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Case of the week 44/2021

Use of CytoSorb in a patient with SARS-CoV-2 infection and secondary septic shock with multiple organ failure

Dr. Tobias Hübner, Dr. Stefanie Wick, PD Dr. Thomas A. Neff
Department for Anesthesia and Intensive Care Medicine, Münsterlingen Cantonal Hospital, Switzerland

This case reports on a 67-year-old male patient who was transferred from the emergency department to the multidisciplinary intensive care unit due to severe respiratory failure from a newly diagnosed CO-VID-19 disease.

Case presentation

- Previously, the patient had been admitted as an emergency case by his son-in-law due to increasing dyspnea, fever and cough. The patient had not been vaccinated against COVID-19 and had returned the previous day from a trip abroad via a car journey of several hours, during which his condition increasingly deteriorated. The symptoms had been present for about 10 days, and the patient had already seen a doctor and received antibiotics during his stay abroad
- Known medical history included hypertensive heart disease, chronic recurrent pancreatitis, post cholecystectomy and direct closure of an umbilical hernia for porcelain gallbladder (2020), sublay plastic mesh for recurrent umbilical hernia (2020)
- He was immediately started on non-invasive ventilation therapy (NIV), however, this did not result in stabilization of his respiratory situation, so that endotracheal intubation was performed on the second day of hospitalization due to imminent respiratory exhaustion
- Because of the bilateral pulmonary infiltrates and severely impaired gas exchange with an oxygenation index of <100 mmHg, the diagnosis of severe acute respiratory distress syndrome (ARDS) was made according to the Berlin definition followed by initiation of lung protective ventilation
- In addition, Nitric Oxide therapy was established, which significantly improved his oxygenation (responder)
- According to the current recommendations, immunomodulatory therapy with dexamethasone was started and continued for a total of 14 days
- Initially, he had acute renal insufficiency, which was identified as prerenal and caused by the SARS-CoV-2 infection. Under volume therapy, renal retention parameters initially regressed
- Five days after transfer to the ICU, the patient then developed septic shock with confirmation of Pseudomonas aeruginosa and Serratia marcescens in the tracheal tract
- Empirical antibiotic therapy with piperacillin/tazobactam was started and escalated to meropenem and vancomycin after obtaining the resistance profile
- In the meantime, he also developed acute tachycardic atrial fibrillation with frequencies up to 180/min. Despite various attempts at medication and electrical conversion, permanent sinus rhythm could not be sustained. This was later achieved by administering digoxin and subsequent additional amiodarone
- In addition, high-dose volume resuscitation together with maximum vasoactive therapy (norepinephrine 1.5 µg/kg/min, epinephrine 0.5 µg/kg/min, vasopressin 0.03 E/min) and supplementary hydrocortisone (200mg/24h) were necessary to hemodynamically stabilize the patient
- Furthermore, the patient developed sepsis-induced thrombocytopenia

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- In the context of the septic shock, the patient developed acute kidney failure (according to AKIN II) and again, severe metabolic acidosis, so that the indication for continuous renal replacement therapy (CRRT) was given
- With the rationale to control the hyperinflammation (interleukin IL-6 129,367 pg/ml, procalcitonin PCT 85.9 ng/ml, C-Reactive Protein CRP 515 mg/l, leukocytes 24/µl) as well as treating lactic acidosis (4.7 mmol/l), CytoSorb hemoadsorption therapy was also started

Treatment

- A total of 5 treatments with CytoSorb were performed for a total treatment period of 48 hours
- The adsorber was operated in combination with a conventional CRRT machine (Multifiltrate, Fresenius Medical Care) run in CVVHD mode
- Blood flow rate: 160 ml/min
- Anticoagulation: citrate (4 mmol/h)
- CytoSorb adsorber Position: pre-hemofilter

Measurements

- Hemodynamic stability (need for vasoactive substances)
- Inflammatory parameters (IL-6, PCT, CRP, leukocytes)
- Lactate

Results

- During the treatments and over the following 48 hours, there was a clear stabilization in his hemodynamic situation accompanied by a steady reduction in vasoactive therapy (noradrenaline 0.5 µg/kg/min, adrenaline stopped, vasopressin 0.01 E/min)
- Control of the hyperinflammatory state was also achieved over the 5 treatments. IL-6 decreased from 129,367 pg/ml to 121 pg/ml, PCT from 85 to 25 ng/ml and CRP was reduced from 515 to 155 mg/l
- The lactate values had returned to normal after the 5 treatments

Patient Follow-Up

- At the neurological wake-up test 7 days after discontinuation of CytoSorb therapy, the patient showed no reaction at all, and his pupils remained for the first time unresponsive to light
- An EEG performed the following day showed a severe general change („alpha coma“) without relevant cortical activity, even under maximum stimulation, compatible with hypoxic brain damage without hope for recovery
- Given this as well as a simultaneous recurrence of refractory cardiovascular and pulmonary failure, the decision was made in consultation with the family to discontinue life-sustaining therapies and the patient eventually died in the setting of hypoxia in COVID-19-induced ARDS

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Conclusion

- In this patient with SARS-CoV-2 infection and secondary septic shock with multiple organ failure, the use of CytoSorb resulted in significant hemodynamic stabilization, control of the hyperinflammation as well as resolution of his metabolic acidosis
- This case shows that the early and individualized use of CytoSorb may significantly improve the hemodynamic situation. Unfortunately, the fatal outcome of this case with severe SARS-CoV-2 disease was only able to be delayed by Cytosorb, not prevented
- The use of CytoSorb therapy was easy, safe and the installation of the adsorber as well as the corresponding changes were possible without any problems