CytoSorb®

Case of the week 22/2020

Use of CytoSorb in severe ARDS after COVID-19 infection

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This case reports on a 65-year-old male patient (pre-existing chronic obstructive pulmonary disease, nicotine abuse with a total of 30-pack-years, and history of spontaneous pneumothorax in 2004) who was transferred from an external hospital to the University Hospital of Halle with proven COVID-19 infection and severe Acute Respiratory Distress Syndrome (ARDS).

Case presentation:

- Previously, the patient had been admitted to a peripheral hospital after a stay abroad and had already been mechanically ventilated in a lung protective manner for 2 weeks before the decision was made to transfer him to a specialized clinic due to a further deterioration in his clinical condition and possible imminent indication for extracorporeal membrane oxygenation (ECMO) implantation
- Following transfer to Halle University Hospital, he was directly admitted to the intensive care unit with continuation of therapy including the ventilation regime
- Change of antibiotic therapy from piperacillin/tazobactam and clarithromycin to amikacin (for a total of 4 days) and meropenem (for a total of 7 days)
- Due to an increasing deterioration of lung function and the development of a pneumothorax, the indication for veno-venous (vv) ECMO was made 3 days after admission and mechanical ventilation was adjusted accordingly (tidal volume <6 ml/kg body weight, low FiO_2)
- The patient could be well stabilized for the following 2 weeks, he was awake, continued to be ventilated with good tracheal tube tolerance, showed stable hemodynamics, was catecholamine-free and exhibited only slightly increased infection values (PCT 1 ng/ml)
- He then experienced a worsening of his clinical picture with increasing inflammatory parameters (leukocytosis ~40 Gpt/l, IL-6 160 pg/ml, PCT >3 pg/ml) accompanied by a deterioration in hemodynamics with low peripheral resistance (systemic vascular resistance index - SVRI 900 dyn*s/cm^5*m^2) and increasing catecholamine requirements (norepinephrine 0.3 µg/kg/min)
- Re-initiation of antibiotic therapy with levofloxacin and vancomycin due to the detection of coagulase-negative staphylococci
- In addition, the patient developed multiple organ failure including disseminated intravascular coagulopathy, liver failure (bilirubin 57.6 µmol/l, gammaGT 5.95 µkat/l, INR 2.36) and acute anuric renal failure with increasing retention parameters resulting in the initiation of continuous renal replacement therapy (CRRT)
- Antiinfective therapy was again changed to caspofungin, tigecyclin, and ceftazidim
- Due to the uncontrolled condition with further deterioration, a CytoSorb adsorber was then integrated into the CRRT circuit with the rationale to stabilize hemodynamics and to reduce elevated plasma concentrations of inflammatory mediators

Treatment

- Four treatments with CytoSorb for a total of 4 days (each treatment for 24 hours)
- CytoSorb was used in combination with CRRT (Multifiltrate, Fresenius Medical Care) run in CVVHD mode

- Blood flow rate: 120-150 ml/min
- Anticoagulation: citrate
- CytoSorb adsorber position: pre-hemofilter

Mesasurements

- Hemodynamics and catecholamine requirements
- Inflammatory parameters
- Respiratory and ventilation parameters

Results

- Following a short increase in norepinephrine requirements on the day of CytoSorb initiation, norepinephrine could be consistently reduced over the treatment cycles. At the end of therapy, a dose of 0.2 µg/kg/min was still necessary while the SVRI had improved to 1657 dyn*s/cm^5*m^2. Three days after completion of the CytoSorb treatment, only minimal doses of catecholamine were required
- Inflammatory parameters (PCT and CRP) initially increased in the first 3 days under CytoSorb, with a subsequent timely decrease over the following days. Leukocytes immediately started to decrease after the start of CytoSorb therapy and reached normal values at the end of CytoSorb therapy
- The respiratory situation could be kept stable under treatment

Patient Follow-Up

- During a cryo-biopsy of the lung, there was a complicating incident due to a hemorrhage, which, however, could be well controlled
- At the time of documentation, the patient is still on dialysis (CRRT) with recurring renal function and diuresis but with still limited clearance capacity
- Also vv ECMO-therapy is currently still continued at a reduced level

Conclusions

- In this patient with severe ARDS after SARS-CoV-2 infection, the combined treatment consisting of intensive care standard therapy, vv ECMO, CRRT and CytoSorb hemoadsorption therapy was associated with a significant stabilization in hemodynamics and reduced catecholamine doses
- An early start of CytoSorb therapy is decisive in the presence of hyperinflammation
- Furthermore, not only should laboratory diagnostic parameters be used as a decision criterion for starting therapy, but much more attention should be paid to early signs of clinical deterioration (hemodynamics, organ dysfunction)
- The timely installation of the CytoSorb adsorber into the CRRT system was possible without any problems while simultaneously running ECMO therapy