

Sepsis and Cytokine Storm: The Role of Dialytic Techniques in the Different Stages of a Rapidly Progressive Disease

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Introduction

Despite advancements in research and numerous clinical studies on innovative therapies, no new pharmacological agent has been proven to significantly improve survival in septic shock. Understanding the role of pro-inflammatory cytokines in disease progression, particularly in the transition from reversibility to irreversibility, has led to the development of extracorporeal therapies capable of altering the course of this rapidly worsening condition.

The irreversibility of septic shock is primarily determined by microcirculatory dysfunction and vasoplegia that is resistant to fluid resuscitation and vasoactive drugs. The continuous removal of cyclically produced pro- and anti-inflammatory mediators contributes to immune modulation and the restoration of the patient's immune homeostasis. Acute kidney injury (AKI) complicates 19% of sepsis cases, 23% of severe sepsis cases, and 50% of septic shock cases, with an unfavorable prognosis in 75% of patients.

Methods

A meta-analysis conducted by Kellum et al. (2013) demonstrated that extracorporeal purification therapies can reduce mortality in septic patients. Techniques such as hemoperfusion, plasma filtration, and hemoadsorption have significantly improved hemodynamics and organ function. Hemoperfusion with Toraymyxin[®], used in shock caused by Gram-negative bacteria, selectively removes over 90% of circulating lipopolysaccharide in two 120-minute sessions, 24 hours apart. Clinical studies have confirmed its efficacy in patients refractory to conventional medical therapy.

Results

Plasma filtration (CPFA[®]) and hemoadsorption (Cytosorb[®], Oxiris[®]) have proven effective in reducing mortality in patients who have progressed to the irreversible stage. The success of the therapy is closely related to the timing of initiation and the patient's early hemodynamic response. A retrospective study by Votrico et al. (2020-2022) on 59 patients with S-AKI treated with CRRT and Cytosorb showed that more intensive treatment (duration ≥ 72 h) resulted in better hemodynamic stability (SBP, DBP, MAP) and improved inflammatory marker trends (CRP, PCT).

Conclusion

Available evidence supports the efficacy of extracorporeal purification techniques in improving survival in critically ill patients. Multidisciplinary collaboration between intensivists and nephrologists remains crucial to optimizing treatment timing and potentially developing shared guidelines for managing this otherwise challenging condition.