

Use of CytoSorb in septic shock, immunosuppression in the context of chronic glomerulonephritis and uncontrolled long-term intake of glucocorticoids

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This case study reports on a 28-year-old patient, who was admitted to the hospital via emergency transport already hypotonic, tachycardic, disoriented and with clear signs of sepsis.

Case presentation

- One week previously, the patient had suffered from a flu-like infection and showed increased, painless edema, in particular on the legs (left leg already lividly discolored). Thrombosis was excluded using Doppler sonographically. Diagnosis made of anasarca with severe protein deficiency (on admission albumin 16 g/l, total protein 33 g/l)
- It was also known that the patient had ingested 40 mg prednisolone daily for at least 2 years
- After admission he was directly transferred to the intensive care unit in full-blown septic shock
- Blood cultures were immediately taken and antibiotic therapy with tazobactam/piperacillin and ciprofloxacin started, which was later extended to vancomycin and voriconazole due to his immunosuppression
- Lab diagnostics revealed rhabdomyolysis (CK 9940 U/l, myoglobin 26961 ng/ml), coagulation disorder with an INR of 1.59, leukopenia $0.47 \cdot 10^3/\mu\text{l}$, an incipient renal failure (creatinine 1.9 mg/dl), strongly increased inflammation and infection parameters (CRP 189 mg/l, PCT 299,82 ng/ml with later increased to 1002 ng/ml) as well as activation of Troponin and NT-proBNP as an expression of septic cardiomyopathy (troponin I 0.13 ng/ml and NT-proBNP 13020 pg/ml), as well as the development of hypoglycaemia and electrolyte imbalance
- Start of high-dose volume (first 24 h approximately 9 liters positive balance) and catecholamine therapy with a progressive increase of norepinephrine requirement over the first hours after admission to 8 mg/h
- Additional administration of hydrocortisone (200 mg/day), immunoglobulins (octagam 10%, 40 g total dose) and human albumin, as well as the administration of acyclovir due to herpes reactivation in the facial area
- Despite the initiation of these additional therapies the condition of the patient deteriorated severely, so that endotracheal intubation had to be performed still on the day of admission due to respiratory insufficiency, during which the patient had to be cardiopulmonarily resuscitated for approx. 5 minutes due to pressureless circulation. On the 4th day a dilatative tracheotomy was performed without complications despite thrombopenia and coagulopathy
- Meanwhile, increasing pancytopenia with the need for several transfusions
- Permanent extension of catecholamine therapy to adrenaline with peak values of up to 6 mg/h, as well as short term dobutamine infusion
- Due to the extremely high catecholamine requirement in combination with progressive rhabdomyolysis and the uncontrollable systemic inflammation with fulminant shock, renal replacement therapy was initiated together with CytoSorb
- Final diagnosis: Septic shock with immunosuppression in the context of chronic glomerulonephritis (of unknown genesis) and uncontrolled ingestion of 40 mg prednisolone for years with later proof of E. coli infection

Treatment

- 35 consecutive treatments with CytoSorb (treatments between 6-8 hours each)
- CytoSorb was used in conjunction with CRRT (Multifiltrate, Fresenius Medical Care) performed in CWHD mode
- Anticoagulation: citrate
- CytoSorb adsorber position: pre-hemofilter

Measurements

- Hemodynamics and need for catecholamines
- Rhabdomyolytic parameters

Results

- The sum of all therapeutic measures led to a hemodynamic stabilization with a significant reduction of the catecholamine doses - within 12 hours, the norepinephrine dose could be reduced from 8 to 6 mg/h and adrenaline from 6 to 4 mg/h, after 3 days norepinephrine dose was at 3 mg/h, epinephrine at 3.3 mg/h, on day 6 after the start of CytoSorb therapy, norepinephrine dose was at 1.2 mg/h while epinephrine infusion could be stopped
- Myoglobin was reduced to 18062 ng/ml already 20 hours after the initiation of therapy with CytoSorb, but remained relatively high due to progressive rhabdomyolysis - however a significant part of the newly formed myoglobin could be adsorbed, which was evident by the rapid increase when the adsorber was saturated and by an apparent decrease of myoglobin levels when a new adsorber was installed
- Renal function initially improved under ongoing therapy

Patient Follow-Up

- After a total of treatment 12 days, CytoSorb therapy could be stopped with markedly decreasing myoglobin levels, however, he still required moderate catecholamine therapy
- Increasing development of epidermal necrolysis throughout the course of his stay – after correspondence with the Documentation Center for Severe Skin Reactions at Freiburg University Hospital, Lyell syndrome was excluded hence the diagnosis.
- Permanent subileus to ileus symptoms, presumably as a complication of sepsis with intestinal paralysis
- Respiratory deterioration with development of ARDS, installation of an iLA active due to increasing decarboxylation disorder
- Test incisions at the necrotizing extremities in the context of the overall septic picture, and microcirculation disturbances (DIC) showed dead necrotic tissue down to the deepest layers in both lower limbs
- Due to the need for a major amputation of both lower limbs and amputation of the upper extremities of unknown extent, the patient ultimately died of multiple organ failure (lung, liver, kidney, gastrointestinal tract, coagulation) in the presence of his relatives

CONCLUSIONS

- **Despite the most severe shock, hemodynamic stabilization could be achieved with a significant reduction in catecholamine doses and the uncontrolled inflammatory reaction could be brought under control**
- **In this case, the combined use of CytoSorb and CRRT for the treatment of severe rhabdomyolysis proved to be effective, however the reduction in myoglobin plasma levels can probably be attributed to the use of the adsorber**
- **The treatment was safe and well tolerated**