Clinical Results of Lipopolysaccharide Filter Use in Sepsis Developed After Liver Transplantation: Report of Two Cases

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Abstract

Background and Case Presentation: Sepsis remains as a preventable cause of mortality in ICU inpatients. Lipopolysaccharide (LPS) is the endotoxin, a structural component of the cell wall of gram-negative bacteria. Its release in systemic circulation results in the release of a group of inflammatory mediators, leading to initialization and/or exacerbation of sepsis. We report two cases with a history of Liver Transplantation (LT) cases that underwent LPS filter treatment with a diagnosis of Gram-negative related septic episode and discuss the related literature.

Conclusions: Our cases demonstrate that LPS filters have significant and accountable effect on prognosis in treatment of sepsis. Further studies would be promising to clarify mechanisms and effectivity profiles of these techniques to provide better treatment algorithms.

Keywords: Sepsis; Lipopolysaccharide; Lipopolysaccharide filter

Background

The incidence of sepsis, one of the leading causes of mortality and morbidity in intensive care unit (ICU) patients, shows a continuous increase despite all developments in the diagnosis and treatment of intensive care infections [1]. Sepsis remains as a preventable cause of mortality in ICU inpatients. Despite advances in antimicrobial therapy, multidrug resistance in microbiological agents causing intensive care infections has led to the search for adjuvant or aftercare treatment methods in addition to antibiotic therapy in researchers working in this area [2]. Treatment methods based on extracorporeal circulation are the result of the search in this field. These treatment methods, which were initially designed to indiscriminately remove inflammatory and pro-inflammatory cytokines involved in sepsis, have changed over time to become more selective in terms of the molecules they target. Lipopolysaccharide (LPS) is the endotoxin, a structural component of the cell wall of gram-negative bacteria. Its release in systemic circulation results in the release of a group of inflammatory mediators of the host by activation of the coagulation cascade with macrophages, neutrophils, and endothelial cells [1-3].

While patients undergoing liver transplantation due to chronic liver failure are prone to early and late infections due to both immunosuppressive treatment regimens and complex surgical procedures, the sepsis response of the transplanted liver is insufficient to limit the inflammatory process compared to healthy liver tissue [4].

In our study, it is aimed to present the results of cases where endotoxins removed from the circulation through extracorporeal circulation on the patients in our institute with a history of liver transplantation and being treated in the ICU due to sepsis-related multiple organ failure and discuss the literature on the subject.

Case Presentations

Case1

A 26-year-old male patient who had a history of liver transplantation with live donor 3 months ago was admitted to the ICU with the diagnosis of secondary abdominal sepsis to the infectious biloma. Mean arterial blood pressure (MAP) at the time of admission was 61.6 mmHg, consciousness was blurred, and he was tachypneic. There was a Klebsiella pneumoniae growth in the blood culture taken from the patient. Due to developing adult respiratory distress syndrome (ARDS), elective...
endotracheal intubation (ETI) and subsequent mechanical ventilation (MV) were performed. The patient was applied LPS filter (Alteco LPS Adsorber, Sweden) for 1 session (6 hours) with a continuous veno-venous hemodiafiltration (CVVHDF) device. At follow-up, the patient’s clinical condition improved significantly 2 days after the procedure and the patient was extubated.

**Case 2**
A 25-year-old female patient with a history of liver transplantation 25 months ago was admitted to the ICU due to ARDS. The patient who had severe hypoxemia symptoms was started to receive MV after ETI. The patient with a MAP value of 60 mmHg was provided with the vasopressor support (noradrenaline 0.1 mcg/kg/min). Proteus vulgaris and *E. coli* growth in the blood culture and Proteus mirabilis growth in the sputum culture were detected. The patient was applied LPS filter (Alteco LPS Adsorber, Sweden) for 1 session (6 hours) with a hem adsorption device. At follow-up, the patient showed a significant improvement in clinical condition on day 3 after the procedure, thus, MV was terminated.

### Hemodynamic findings

Statistical analysis was carried out with PASW Statistics 18.0, Chicago, IL. Data are presented as the mean ±standard Deviation (SD). The comparison of continuous variables between group was made with t-Test and Mann Whitney U test for independent samples. (SD). The comparison of continuous variables between group was made with t-Test and Mann Whitney U test for independent samples.

<table>
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<th>CRP</th>
<th>PCT</th>
<th>WBC</th>
<th>PLT</th>
<th>FIBRINOGEN</th>
<th>INR</th>
<th>NLo</th>
<th>CRE</th>
<th>LACTATE</th>
<th>Mmol/L</th>
<th>PaO2/FiO2</th>
<th>URINE ml</th>
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P-value 0.001 0.142 0.096 0.406 0.229 0.85 0.0003 0.002 0.176 0.00004 0.05 11 20

- **Table 1**: Hemodynamic findings before and after the procedure as well as laboratory and physiological scoring results of the cases.
- **Discussion**

Although the contribution of extracorporeal filter systems in the treatment of sepsis is not well known, studies on the positive results of different filters have been published [5,6]. Many filters have been developed to treat sepsis-induced multiple organ failure statuses by removing cytokines from the circulation through extracorporeal circulation [7]. The fact that the graft survival is negatively affected in the secondary sepsis in infections caused by gram-negative microorganisms in patients after liver transplantation was revealed in Yokoyama S et al. [8]. However, currently, there is no English study in the literature evaluating the effectiveness of any of the various filter systems in this group of patients.

**References**

8. Yokoyama I, Todo S, Miyata T, Selby R, Tzakis AG, Starzl TE. Endotoxia...


