

Endotoxin removal in septic E. Coli bacteremia during continuous veno-venous hemodiafiltration therapy

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Almost all parameters recorded were improved, in particular we could quickly stop vasopressor support and a hemodynamic stability was seen directly after the treatment as well as 12 hours later. The patient was still alive 28 days after the Alteco LPS Adsorber treatment and stayed in total 47 days in ICU after the completion of endotoxin removal. The product was considered safe to use as no device failure occurred, nor side effects or any adverse events.

Endotoxin (or lipopolysaccharide, LPS) is the toxic part of gram-negative bacteria, present in the outer membrane of the bacteria cell wall, released when the bacterial cell disintegrates. High levels of endotoxin activity are associated with worse clinical outcomes and death.¹ Endotoxin is the initial trigger of the inflammatory cascade and is well known to induce direct damage and cause release of inflammatory mediators, potentially leading to sepsis and septic shock.²

In 2020, the number of sepsis cases was estimated to be 49 million, resulting in 11 million deaths, or 1 in 5 globally. This makes sepsis one of the most common causes of death in modern intensive care with a mortality ranging from 20-50%.^{3,4} In addition, 45-70% of acute kidney injury (AKI) cases in the intensive care unit is associated with sepsis.⁵

We used an endotoxin removal device (Alteco LPS Adsorber, Lund, Sweden) for extracorporeal blood purification in combination with continuous renal replacement therapy (continuous veno-venous hemodiafiltration, CVVHDF) as an addition to the etiological antibiotic therapy.

Case report

A 58-year old male, previously hospitalized in our ICU for COVID-19 pneumonia, was readmitted in ICU with septic shock originating from an E. Coli pyelonephritis. The patient suffered a profound hypotension despite high vasopressors and inotropes dosages.

Method

Treatment with the Alteco LPS Adsorber was started 24 hours after admission, it was continued together with CVVHDF therapy. Two endotoxin removal treatments were performed in a 24-hour period, each one lasting 6 hours.

The following CRRT setting parameters were used: blood flow rate 150 ml/min, dialysate pump flow rate 1500 ml/h and re-infusion pump flow rate 1000 ml/h. Anticoagulation was achieved via a heparin continuous infusion with a 200 seconds activated clotting time (ACT) target.

Vital signs, blood chemistry values, urine output, blood gas analysis, hemodynamic parameters, SOFA score, inotropes and vasopressor dosages were recorded right before the first treatment start, at the end of the treatments and 12 hours after treatments ended.

Results

Hemodynamic parameters did improve during treatment: vasopressor support was reduced and norepinephrine was discontinued; cardiac index, systemic vascular resistances and oxygenation improved, blood lactate levels were reduced and SOFA score got slightly better. These results were maintained at least 12 hours after the endotoxin removal treatment completion. Evolution of clinical parameters are summarized in Table 1.

No device failure or adverse events occurred during treatments. The patient was still alive 28 days after the Alteco LPS Adsorber treatment and his total ICU stay was 47 days.

	At first treatment start	At treatments end	12 hours after treatments end
Body Temperature (C°)	36.5	36.6	36.6
Heart Rate (BPM)	105	92	80
Mean Arterial Pressure (MAP) (mmHg)	65	65	75
S-PCT (ng/mL)	53.1	51	48
S-Lactate (mmol/l)	3.7	1.5	2.1
S-WBC (u/L)	1.15	2.3	4.4
S-Creatinine (umol/L)	1.66	1.4	1.34
Urine output (ml/h)	60	50	50
PaO2 (mmHg)	103	129	119
PaO2/FiO2 (mmHg)	170	215	280
Cardiac output (CO) (L/min)	4.4	5.3	5.7
Cardiac Index (CI) (L/min/m2)	2.3	2.5	3
Systemic vascular resistance index (SVRI) (dyn*s/cm5*m)	1400	2100	1880
SOFA score (points)	12	10	10
Vasopressor support:			
Norepinephrine (UI/kg/hour)	0.05	0.15	0.00
Epinephrine (UI/kg/hour)	0.05	0.05	0.046
Vasopressin (UI/kg/hour)	2	0.02	0.018

Table 1

Discussion

Our single clinical experience shows the potential role of endotoxin removal in septic shock. This may indicate removing endotoxin from the bloodstream could play a role as an additional therapy in order to gain time for the etiological therapies to work. Further clinical investigation is needed to determine role and effectiveness of LPS adsorption in endotoxemic shock.

Conclusion

This clinical report of treatment with Alteco LPS Adsorber in endotoxemic septic shock from pyelonephritis, caused by the gram-negative bacteria E. Coli, shows that the treatment was safe and hemodynamic and respiratory variables improved.

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