

Cytokine hemoadsorption in the treatment of a critically ill postpartum woman with COVID-19 pneumonia

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A 35-year-old pregnant woman (gestational age 32 weeks) admitted to hospital due to COVID-19 pneumonia and severe respiratory failure.

Case presentation

- Initially, she received standard treatment with dexamethasone (12 mg), antibiotics (azithromycin 500 mg, ceftriaxone 2 g) and enoxaparin (8000 IU) as thrombotic and embolic prophylaxis
- On the second day of hospitalization, due to a deterioration in her respiratory status despite high flow oxygen therapy (60 L/min of flow, FiO₂ 100%), she had to be invasively ventilated and the decision was made to terminate the 32 week pregnancy delivering a healthy, premature infant
- After the cesarean section, remdesivir (200 mg loading dose followed by 100 mg for the next 4 days), methylprednisolone (250 mg), enoxaparin (8000 IU) and pantoprazole (40 mg) were administered, but her respiratory failure worsened further
- Using assist-control mode of ventilation (respiratory rate 22/min, PEEP 12 cmH₂O, Pcontrol 16 cmH₂O, FiO₂ 80%), her arterial acid-base status was pH 7.31, PaO₂ 57 mmHg, PaCO₂ 66.8 mmHg, oxygen saturation 86%
- Laboratory analysis revealed elevated inflammatory parameters (C-reactive protein [CRP] 63 mg/l, interleukin [IL]-6 115.2 pg/ml, ferritin 934 µg/l), her respiratory function remained poor (PaO₂/FiO₂ 71 mmHg) while her renal function was preserved
- Over the following 4 days, and despite maximum therapy her clinical condition continued to deteriorate so that extracorporeal blood therapy with CytoSorb inserted into a continuous renal replacement (CRRT) circuit was started. Because of recurring clinical instability around day 14 a second session had to be initiated. Between both cycles, the clinical course was complicated by the development of right-sided pneumothorax and pneumomediastinum as seen on chest CT scan, along with bilateral ground glass lung infiltrates with peripheral consolidations

Treatment

- In total, two hemoadsorption sessions were performed (1st treatment 12 hours, 2nd treatment 24 hours). Of note, the first procedure had to be discontinued after 12 hours due to respiratory conditions requiring prone positioning
- CytoSorb was used in combination with CRRT (PrismaFlex system, Baxter) run in veno-venous hemodiafiltration (CVVHDF) mode
- Blood flow rate: 200 ml/min
- Anticoagulation: low-molecular-weight heparin

Measurements

- Inflammatory status
- Respiratory situation

Results

- The day after the first procedure, a reduction in inflammatory parameters was observed. Also the second treatment cycle was associated with a reduction in inflammatory parameters (CRP from 32.8 to 14.7 mg/l, IL-6 from 60 to 4.2 mg/l, ferritin from 226 to 156 µg/l)
- Furthermore, there was an initial improvement in respiratory status ($\text{PaO}_2/\text{FiO}_2$ 103 mmHg) following the first treatment interval. During the course of the second treatment cycle, a substantial respiratory recovery ($\text{PaO}_2/\text{FiO}_2$ 310 mmHg) was noticed

Patient Follow-up

- Two days after the 2nd procedure, the chest CT-scan showed a significant regression of the pulmonary infiltrates and pneumomediastinum
- On the 20th treatment day, the patient was successfully weaned from mechanical ventilation and subsequently fully recovered

Conclusion

- In this case of a critically ill postpartum woman with COVID-19 pneumonia, treatment with a combination of CVVHDF and CytoSorb was associated with a reduction in inflammatory mediators as well as an improvement in the respiratory situation
- The authors state that acute respiratory distress syndrome is one of the most serious complications of COVID-19 disease which is primarily a consequence of excessive production of various proinflammatory cytokines
- Non-selective cytokine removal using the extracorporeal blood purification technique may have advantages over treatment approaches that only target single cytokines