Hemoadsorption with Adult CytoSorb® in a Low Weight Pediatric Case - A Worldwide Premiere Procedure

Cirstoveanu C, Barascu I, Stancu A.
Case Rep Crit Care. 2017;2017:6987167

This case study reports on the case of a nine-month-old male infant who was admitted to the neonatal intensive care unit from the pediatric cardiovascular surgery unit, on his fourth postoperative day after the correction of tetralogy of Fallot.

Case presentation

- On the 3rd postop day the patient became febrile, so a complete blood count (CBC), biochemistry and a blood culture were performed. On day 4 he was admitted to the NICU gravely unwell, intubated and mechanically ventilated, with unilaterally diminished breath sounds, hypoxemia (oxygen saturation: 90%), oliguria, tachycardia (137 beats per minute), hypotension (74/44/59 mmHg) and abdominal distention with anasarca and fever (39-40°C). Physical examination revealed hepatosplenomegaly.

- CBC showed hemoconcentration (Hb: 14.2 g/dl, Ht: 45%), thrombocytopenia (27,000/mm3), leukocytosis (17,800/mm3) with neutrophilia (66.6%). Coagulation tests revealed a grossly elevated INR (4.66), hypofibrinogenemia (113 mg/dl) and a prolonged aPPT time (63 seconds). A severe inflammatory response (SIRS) was noted (CRP: 47.76 U/L, Procalcitonin: 10 ng/L). Liver function tests (LFTs) were greatly abnormal (ALT: 1883.1 U/L, AST: 4214.5 U/L, GGT 72 U/L, total bilirubin: 10.05 mg/dl, direct bilirubin: 7.59 mg/dl), consistent with hepatocellular necrosis.

- Renal impairment was evident with a creatinine of 1.15 mg/dl and urea of 55 mg/dl. Creatinine kinase and creatine kinase-MB were also elevated with values of 1619 U/L and 159.6 U/L, respectively. Acid-base balance was deranged (metabolic acidosis). Blood culture was sterile and the culture from tracheal aspirate revealed Escherichia coli.

- Meropenem, Vancomycin and Fluconazole were initiated. Multiple episodes of severe hypotension and bradycardia were treated with adrenaline, noradrenaline and dopamine. Due to persistent SIRS (CRP values from 47.76 to 54.76), antibiotics were changed to Tienam (Imipenem and Cilastin) and Amikacin.

- Two days after ICU admission oliguria rapidly evolved to anuria, and peritoneal dialysis was initiated. While the patient’s fluid intake continued to exceed the output the decision was made to start hemodiafiltration (HDF) (Prismaflex, Baxter). Throughout HDF, the patient continued to be hypotensive and bradycardic necessitating in an increased dose of inotropic agents.

- Metabolic acidosis also persisted despite treatment, he continued to be thrombocytopenic requiring multiple thrombocyte mass transfusions. He also developed macrocytic, hyperchromic anemia. After initiation of HDF he continued to be oliguric with intensely hyperchromic hematuria.

- As the patient continued to be febrile, antibiotic therapy was modified once more to Meropenem and Ciprofloxacin for a duration of 16 days. Antibiotic doses were kept constant throughout.

- Bilirubin levels kept increasing, culminating in a maximum value of 54 mg/dl of total bilirubin and 31.67 mg/dl of direct bilirubin. Intense scleral and cutaneous jaundice was observed and the patient was diagnosed with cholestatic jaundice.

- On the 9th day of continuous hemodiafiltration the therapeutic decision of commencing hemadsorption with a cytokine adsorber (CytoSorb) was taken

Treatment

- One treatment with CytoSorb for 49 hours
- CytoSorb was used in conjunction with CRRT (Prismaflex, Baxter) performed in CVVHDF mode
- Blood flow rate: 40 ml/min
- Because of the flow rate being so much slower that the recommended flow rate, the procedure was maintained for 49 hours
- Anticoagulation: heparin
- CytoSorb adsorber position: post-hemofilter
Measurements
- Demand for catecholamines (norepinephrine, dopamine, epinephrine)
- Ventilation settings (FiO₂, respiratory rate, positive end expiratory pressure (PEEP), positive inspiratory pressure (PIP))
- Bilirubin, transaminases

Results
- During the first 24-hour period with CytoSorb, total bilirubin value decreased from 54 to 17 mg/dl and the patient’s general status improved considerably. At the end of the 49 hours the total bilirubin was 14 mg/dl.
- The liver function (aminotransferases) also decreased rapidly but rose to their previous values as soon as CytoSorb® was removed.
- Noradrenaline decreased rapidly from 0.8 to 0.18 mcg/kg/min during the first 24 hrs and ceased within the next 24 hours. Dopamine decreased from 8 to 5 mcg/kg/min to 0 during liver support. The dose of adrenaline decreased within 48 hours of CytoSorb® treatment and ceased after 5 days.
- The patient’s ventilation settings also improved during CytoSorb treatment

Patient Follow-Up
- HDF was stopped after 11 days
- The patient’s cardiovascular status improved
- Diuresis gradually reached normal values and enteral nutrition could be initiated
- Quantitative renal function returned to normal as did renal function tests
- It was possible to keep the antibiotic doses constant during the entire CytoSorb procedure
- The patient was discharged home after 34 days of hospitalization, in good general status, hemodynamically stable, afebrile and weighing 9.6 kilograms
- He was referred to a pediatric neurologist for follow-up

CONCLUSIONS
- This is the first published case of CytoSorb used in a critically unwell 9 month old baby
- CytoSorb could be safely used in this pediatric case of septic multi-organ failure after cardiac surgery
- Both bilirubin levels and liver enzymes improved dramatically during CytoSorb use as did the patients hemodynamic and respiratory status
- Despite the fact that the flow rate was only 40mls / min (normally >100-150 mls/min), there were no instances of clotting in the adsorber
- Antibiotic doses could be kept constant during the entire hemoadsorption procedure using CytoSorb