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Case of the week 32/2021

Use of CytoSorb in the treatment of a COVID-19 patient with severe ARDS

Dr. Sachin Gupta
Narayana Super Speciality Hospital, Gurgaon, India

This case reports on a 40-year-old-female who was hospitalized with signs of respiratory distress due to SARS-CoV-2 infection.

Case presentation

- She was diagnosed as COVID-19 positive two days prior to admission
- Upon hospital admission, the patient showed symptoms of shortness of breath and fever with vital parameters as follows: SpO_2 72% on room air, respiratory rate 24/min, heart rate 92/min, mean arterial pressure 88 mmHg
- Due to progressing signs of acute respiratory dysfunction syndrome - ARDS, (pH 7.34, HCO3 21.9 mmol/L, PaO_2 50 mmHg, $PaCO_2$ 30 mmHg, FiO_2 60%, PaO_2/FiO_2 112, lactate 2.6 mmol/L), the patient was placed on high flow nasal cannula (HFNC) oxygen therapy
- CT showed she had severe lung infection with a severity score of 32/40
- Her SOFA and APACHE II scores on admission were 2 and 7 respectively, she had no history of comorbidities
- The patient was transferred to the Intensive Care unit (ICU) for further treatment
- She was placed on antiviral therapy with remdesivir (200 mg i.v. on day one and 100 mg daily for next 4 days orally) and antibiotic therapy cefoperazone/sulbactam (1.5 gm twice daily)
- The patient exhibited signs of COVID-19 associated systemic hyperinflammation with elevated interleukin (IL)-6 (212 pg/ml), C-reactive protein (CRP, 136.7 mg/L), D-Dimer (972.12 ng/mL), and ferritin (1686 ng/mL) levels
- Patient had minimal bilateral pleural effusion and edema of her arms and legs which was managed with diuretics and euvolemic fluid status
- Furthermore, she was given steroidal therapy (methylprednisolone 40 mg iv twice daily)
- Additionally, she was placed in awake prone positioning
- As the patient did not respond to the applied standard therapy measures with further aggravation of the hyperinflammatory state and increasing inflammatory markers, the decision was made to start CytoSorb therapy

Measurements

- Hemodynamics and vasopressor requirements
- Inflammatory markers
- Respiratory parameters and lung function
- Metabolic status

Treatment

- Two CytoSorb therapy sessions were performed for a duration of 12 hours each. There was a break of 24 hours between the two applications to monitor the clinical trend

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- CytoSorb therapy was run in hemoperfusion mode only using a conventional hemodialysis machine
- Anticoagulation: Enoxaparin 0.6 ml subcutaneously
- Blood Flow Rate: 150ml/min

Results

- Treatment was associated with a marked reduction in IL-6 levels (1st treatment 212.6 to 116.4 pg/mL, 2nd treatment 106.2 to 48.4 pg/mL) and in CRP levels (1st treatment 136.7 to 130.1 mg/L, 2nd treatment 107.1 to 62.8 pg/mL), indicating a clear improvement of the hyperinflammatory situation. D-Dimers (979.12 to 616 ng/mL) and ferritin (1686 to 330 ng/mL) levels could be also reduced throughout the 2 treatment cycles
- Following the first CytoSorb treatment cycle, there was already some improvement in respiratory parameters (PaO_2/FiO_2 112 to 148 mmHg), however lung function and oxygenation further improved as a result of the second treatment with an increase of PaO_2/FiO_2 from 196 to 263 mmHg
- Both treatments further resulted in a clear decrease in plasma lactate levels from 2.6 to 0.9 mmol/L
- The patient's APACHE score decreased to 3 after the 2nd cycle while the SOFA score of 2 remained constant throughout the treatment

Patient Follow-Up

- A subsequent CT scan of the chest showed a decrease in lung infection with a CT severity score of 5/40
- The patients respiratory situation further improved and she could be weaned off HFNC on Day 6
- She was discharged from ICU on day 8 in a clinically stable condition
- The patient was discharged from the hospital on day 11 with a negative confirmation of SARS-CoV-2

Conclusions

- In this patient with COVID-19 and severe ARDS, treatment with CytoSorb hemoadsorption therapy was associated with control of the inflammatory response and an improvement in lung function
- Timely application and running CytoSorb hemoperfusion for at least 12 hours were associated with better control of the hyperinflammatory state and may have avoided full-blown cytokine release syndrome with concomitant subsequent organ failure
- The CytoSorb device could be safely run in hemoperfusion mode without technical problems