THE EFFICACY OF HEMOADSORPTION FOR SEVERE MULTISYSTEM INFLAMMATORY SYNDROME IN CHILDREN (MIS-C): A CASE SERIES

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Background

- Children with COVID-19 infection have mild symptoms. However, some children may develop a hyperinflammatory response called multisystem inflammatory syndrome in children (MIS-C) after the COVID-19 infection.
- The pathophysiology is mainly dysregulated inflammatory response lead to multi-organ dysfunction especially cardiovascular system.
- Despite early treatment with IVIG and corticosteroid, some children with MIS-C are still refractory disease and progressive symptoms.
- Additional from biologic agent, we try to find the treatment options as adjunctive treatment for rapid removing the inflammatory mediators. Blood purification by hemoadsorption may be a good choice for improve this clinical symptoms.

Methods

- Five critically-ill children with severe MIS-C who received initiated treatment with IVIG and corticosteroid, were received an extracorporeal blood purification by using HA330 hemoadsorber (HA330; Jafron, Zhuhai City, China) combined with a continuous renal replacement therapy (CRRT) machine.
- The reduction of the PELOD-2 and PRISM-3 score, VIS, and inflammatory markers such as IL-6, procalcitonin (PCT), high sensitivity C-reactive protein (hs-CRP), lactate levels at 72 hours were recorded.

Table 1. Baseline characteristics and initial laboratory markers

	Cases				
	1	2	3	4	5
Sex	Male	Male	Male	Female	Male
Age	14 y	5 y 2 m	11	4 y 11 m	8 y
Underlying disease	none	none	none	none	Crohn's disease
Clinical presentations	Myocarditis with cardiogenic shock	Fulminant myocarditis with cardiogenic shock	Myocarditis with cardiogenic shock	Myocarditis with cardiogenic shock	Myocarditis With cardiogenic shock, septic shock
Respiratory support	Invasive	Invasive	Invasive	Invasive	Invasive
Mechanical support	None	VA-ECMO	None	None	None
PELOD-2 score	13	10	7	6	9
PRISM-3 score	28	15	15	15	18
VIS	15	70	20	52	20
Laboratory/Inflammatory markers					
NT-pro-BNP (pg/mL)	>35,000	>35,000	22,906	>35,000	>35,000
hs-Trop I (ng/L)	1,462.0	1,534.6	400.8	262.6	N/A
IL-6 (pg/mL)	101.0	121.0	216.5	6.7	323.7
hs-CRP (mg/L)	134.9	6.4	138.1	85.7	17.9
ESR (mm/h)	54.0	2.0	2.0	72.0	69
PCT (pg/mL)	>100.0	21.6	14.9	65.5	3.4
Lactate (mmol/L)	5.4	0.7	1.1	3.7	2.9

VA-ECMO, venoarterial extracorporeal membrane oxygenation; *PELOD*, Pediatric Logistic Organ Dysfunction; *PRISM*, Pediatric Risk of Mortality; *VIS*, vasoactive inotropic score; *NT-pro-BNP*, N-terminal pro B-type natriuretic peptide; *hs-Trop I*, high sensitivity troponin I; *IL-6*, interleukin 6; *hs-CRP*, high sensitivity C-reactive protein; *PCT*, procalcitonin

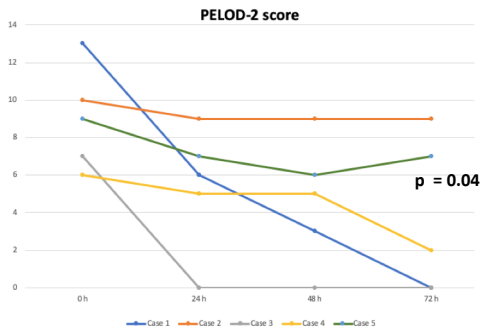
Results

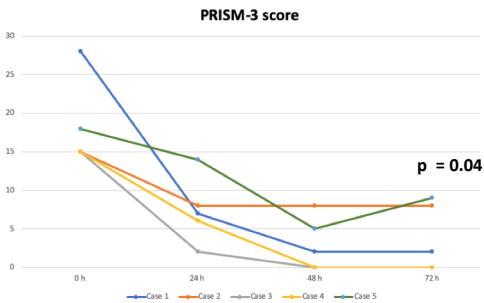
We found that the reduction of the average PELOD-2 and PRISM-3 score decreased significantly compared between baseline and 72 hours after HA treatment. There were no statistically difference in the VIS and other inflammatory markers such as IL-6, PCT, hs-CRP and lactate levels at 72 hours. (Table 2)

Table 2. Comparation mortality score and laboratory results at 72 hour follow-up from baseline

	MIS-C (n = 5)	
	Median (IQR)	P-value
PELOD-2 score		
• At baseline	9 (7-10)	Ref
• At 72 h	2 (0-7)	0.04
PRISM-3 score		
• At baseline	15 (15-18)	Ref
• At 72 h	2 (0-8)	0.04
VIS score		
• At baseline	20 (20-52)	Ref
• At 72 h	7 (3-7)	0.06
Inflammatory markers		
IL-6 (pg/mL)		
• At baseline	121 (101-216.5)	Ref
• At 72 h	6.1 (5.9-6.6)	0.14
Procalcitonin (pg/mL)		
• At baseline	18.3 (9.2-43.5)	Ref
• At 72 h	5.1 (1.6-8.7)	0.08
hs-CRP (mg/L)		
• At baseline	85.7 (17.9-134.9)	Ref
• At 72 h	33.3 (10.5-88.7)	0.50
Lactate (mmol/L)		
• At baseline	2.9 (1.1-3.7)	Ref
• At 72 h	1.9 (1.6-2.2)	0.50

PELOD, Pediatric Logistic Organ Dysfunction; *PRISM*, Pediatric Risk of Mortality; *VIS*, vasoactive inotropic score; *IL-6*, interleukin 6; *PCT*, procalcitonin; *hs-CRP*, high sensitivity C-reactive protein.





Conclusions

MIS-C is rare and may have a serious complication especially cardiovascular dysfunction. Early treatment with IVIG and corticosteroid may have a favorable outcome. In the severe MIS-C and refractory disease, using HA330 may be a good option and safe for adjunctive treatment with IVIG and corticosteroid for rapid improvement in organ dysfunction and mortality score.