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Case of the week 22/2021

Use of CytoSorb® as a therapeutic option in a critically ill patient with acute respiratory distress syndrome caused by influenza A (H1N1) pneumonia: A case report

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This case reports on a 29-year-old previously healthy male patient, who was transferred from a small hospital to the Medical Intensive Care Unit (MICU) of the University Clinical Centre of Republika Srpska in Banja Luka, due to muscle and joint pain, general weakness, and fever up to 39°C which had been present for the previous 6 days.

Case presentation

- The patient presented with pronounced liver dysfunction with a total bilirubin of 5.7 mg/dl, serum glutamic oxaloacetic transaminase (GOT) 633 U/L, serum glutamic pyruvate transaminase (GPT) 412 U/L, gamma-glutamyl transferase (gamma GT) 161 U/L, and a lactate dehydrogenase (LDH) of 1668 U/L
- Moreover, he also exhibited signs of systemic inflammation as indicated by a C-reactive protein (CRP) of 519 mg/l, procalcitonin (PCT) of 1.28 ng/ml, and increased leukocyte levels (14.8×103/µl)
- Due to acute respiratory failure and an altered state of consciousness on admission, continuous sedation and muscle relaxation were administered and the patient was intubated and mechanically ventilated (lung-protective ventilation) with an FiO_2 of 100% and a corresponding SpO_2 of 88.7%
- As hemodynamic instability progressed, the rate of norepinephrine had to be increased to 0.6 µg/kg/min
- Diagnostics were pointing towards influenza A, however the patient also received empirical broad-spectrum antimicrobial therapy including meropenem (1 g every 8 h intravenous [IV]) and azithromycin (500 mg once daily IV), and oseltamivir (75 mg, every 12 h orally)
- In addition, methylprednisolone (80 mg every 12 h IV), stress ulcer prophylaxis, and thromboprophylaxis were administered and all drug doses were adjusted according to his renal function
- The patient received continuous respiratory and hemodynamic monitoring, with regular checking of arterial blood gases
- At several time points during the 1st day of hospitalization, the patient was placed in a prone position to aid ventilation
- Chest CT showed massive bilateral pneumonia with minimal pleural effusions
- Due to the development of acute renal failure on day 6 of hospitalization, continuous renal replacement therapy (CRRT) was started

- Given the progressive hemodynamic instability accompanied by increasing norepinephrine requirements and the uncontrolled inflammatory response, a CytoSorb adsorber was additionally installed into the CRRT circuit on hospital day 7. Due to a recurring septic episode on day 10, a second CytoSorb therapy session was commenced

Treatment

- A total of 2 CytoSorb treatments were performed
- CytoSorb was used in conjunction with CRRT (Fresenius Medical Care, multiFiltrate) run in continuous venovenous hemodiafiltration (CVVHDF) mode

Measurements

- Hemodynamics and norepinephrine requirements
- Inflammatory marker levels
- Ventilation parameters and lung function
- Liver parameters

Results

- Immediately after the first session of combined therapy, norepinephrine requirements were reduced from 0.6 to 0.15 µg/kg/min and the infusion could be completely discontinued 2 days later. After deterioration of the patient's clinical condition on day 10 with a concomitant increase in norepinephrine demand, the application of a second adsorber resulted again in an immediate reduction in norepinephrine requirements and complete discontinuation of norepinephrine 1 day later
- Inflammatory marker levels could also be clearly reduced. CRP decreased from 519 mg/L to 330 mg/L after the first treatment while the second treatment resulted in a further decrease in CRP levels. Simultaneously, leukocyte (9.2×10^3/µl) and PCT levels (0.7 ng/ml) normalized during the course of both treatments
- Treatment was further associated with a gradual improvement in ventilation parameters and lung function with a concomitant reduction in FiO_2
- There was also an improvement in liver function as evidenced by a decrease in total bilirubin (3.2 mg/dl), GOT (289 U/L), gamma GT (102 U/L), and LDH (562 U/L)

Patient Follow-Up

- After cessation of the 2nd CytoSorb therapy session, the patient did not experience any further periods of hemodynamic instability and made a gradual recovery thereafter
- During his ICU stay the patient also developed an ICU delirium which was treated with antipsychotics
- Due to prolonged ventilation and his inadequate level of consciousness, percutaneous tracheostomy was performed
- After reaching a satisfactory state of alertness, the patient could be successfully weaned off the ventilator
- After 48 days spent in the MICU, the patient was transferred to the general ward, and few days later, he was sent to a rehabilitation clinic

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Conclusion

- In this patient with influenza type A and bilateral pneumonia, combined treatment with standard therapy, CRRT, and CytoSorb hemoadsorption was associated with rapid hemodynamic stabilization, control of the inflammatory response and a gradual improvement in his ventilation parameters and lung function
- The combination of pharmacotherapy, supportive measures, and application of CytoSorb resulted in complete recovery of the patient
- The authors state that controlling the inflammatory response using hemoadsorption therapy may have had a positive impact on the endothelial glycocalyx and may also be beneficial for maintaining the vascular barrier function which plays a pivotal role in the development of oxygen mismatch and tissue edema