

Use of CytoSorb in septic multiple organ failure following intestinal ischemia due to volvulus with concomitant liver failure after COVID-19 disease

Dr. Klaus Kogelmann
Interdisciplinary Intensive Care Medicine, Emden Hospital, Germany

This case reports on a 45-year-old male patient who was hospitalized for emergency intervention due to recurrent abdominal discomfort following CT-confirmed occlusion of the superior mesenteric artery.

Case presentation

- Three weeks earlier, the patient suffered a hemorrhagic small bowel infarction secondary to torsion of the mesoileum due to adhesions (state after appendectomy 40 years ago). In addition, there was a SARS-CoV-2 infection that was asymptomatic at that time. A heterogeneous Activated Protein C (APC) resistance (factor V disorder) was known from the patient's medical history
- After the diagnosis of incomplete ischemia of the small intestine with fresh thrombosis of the superior mesenteric artery, emergency thrombectomy was performed and the patient was transferred to the intensive care unit (ICU)
- One day later, a revision laparotomy was performed with resection of the entire jejunum and ileum as well as the caecum with closure of the ascending colon and formation of a terminal stoma at the duodenojejunal junction
- The patient was readmitted to the ICU postoperatively in full-blown septic shock due to peritonitis with mesenteric ischemia
- After consultation with the coagulation outpatient department of the MH Hannover, the common consensus regarding the recurrent thromboses with pronounced coagulation disorders was the consequence of a combination of a potential hypercoagulopathy (heterogeneous protein C resistance), COVID-19 disease and torsion of the mesenteric root
- Initiation of hydrocortisone therapy with 10 mg/h
- He had a Simplified Acute Physiology Score (SAPS) II score of 56 at that time
- Significantly elevated inflammatory parameters indicated a pronounced infection-driven hyperinflammatory situation (C-Reactive Protein - CRP 285.9 mg/l, procalcitonin - PCT 2.36 ng/ml)
- In addition, the patient was severely hemodynamically unstable (norepinephrine 2.5 mg/h with a mean arterial pressure [MAP] of 68 mmHg) and had pronounced lactic acidosis (11 mmol/l)
- In addition, acute liver failure with significantly increased liver values (LDH 7703 U/l, aspartate aminotransferase 13300 U/l, alanine aminotransferase 7332 U/l, gamma-glutamyltransferase 135 U/l, bilirubin 2.35 mg/dl) was progressing rapidly
- His condition unfortunately did not improve within the first 24 hours despite differentiated, protocol-based and cardiac output-guided sepsis therapy (volume, catecholamines, lung-protective ventilation therapy, calculated antibiotic therapy), so that continuous renal replacement therapy (CRRT) in combination with CytoSorb cytokine adsorption was started due to persistent oliguric renal failure (Glomerular Filtration Rate - GFR 40 ml/min, creatinine 1.83 mg/dl, urea 77 mg/dl) and refractory shock

Treatment

- Three consecutive treatments with CytoSorb for 24 hours each
- CytoSorb was used in combination with CRRT (Multifiltrate, Fresenius Medical Care) in continuous veno-venous hemodialysis (CVVHD) mode
- Blood flow rate: 100-200 ml/min
- Anticoagulation: citrate
- CytoSorb adsorber position: pre-hemofilter

Measurements

- Hemodynamics and norepinephrine requirements
- Inflammatory parameters
- Lactate
- Liver function
- Respiratory situation
- SAPS II and overall clinical situation

Results

- During treatment, norepinephrine requirements progressively reduced and could be completely stopped 24 hours after the end of the 3 treatment sessions
- Treatment was also associated with control of the hyperinflammatory response accompanied by a clear reduction in inflammatory parameters (CRP 62.6 mg/l, PCT 0.85 pg/ml 24 hours after last treatment)
- Lactate plasma concentrations were also significantly reduced reaching almost normal values (2.6 mmol/l) at the end of treatment
- Initially elevated liver enzymes improved under CytoSorb treatment (aspartate aminotransferase from almost 15,000 U/L to 198 U/L; alanine aminotransferase from over 7,000 to under 1,000 U/L)
- Weaning from the respirator could be initiated shortly after CytoSorb discontinuation
- Furthermore, the SAPS II score dropped significantly from an initial 56 to 37 points, associated with an obvious improvement in the overall clinical situation and cessation of hemodialysis

Patient Follow-up

- After the clear clinical improvement (hemodynamically stable and catecholamine-free, stable ventilation), hemodialysis and cytokine adsorption were discontinued and weaning from the respirator started
- Ten days later, however, the patient unfortunately suffered another fulminant circulatory, renal and liver failure
- An esophago-gastro-duodenoscopy was performed due to upper gastrointestinal hemorrhage, which showed severe fibrinous gastritis and duodenitis with old blood secretions in the duodenum
- Finally, and in the context of the renewed refractory shock and protracted rise in bilirubin levels (19 mg/dl), new hemoadsorption treatment was started as a trial, but this had no effect and the patient died whilst on maximum therapy

Conclusions

- In this patient with septic multiple organ failure due to recurrent mesenteric infarctions with intestinal ischemia and concomitant liver failure, combined treatment with standard therapy, CytoSorb hemoadsorption and renal replacement therapy resulted in significant stabilization of hemodynamics with reduction in norepinephrine doses, control of the hyperinflammatory situation and marked improvement in liver and renal function. In addition, resolution of metabolic acidosis and general improvement in the clinical condition was also noted
- According to the medical team, the initial success of hemadsorption treatment was prompt and obvious. Circulatory and liver failure was completely resolving in this phase, which was clearly due to this treatment
- Unfortunately, after renewed decompensation, the condition was then worsened in a fulminant way and was completely refractory, so that hemadsorption therapy had no effect
- Treatment with CytoSorb was safe and feasible without technical problems