CytoSorb®

Case of the week 19/2019

Use of CytoSorb in the setting of Hong Kong influenza (A/H3N2), toxic hepatitis and multiple organ failure in a pediatric patient

K.V. Serednyakov[1], R.Z. Akhmetshin[2]; R.N. Bogdanov[2]
[1]FMBA Children Infections Scientific Research Center, St. Petersburg, Russia
[2]Republican Children Clinical Hospital, Ufa, Russia

This case reports on a 2-year-old girl who was admitted to the Infections Clinical Hospital with symptoms of central nervous system (CNS) depression.

Case presentation

- Two days before, the disease started acutely with fever (39.0 C). After self medication at home with high dosages of ibuprofen and paracetamol the temperature briefly decreased. An ambulance was called the next day, however the mother refused hospital admission offered by the paramedics
- Upon admission 2 days after the first symptoms, the patient was diagnosed with multiple organ failure (MOF) with cerebral insufficiency/CNS depression, acute liver failure and acute renal failure (ARF)
- Principal diagnosis was confirmed to be influenza A/H3N2 with a fulminant course and the following sequelae: Reye-like syndrome (acute encephalopathy and liver failure), acute lung injury, acute renal failure, cerebral edema, acute anemia and disseminated intravascular coagulation (DIC)
- Volume and antibacterial therapy (cefepim) was started. She was further prescribed spasmolytics and diuretics
- However, the patient's condition deteriorated accompanied by an aggravation of electrolyte disturbances and progression of the CNS disorder
- Three day after initial admission, the child was transferred in a critical condition to the Republican Children Clinical Hospital due to better ICU facilities
- She had to be intubated and mechanically ventilated
- Acute liver failure was evident with massively increased markers of hepatocellular necrosis (aspartate-amino-transferase (ALT) 1522 U/L, alanine-amino-transferase (AST) 627 U/L, gamma glutamyl-transferase (GGT) 185 U/l) and metabolic parameters were markedly deranged (lactate 3.2 mmol/l, base excess +10 mmol/l)
- The next day, her clinical situation further deteriorated and MOF progressed
- Unstable hemodynamics necessitated high dosages of dopamine (5-7.5 µg/kg/min) and norepinephrine (0.3 µg/kg/min) to maintain an arterial blood pressure of above 95/60 mmHg, simultaneously bradyarrhythmia (88-96/min) and muffled heart sounds were present
- The same day, continuous renal replacement therapy (CRRT) was started
- Due to further deterioration of her clinical condition, CytoSorb was added to the extracorporeal circuit one hour after CRRT start
- Final diagnosis: Acute liver failure and multiple organ failure (MOF) as a result of uncontrolled Hong Kong influenza (A/H3N2)

CytoSorb®

Case of the week 19/2019

Treatment

- One treatment with CytoSorb for 24 hours
- CytoSorb was used in continuous veno-venous hemodiafiltration mode (CVVHDF) using a conventional CRRT machine (Multifiltrate, Fresenius Medical Care) with a AV-400 filter
- The adsorber was prefilled with fresh frozen plasma of the same blood type
- Blood flow rate: 150 ml/min
- Anticoagulation: heparin
- Position: pre-hemofilter

Measurements

- Norepinephrine and dopamine requirements
- Renal function (creatinine)
- Cardiac function (calculated right ventricular pressure)
- Metabolic parameters (lactate, base excess)
- Markers of hepatocellular necrosis (ALT, AST, GGT)

Results

- Within 6 hours of CytoSorb therapy, hemodynamics stabilized and norepinephrine and dopamine infusions could be substantially reduced. Both, catecholamine and inotropic support were completely tapered off the same evening
- The combined CVVHDF and CytoSorb treatment was associated with a full recovery of renal function accompanied by a significant decrease in creatinine (from 24 to 7.1 µmol/l within 48 hours)
- Echocardiography confirmed an improvement in cardiac function as evidenced by a decrease of calculated right ventricular pressure from 53 mmHg to 22 mmHg within 3 days
- Lactate levels decreased from 4.7 to 2.1 mmol/l and base excess from 8.5 to -2.1 mmol/l within 24 hours of CytoSorb therapy
- Levels of hepatocellular necrosis markers could also be significantly reduced during the course of the 24 hours CytoSorb treatment (ALT from 1522 to 504 U/l, AST from 627 to 77 U/l, GGT from 185 to 101 U/l) with stable levels after cessation of treatment

Patient follow-Up

- One day after discontinuation of CytoSorb, her respiratory function improved and the patient could be extubated the following day
- Eight days later, the patient was transferred to the normal ward
- Discharge from the hospital in a stable condition one week later

CytoSorb®

Case of the week 19/2019

Conclusions

- In this patient with Hong Kong influenza (A/H3N2), toxic hepatitis and multiple organ failure the combined treatment of standard therapy, CVVHDF and CytoSorb was effective and resulted in rapid hemodynamic stabilization accompanied by metabolic stabilization and reversal of multiple organ failure
- According to the medical team, running an extracorporeal circuit in children of small weight requires experience and caution. Fresh frozen plasma of the same blood type was used for priming the adsorber with no coagulation problems occurring during the process. Without doubt, a smaller volume CytoSorb would be helpful in a pediatric intensive care unit
- CytoSorb use was safe. There were no technical difficulties with installing it into the circuit and no CytoSorb-related adverse events occurred