]	20	-6.0	-23.8 – +7.8	13	-3.0	-23.0 – +6.0	17	-2.0	-17.0 – +2.5	0.908

Molecular Adsorbent Recirculating System (MARS); Therapeutic Plasma Exchange (TPE); Lactate Dehydrogenase (LDH); Pancreas-Amylase (P-Amylase); Aspartate transaminase (AST); Alanine transaminase (ALT); Alkaline phosphatase (AP); Gamma-glutamyl Transpeptidase (GGT); C-reactive Protein (CRP); Interquartile range (IQR); Serum Creatinine (SCr). *n* indicated available datasets for each parameters before and after treatment.

Table S3. Correlation analysis of absolute reduction of parameters studied and duration of treatment.

Parameter	r	CytoSorb			r	MARS			r	TPE		
		95% CI	p Value	R ²		95% CI	p Value	R ²		95% CI	p Value	R ²
Total bilirubin	0.00	-0.32 – +0.24	0.732	0.03	0.33	+0.05 – +0.52	0.011	0.11	0.21	-0.02 – +0.42	0.064	0.01
Lactate	0.05	-0.36 – +0.20	0.070	0.26	-0.18	-0.44 – +0.11	0.561	0.01	-0.37	-0.68 – +0.07	0.084	0.00
LDH	0.02	-0.38 – +0.26	0.215	0.18	0.12	-0.13 – +0.38	0.352	0.01	0.06	-0.17 – +0.29	0.597	0.00
P-Amylase	0.05	-0.58 – +0.34	0.100	0.25	-0.01	-0.26 – +0.27	0.949	0.00	0.14	-0.30 – +0.53	0.536	0.00
Lipase	0.00	-0.64 – +0.24	0.803	0.10	0.08	-0.18 – +0.35	0.542	0.02	0.11	-0.32 – +0.50	0.620	0.00
AST	0.03	-0.37 – +0.25	0.161	0.17	0.20	-0.04 – +0.46	0.133	0.01	0.32	+0.09 – +0.51	0.005	0.11
ALT	0.02	-0.33 – +0.30	0.262	0.14	0.09	-0.02 – 0.48	0.480	0.00	0.27	+0.05 – +0.48	0.017	0.05
AP	0.01	-0.21 – +0.41	0.397	0.03	-0.09	-0.28 – +0.25	0.493	0.02	0.00	-0.23 – +0.24	0.974	0.01
GGT	0.02	-0.36 – +0.26	0.238	0.11	-0.18	-0.42 – +0.09	0.171	0.04	0.02	-0.21 – +0.26	0.842	0.00
CRP	0.00	-0.34 – +0.27	0.970	0.02	0.07	-0.23 – +0.32	0.595	0.00	0.29	+0.04 – +0.50	0.019	0.00
SCr	-0.25	-0.52 – +0.04	0.085	0.05	-0.03	0.31 – +0.21	0.674	0.00	-0.20	-0.41 – +0.03	0.076	0.03
Urea	-0.19	-0.46 – +0.11	0.208	0.07	-0.02	-0.28 – +0.23	0.852	0.01	-0.01	-0.24 – 0.22	0.939	0.00

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Supplemental Figure

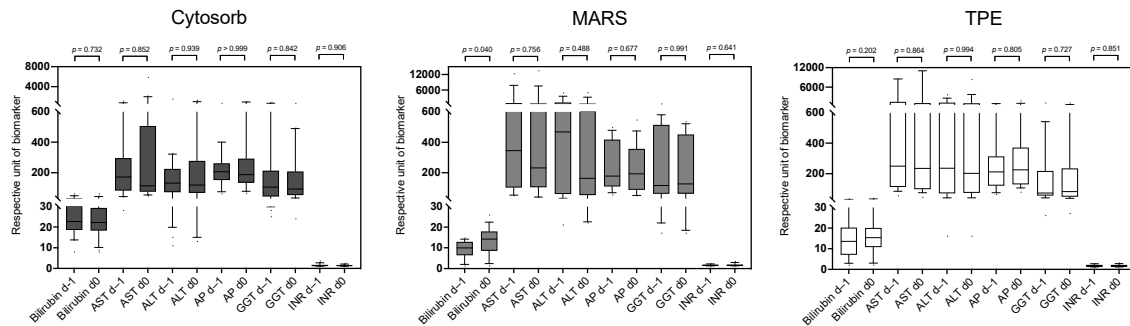


Figure S1. Course of routine liver parameters within two days before first liver support therapy.

Procedure-dependent absolute changes of blood pressure and vasopressor demand in response to Cytosorb, Molecular Adsorbent Recirculating System (MARS) and Therapeutic Plasma Exchange (TPE) therapy. Data are reported as box-and-whisker plots (interquartile range, 10% to 90% interval). D0 day of first liver support therapy, d-1 one day before first liver support therapy. Total bilirubin (Bilirubin) [mg/dL]; Aspartate transaminase (AST) [U/L]; Alanine transaminase (ALT) [U/L]; Alkaline phosphatase (AP) [U/L]; Gamma-glutamyl Transpeptidase (GGT) [U/L]; International Normalized Ratio (INR).