



THE ROLE OF BLOOD PURIFICATION BY HEMOADSORPTION AS ADJUNCTIVE TREATMENT IN CHILDREN WITH SEPTIC SHOCK – A CASE SERIES

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Background

- Sepsis is a major healthcare problem and leading cause of death in the pediatric population.
- One of the hallmarks of sepsis and multiorgan failure is the hyperinflammation due to excessive release of cytokines and inflammatory mediators.
- The new therapeutic approaches such as immune-modulation and blood purification have been tried to improve outcomes in patients with sepsis and septic shock.

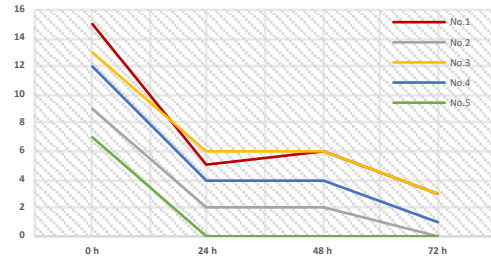
Patients and methods:

Five critically ill children with septic shock and multiorgan failure who received extracorporeal blood purification techniques with hemoadsorption device (HA330; Jafron Biomedical Co., Ltd., China), used as adjunctive therapy, aiming to restore the immune response to infection, by removing the triggers for the response and the cytokines produced and thereby achieve immune homeostasis

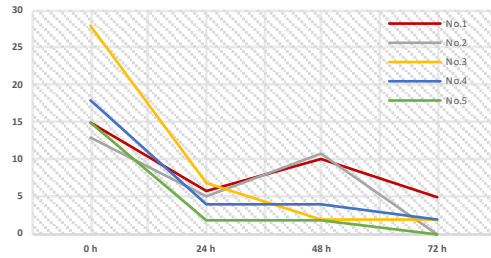
Results:

We found the HA330 as adjunctive therapy of these patients was associated with a reduction in organ dysfunction scores (PELOD-2 and PRISM-3), hemodynamic stabilization with a marked decrease in requirements for vasoactive substances, and reduction in inflammatory mediators such as IL-6. Treatment with this combined therapy was safe and no device-related adverse events.

PELOD-2 scores



PRISM-3 scores



Characteristics

Characteristics	1	2	Cases	3	4	5
Age, y	8	14	14	4	11	
Gender	Female	Female	Male	Male	Male	Male
Underlying disease	unknown	AIH type I ¹	unknown	BA ² with post LDLT ³	unknown	
Clinical presentations	RPGN ⁴ , pulmonary hemorrhage, severe ARDS ⁵ , invasive pulmonary aspergillosis	Acute on top chronic liver failure, HE ⁶ grade III	MIS-C ⁷ with cardiogenic shock	Small bowel perforation with septic shock and multiorgan failure	MIS-C with congestive heart failure	
Inotropic drugs/vasopressors	Noradrenalin, Milrinone	Noradrenalin, Adrenalin	Noradrenalin, Adrenalin, Milrinone	Noradrenalin, Adrenalin, Terlipressin	Noradrenalin	
Antibiotics	Piperacillin-tazobactam, cotrimoxazole, liposomal amphotericin B	Meropenem	Meropenem, Vancomycin	Meropenem, Vancomycin, Metronidazole	Piperacillin-tazobactam	
Other drugs	Methylprednisolone	-	Methylprednisolone, IVIG ⁸ , ASA	Hydrocortisone	Methylprednisolone, IVIG, ASA	

1.Autoimmune hepatitis type I; 2.Biliary atresia; 3.Living donor liver transplantation; 4.Rapid progressive glomerulonephritis; 5.Acute respiratory distress syndrome; 6.Hepatic encephalopathy; 7.Multisystem inflammatory syndrome of children; 8. Intra venous immune globulin.

Cases	1			2			3			4			5		
	Before	After	Reduction rate (%)	Before	After	Reduction rate (%)	Before	After	Reduction rate (%)	Before	After	Reduction rate (%)	Before	After	Reduction rate (%)
Inotropic score	5	0	-100.0	5	0	-100.0	15	3	-80.0	150	0	-100.0	20	0	-100.0
Inflammatory markers															
IL-6, pg/mL	196.3	47.2	-75.9	281.9	9.2	-96.7	101.0	6.1	-94.0	3,609.0	187.6	-94.8	216.5	5.9	-97.3
PCT, ng/mL	4.32	0.55	-87.3	N/A	N/A	N/A	>100.0	N/A	-	N/A	N/A	N/A	14.9	N/A	N/A
hs-CRP, mg/L	N/A	N/A	N/A	N/A	N/A	N/A	266.3	40.6	-84.8	13.0	N/A	N/A	257.0	33.3	-87.0
ESR, mm/h	N/A	N/A	N/A	N/A	N/A	N/A	54	12	-77.8	142.0	21.1	-85.1	2.0	4.0	-
Ammonia, mcg/dL	N/A	N/A	N/A	318.0	92.0	-71.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
NT-proBNP, pg/mL	N/A	N/A	N/A	N/A	N/A	N/A	>35,000	458	-98.7	N/A	N/A	N/A	22,906.0	1,758.0	-92.3
Hs-Trop I, ng/L	N/A	N/A	N/A	N/A	N/A	N/A	1,931.0	1,205.0	-37.6	N/A	N/A	N/A	400.8	100.0	-75.0
D-dimer, ng/mL	N/A	N/A	N/A	N/A	N/A	N/A	5,604.2	1,539.0	-72.5	N/A	N/A	N/A	3,930.0	1,529.0	-61.1
Fibrinogen, g/L	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Others															
OI	17.4	9.2	-47.1	2.2	1.0	-54.5	18.0	1.6	-91.1	11.0	1.7	-84.5	2.0	1.3	-35
Lactate, mmol/L	5.0	1.1	-78.0	4.0	1.3	-67.5	5.4	1.6	-70.4	1.7	0.9	-47.1	1.1	1.4	-
Outcome		Alive			Alive			Alive			Alive			Alive	
ICU length of stay, days		37			14			15			10			4	

VS: Vasoactive-inotropic score; IL-6; Interleukin-6; PCT: procalcitonin; hs-CRP: high-sensitivity C-reactive protein; ESR: erythrocyte sedimentation rate; NT-proBNP: N-terminal pro B-type natriuretic peptide; OI: oxygenation index.

Conclusions:

This small case series showed that hemoadsorption techniques with HA330 cartridge in pediatric septic shock and multiorgan failure resulted in improved organ dysfunction and rapid hemodynamic stabilization. Clinical significant removal of inflammatory cytokines may contribute to improving a patient's outcome in ICU. Further studies are needed to confirm and support its efficacy and safety in a large number of pediatric septic shock patients.

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