Introduction

At the end of the twentieth century, mortality in surgically treated patients with sepsis remains high in spite of the advanced diagnostic methods and interventional therapies now available. Depending on the specific patient group, morbidity ranges from 25 % to 90 % [1, 2, 3, 4, 5]. Endotoxin as a membrane component in gram-negative bacteria may induce activation of cytokine cascades and produce both endothelial and cellular damages. This pathway is relevant particularly in multiple organic failure (MOF) [6]. Endotoxin may also induce secretion of tumor necrosis factor (TNF), which subsequently promotes organic failure as well [7, 8, 9]. Several authors have reported that high levels of TNF correlate with septic shock and outcome of septic patients [8, 10, 11, 12, 13].

During the past 10 years means of extracorporeal detoxification such as continuous venovenous hemofiltration (CVVHF) and plasmapheresis (total plasmatic...
exchange, TPE) have been used in cases of sepsis and septic shock to remove the pathogenic mediators from the patient in distress. Our own team has previously demonstrated the positive effect of TPE on patients with acute necrotizing pancreatitis [14], and others have supported high-flow CVVHF in patients with septic and nonseptic MOF [15]. Only few case reports have been published regarding plasmapheresis and hemofiltration as a combined therapy [16, 17, 18]. No substantial data are presently available on indications for this invasive extracorporeal therapy.

Encouraging results arising from our own research on TPE noting higher efficacy of combined extracorporeal detoxification in patients with persistent renal insufficiency led us to carry out a pilot study in cases of persistent severe sepsis after sufficient surgical treatment of the septic source [14].

Materials and methods

We investigated the effect of combined extracorporeal detoxification therapy in 43 patients with sepsis treated in a surgical intensive care unit. We compared 19 patients receiving CVVHF plus TPE with 24 patients who had been treated earlier and received no additive extracorporeal therapy. Randomization was thus not performed. The mean age was 60.3 years in the therapy group and 64.2 years in the untreated group; there was no difference in sex distribution. There were 7 females and 12 males in the treatment group, and 10 females and 14 males in the control group. The underlying disease was malignant in 8 patients in the therapy group and in 11 patients in the control group (Table 1). The two groups also did not seem to differ in terms of diagnosis (abdomen, abdominal peritonitis, cardiac, renal, hepatic, and other).

Table 1  Demographic data at the start of the study

<table>
<thead>
<tr>
<th>Score</th>
<th>Treatment group</th>
<th>Non-treatment group</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>19</td>
<td>24</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>60.3</td>
<td>64.2</td>
</tr>
<tr>
<td>Female/Male</td>
<td>7/12</td>
<td>10/14</td>
</tr>
<tr>
<td>Underlying disease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>malignant</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td>non-malignant</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Scores</td>
<td></td>
<td></td>
</tr>
<tr>
<td>APACHE II</td>
<td>27.32</td>
<td>26.59 (n.s.)</td>
</tr>
<tr>
<td>SSS</td>
<td>11.61</td>
<td>10.77 (n.s.)</td>
</tr>
<tr>
<td>MOF</td>
<td>6.61</td>
<td>5.58 (p &lt; 0.001)</td>
</tr>
<tr>
<td>Prevalence organ failure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cardiac</td>
<td>9/19</td>
<td>10/24</td>
</tr>
<tr>
<td>pulmonary</td>
<td>6/19</td>
<td>3/24</td>
</tr>
<tr>
<td>renal</td>
<td>3/19</td>
<td>2/24</td>
</tr>
<tr>
<td>hepatic</td>
<td>2/19</td>
<td>3/24</td>
</tr>
<tr>
<td>others</td>
<td>6/19</td>
<td>3/24</td>
</tr>
</tbody>
</table>

The patients were monitored closely for assessment of the effects of plasmapheresis, as changes in the disease were expected. Morbidity and mortality were recorded. The following data were obtained: cardiac output, systemic vascular resistance, blood pressure, respiration, heart rate, urine output, electrolyte concentrations, C-reactive protein, and leukocyte counts. Morbidity regarding heart, renal, pulmonary, or hepatic dysfunction was similar in the two groups and did not reach statistical significance. Initial APACHE II score was also similar (26.6 vs. 27.3 in the control group; n.s.). In the therapy group 12 of 19 patients had postoperative peritonitis, whereas in the control group there were only 9 of 24 patients. The underlying disease was malignant in 8 patients in the therapy group and in 11 patients in the control group (Table 1). The two groups also did not seem to differ in terms of diagnosis (abdomen, abdominal peritonitis, cardiac, renal, hepatic, and others).