Use of CytoSorb in a case of viper snake bite presenting with gangrene and sepsis associated multi-organ failure

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This case study reports on a 32-year-old male patient, who was admitted to the Apollo hospital with extensive cellulitis leading to necrotizing fasciitis of right lower limb, after experiencing a snake bite over the dorsal surface of right lower limb followed by immediate treatment with anti-snake venom at a peripheral hospital a few days before.

Case presentation

- After clinical diagnosis of limb gangrene with septicemia and because of necrotizing fasciitis, he had to have his lower limb amputated
- Following amputation, the patient was drowsy, hypotensive and in septic shock (APACHE II 29 and SOFA 15) and was therefore admitted to Intensive Care postoperatively
- The patient was anemic (hemoglobin 9.7 g/dl) and showed pronounced thrombocytopenia (52,000/mm³) and leucocytosis (leukocyte count 32,000/mm³ with 72% neutrophils). He further had tachypnea and tachycardia (HR of 116/min)
- His coagulation profile was severely compromised as evidenced by a bleeding time of 8.15 min, a clotting time of 12 min, a prothrombin time of 55 sec and an aPTT of 60s treated with four units of fresh frozen plasma and four units of platelet concentrate on the first day after ICU admission
- Standard of care treatment as per the International Sepsis Guidelines including fluid resuscitation was commenced, and due to multiple episodes of severe hypotension and bradycardia he was treated with adrenaline, noradrenaline and dopamine
- On the second day on ICU, he had a respiratory rate of 45-50/minute, with pH 7.45, lactate 4.3 mmol/l, pCO₂ 50 mm Hg, pO₂ 35.2 mm Hg, HCO₃ 27 mmol/l, sO₂ 65.1%. On the basis of these findings, ARDS was diagnosed and he was immediately intubated and mechanically ventilated with a high PEEP, low tidal volume (355 ml) and high FiO₂ (100%).
- He showed a further decrease in urine output, evidence of hemolysis, deranged blood urea and creatinine levels, and the chest radiograph showed bilateral fluffy opacities
- On the third postoperative day and in view of the multi-organ failure, the patient was treated with CytoSorb
Treatment
- Two treatments with CytoSorb for 18 hours each separated from one another by a 6 hour interval
- Anticoagulation: none
- Blood flow: 120 ml/min
- CytoSorb adsorber position: post-hemofilter

Measurements
- Need for catecholamines
- Respiratory parameters and invasiveness of ventilation
- Inflammatory parameters (PCT, platelets, leucocytes)
- Metabolic acidosis (lactate, pH)
- Hemoglobin
- Renal parameters (diuresis, creatinine, urea)

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Post-CytoSorb (1st Device)</th>
<th>Post-CytoSorb (2nd Device)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hemoglobin (g/dl)</td>
<td>9.7</td>
<td>11.7</td>
<td>12.9</td>
</tr>
<tr>
<td>WBC count (mm$^3$)</td>
<td>32,000</td>
<td>23,800</td>
<td>9,700</td>
</tr>
<tr>
<td>Platelet count (mm$^3$)</td>
<td>52,000</td>
<td>82,000</td>
<td>120,000</td>
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<tr>
<td>D-Dimer (ng/ml)</td>
<td>1,500</td>
<td>795</td>
<td>495</td>
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<tr>
<td>Urine output (ml/day)</td>
<td>150</td>
<td>250</td>
<td>450</td>
</tr>
<tr>
<td>Urea (mg/dl)</td>
<td>195</td>
<td>46</td>
<td>29</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>9.86</td>
<td>3.26</td>
<td>1.21</td>
</tr>
<tr>
<td>Lactic acid (mg/dl)</td>
<td>4.3</td>
<td>1.6</td>
<td>0.9</td>
</tr>
<tr>
<td>PCT (ng/ml)</td>
<td>1.8</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>aPTT (sec)</td>
<td>60</td>
<td>42</td>
<td>42</td>
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<tr>
<td>pH (arterial)</td>
<td>7.45</td>
<td>7.40</td>
<td>7.35</td>
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<tr>
<td>APACHE II</td>
<td>29</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>SOFA</td>
<td>15</td>
<td>11</td>
<td>8</td>
</tr>
</tbody>
</table>
Results

- After two subsequent CytoSorb treatments, renal, hemodynamic and respiratory parameters improved remarkably and normalized over the next 5 days
- PEEP and FiO₂ could be reduced significantly and the patient was gradually weaned off the ventilator after cessation of CytoSorb therapy
- Significant improvements in platelet count and resolution of disseminated intravascular coagulation
- Chest radiograph with bilateral lung infiltrates also improved considerably
- During and after CytoSorb therapy, APACHE II and SOFA score reduced to 11 and 8 from a baseline value of 29 and 15, respectively

Patient Follow-Up

- Patient was discharged from ICU in an afebrile condition

Conclusions

- This case is the first report of the successful application of CytoSorb in a snake bite case associated with cellulitis, acute renal failure, and disseminated intravascular coagulation, septicemia and acute respiratory distress syndrome along with standard care
- Since literature regarding hemoadsorption in snake bite cases is limited, larger prospective studies are required to evaluate the exact advantage and possible adverse effects
- CytoSorb along with standard of care can be a safe and advantageous extracorporeal therapy option to treat snake bite patients with multi organ failure to aid recovery