

Use of CytoSorb in a pediatric patient with severe rhabdomyolysis in the context of a SARS-CoV-2 infection

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This case reports on a 13-year-old male patient who presented to hospital with fever (38.9°), reduced general condition, vomiting and pain in his limbs.

Case presentation

- The symptoms had already been present since the previous day, where the patient had taken non-steroidal anti-inflammatory drugs (ibuprofen 400 mg) a total of 4 times within 24 hours
- The patient had also been tested positive for SARS-CoV-2 five weeks earlier and had completed his subsequent quarantine with an asymptomatic course 4 weeks previously
- On admission, the patient also complained of whole-body muscle pain, his skin was bland, and his abdomen soft. Neurology and auscultation were unremarkable
- A subsequent COVID-19 test by PCR proved positive
- Laboratory diagnostics correspondingly showed a characteristic inflammatory situation (C-reactive protein - CRP 60.3 mg/l, procalcitonin 2.38 ng/ml) with increased D-dimer values (3.74 mg/l)
- This was accompanied by signs of an already pronounced rhabdomyolysis (in the presence of hyperkalemia) with markedly increased plasma concentrations of relevant markers (creatinine kinase 130,977 U/l, creatine kinase MB 1252 U/l, myoglobin 43,359 ng/ml, lactate dehydrogenase 2590 U/l)
- The patient was then transferred from the normal ward to the pediatric intensive care unit (PICU)
- Abdominal sonography confirmed bilateral edematous kidneys with a pathological flow pattern (central perfusion), followed by transurethral catheterization with drainage of brownish urine (myoglobinuria)
- At that time, the autoimmune profile was still pending and the bacterial pathogen diagnostics were negative
- Given the SARS-CoV-2 positive findings and hyperinflammation the agreed working diagnosis was a so-called Pediatric Inflammatory Multisystem Syndrome Temporally-Associated with SARS-CoV-2 Infection (PIMS-TS) with consecutive acute renal failure and crush kidney as a result of rhabdomyolysis
- Subsequent therapy included induced diuresis, alkalinization of the urine and initiation of anti-infective (tazobactam/piperacillin) and immunomodulatory therapy (methylprednisolone + intravenous immunoglobulins)
- The patient did not require ventilation at any time, but needed moderate norepinephrine support (up to 0.08 µg/kg/min) for hemodynamic stabilization
- Due to the anuria with imminent hypervolemia, continuous renal replacement therapy (CRRT) was started
- To eliminate high plasma concentrations of myoglobin and to control the hyperinflammatory situation, a CytoSorb hemoadsorber was additionally integrated into the CRRT circuit a few hours after the start of dialysis

Treatment

- 5 consecutive treatment cycles with CytoSorb together with the dialysis treatment for a total period of 4 days
- CytoSorb was used in combination with CRRT (Prismaflex, HF 1000 Set, Gambro) in CVHDF mode
- Blood flow rate: 170 ml/min
- Anticoagulation: Citrate, heparin and additional epoprostenol up to 4 ng/kg/min due to hypercoagulability
- CytoSorb adsorber position: post-hemofilter, blood priming

Measurements

- Hemodynamics and catecholamine dosage
- Inflammatory response
- Rhabdomyolysis

Results

- Reduction and discontinuation of catecholamine support in the first hours after start of the first CytoSorb treatment
- During treatment clear control of the hyperinflammatory response could be achieved. CRP decreased from 60.3 mg/dl to 6 mg/dl during the course of therapy and continued to decrease over the following days
- The combined treatment also resulted in a significant reduction in rhabdomyolysis parameters. At the end of the treatments, creatine kinase was as low as 723 U/l and myoglobin as low as 165 ng/ml. In addition, the combined use of the two procedures potentially prevented sustained kidney damage

Patient Follow-Up

- Creatine kinase and myoglobin levels reached normal values 5 days after the end of CytoSorb treatment
- Onset of significant spontaneous diuresis after the 3rd CytoSorb treatment
- Five days after the end of CytoSorb treatment, the patient could be transferred to the normal ward for further treatment

Conclusions

- In this pediatric patient with PIMS-TS and consecutive acute renal failure due to rhabdomyolysis, treatment consisting of standard therapy and continuous renal replacement therapy in combination with CytoSorb hemoadsorption resulted in a rapid and sustained reduction in rhabdomyolysis parameters, control of the inflammatory response and consecutive stabilization of renal function
- According to the medical team, treatment with CytoSorb is a potential therapy adjunct for patients with PIMS-TS and involvement of multiple organs, especially renal failure
- In this particular case, the early application of CytoSorb hemoadsorption allowed the myoglobin to be rapidly removed beyond the extent of elimination possible by hemodiafiltration alone. By that, restoration and full return of the patient's renal function could be achieved
- CytoSorb was safe and easy to use in combination with CRRT