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Case of the week 10/2020

Use of CytoSorb in a pediatric patient with septic shock in the setting of a non-controlled infectious focus

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The case study reports on a 16-year-old girl, who presented to the hospital with syncope and fever (39°C), tachycardia, complaints of chest pain and coughing after fainting at home.

Case presentation

- The girl had been self-medicated at home with myramistin (antiseptic spray) and antipyretic drugs for 7 days before admission
- Further medical history was unremarkable apart from recurrent tonsillitis in her early childhood. A flu vaccination had been performed several months before admission. No allergies were reported
- At the hospital the girl was diagnosed with an acute respiratory viral infection, out-of-hospital bilateral multi-segmental pneumonia and exudative pleuritis
- As her condition was rapidly deteriorating, she was transferred to the Infectious Diseases pediatric ICU
- In the ICU she was immediately intubated and started on broad-spectrum antibiotic therapy (ertapenem, azithromycin)
- Over time, the girl developed multiple organ failure (MOF) including disseminated intravascular coagulopathy (DIC), severe acute respiratory distress syndrome (ARDS) with PaO_2/FiO_2 ratio 75 mmHg, cardiovascular insufficiency, acute kidney injury and reactive pancreatitis
- The child's condition continued to drastically deteriorate and within 10 hours after admission, the diagnosis was septic shock refractory to standard therapy
- She was hypotensive, had high vasopressor requirements (norepinephrine 1.45 µg/kg/min) and pronounced lactic acidosis (lactate 7.4 mmol/l)
- Laboratory diagnostics revealed extremely high levels of inflammatory mediators (procalcitonin (PCT) 172,63 ng/ml, C-reactive protein (CRP) 313,20 mg/l)
- At that time, her sepsis-related organ failure assessment (SOFA) score was 11
- Linezolid was added to antibiotic therapy, ertapenem was changed to meropenem
- Within 12 hours after septic shock was diagnosed and in a setting of a lack of response to standard therapy the decision was made to start continuous renal replacement therapy (CRRT) together with CytoSorb hemoadsorption in order to stabilize hemodynamics and prevent further progression of MOF

Treatment

- One session of CytoSorb therapy for a total treatment time of 24 hours
- CytoSorb was used in conjunction with Prismaflex (Gambro Medical, Sweden) run in CVVHDF mode (with a AN69ST membrane, Baxter)

- Blood flow rate: 130 ml/min
- Anticoagulation: heparin, 2-5 units/kg/hour
- CytoSorb adsorber position: post-hemofilter

Measurements

- Vasopressor requirements
- SOFA score
- Lactate
- Inflammatory mediators

Results

- Three hours after the start of blood purification therapy, vasopressor demand decreased from 1.45 to 0.5 µg/kg/min, which remained stable until the cessation of blood purification therapy. 48 hours after CytoSorb therapy start (and 24 hours after a pleural effusion was drained, see below), the patient no longer required norepinephrine support for hemodynamic stabilization
- Treatment was also associated with a reduction in PCT levels from 172.63 to 99.61 ng/ml within 6 hours of blood purification therapy. However, thereafter PCT plasma concentrations rose again reaching levels of 142.21 ng/ml by 24 hours. Streptococcus pneumoniae was detected in endotracheal aspirate and antibacterial therapy was adjusted to meropenem, linezolid and levofloxacine. 48 hours after blood purification therapy initiation, inflammatory mediators concentrations decreased significantly (PCT reduced to 64.56 ng/ml, CRP to 179.10 mg/l) after control of the infectious focus
- Blood lactate levels dropped from 7.4 to 2.7 mmol/l within 6 hours of blood purification therapy
- Upon cessation of blood purification therapy, SOFA score decrease was minimal (from 11 to 10). However, 24 hours after discontinuation of therapy SOFA score reduced from 11 to 6

Patient follow-up

- CRRT and CytoSorb were simultaneously stopped after 24 hours of treatment
- Immediately after blood purification was discontinued, the key infection locus (pleural effusion) was found and quickly drained. The same infectious agent was identified (Streptococcus pneumoniae) in the pleural exudate
- The patient was extubated 4 days after blood purification therapy was started
- She was alert, had good appetite and no discomfort. Her diuresis restored
- The girl was discharged from hospital on day 14 after the start of blood purification therapy in a clinically stable condition

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Conclusions

- The combination of CVVHDF and hemoadsorption using CytoSorb proved efficient in the reduction in vasopressor requirement in this young patient with septic shock
- In this case, blood purification with CRRT and CytoSorb helped to stop the progression of multiple organ failure and could thus represent a helpful treatment option in septic shock patients to win time for infectious source discovery and control with the least possible damage. Therefore, this therapy may be reasonable for patients with septic shock, if it is impossible to perform source control quickly
- Of note, the SOFA score changes in this clinical case were delayed. The authors suggest that meaningful SOFA score changes assessment be performed at least 48 hours after blood purification initiation
- CytoSorb use was safe and easy to use