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Case of the week 32/2022

# Hemoadsorption for severe MIS-C in critically ill children, should we consider it as a therapeutic opportunity?

*Gabriella Bottari[1], Flavia Severini[2], Anna Hermine Markowich[2], Giulia Lorenzetti[2], Juan Carlos Ruiz Rodriguez[3,4], Ricard Ferrer[3,4], Paola Francalanci[5], Antonio Ammirati[6], Paolo Palma[7] and Corrado Cecchetti[1]*
*[1] Pediatric Intensive Care Unit, Pediatric Emergency Department, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy*
*[2] Department of Pediatrics, University of Rome Tor Vergata, Residency School of Pediatrics, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy*
*[3] Intensive Care Department, Vall d'Hebron University Hospital, Vall d'Hebron Barcelona Hospital Campus, Barcelona, Spain*
*[4] Shock, Organ Dysfunction and Resuscitation Research Group, Vall d'Hebron Research, Institute (VHIR), Barcelona, Spain*
*[5] Unit of Pathology, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy*
*[6] Pediatric Emergency Unit, Pediatric Emergency Department, Bambino Gesù Children's Hospital, IRCSS, Rome, Italy*
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*This case reports on a 13 year old boy (weight 60 kg, height 160 cm) who presented with fever, rash, abdominal pain, and vomiting.*

## Case presentation

- Blood tests revealed elevated leukocytes with neutrophilia, high C-reactive protein (CRP) (29.31 mg/gL), procalcitonin (3.32 ng/mL), and hyperferritinemia (1529 ng/mL)
- He had a positive history for SARS-CoV-2 infection 6 weeks previously with positive serology
- Within 24 h he developed diarrhea, poor pallor, and hypotension
- Cardiac markers were elevated, and 2D-echocardiogram showed left ventricular (LV) dysfunction (Ejection Fraction EF 35%)
- Supportive care with milrinone and dopamine was started and, as multisystem inflammatory syndrome in children (MIS-C) was suspected, he received immunoglobulins and corticosteroids
- The following day he deteriorated, with an 2D-echocardiogram showing a LVEF of 25%, therefore he was referred to the pediatric intensive care unit (PICU) requiring endotracheal intubation and invasive mechanical ventilation (IMV) due to cardiogenic shock
- Given the increase in troponin I (high sensitivity troponin, hs-TnI) levels from 75 to 1200 pg/ml in 12 h, infectious myocarditis was suspected and an endomyocardial biopsy (EMB) was taken
- Considering the clinical picture of hyperinflammation associated severe shock due to left ventricular dysfunction (LVD) and high lactate (7.9 mmol/l) with the need for high inotropic and vasopressor support (epinephrine 0.35 µ/kg/min, norepinephrine 0.06 µ/kg/min, and milrinone 0.5 µ/kg/min), hemoadsorption with CytoSorb was started in combination with continuous kidney replacement therapy (CKRT)
- Of note, even though the patient fulfilled the diagnostic criteria of MIS-C, the authors could not completely rule out the development of fulminant myocarditis due to Parvovirus B19 (PVB19) positivity after suffering from COVID-19, which is why corticosteroids were withheld and immunoglobulins and anakinra were maintained

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## Treatment

- The patient received in total 5 adsorbers over 72 hrs with the first 2 adsorbers for 12 hours each, and a further 3 adsorbers for 24 hours each inserted into the continuous renal replacement circuit
- Anticoagulation protocol: citrate-calcium

## Measurements

- Hemodynamics and requirements for vasoactive substances
- Inflammatory parameters
- Left ventricular ejection fraction
- Cardiac enzymes
- Safety

## Results

- The therapeutic strategy resulted in hemodynamic stabilization with a rapid reduction followed by the cessation of vasopressors at the time of discontinuation of CytoSorb therapy
- Treatment was also associated with control of the hyperinflammatory response as evidenced by a reduction in inflammatory parameters including CRP, interleukin – IL-6 and IL-10
- After the first 24 h of combined hemoadsorption and CKRT therapy, an improvement in the LVEF to 50% was observed
- Troponin I levels decreased from 1200 pg/ml to around 375 pg/ml within 12 hours of treatment with decreasing levels thereafter, reaching ~100 pg/ml by the end of blood purification therapy
- No adverse events were noted

## Patient Follow-up

- CKRT was discontinued at the same time of hemoperfusion after 72 h (day 3)
- He was weaned off invasive mechanical ventilation on day 6 and discharged from the PICU on day 8
- After 2 weeks his cardiac function had completely restored and the patient was discharged from the hospital on day 20 requiring only the diuretic, spironolactone

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## Conclusion

- In this adolescent with refractory shock secondary to LV dysfunction in the context of MIS-C, treatment with hemoadsorption in combination with immunomodulatory therapies resulted in hemodynamic and clinical stabilization as well as control of the hyperinflammatory response with the treatment appearing safe and feasible
- The authors compare this case with two more published cases where CytoSorb has been used as an adjuvant therapy in similarly critically ill children with severe forms of MIS-C. All three patients responded with prompt improvements in their myocardial function (within the first 24 h) following the start of hemoadsorption
- The authors state that using this blood purification strategy could be a therapeutic opportunity in severe LVD due to MIS-C, sparing the need for extracorporeal membrane oxygenation (ECMO) and other mechanical cardiocirculatory supports, with the advantage of it being less invasive. They also state that CytoSorb does not appear to interfere with most common immunomodulatory therapies although further evidence is required