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Efficacy and Safety of High-volume Hemofiltration (HVHF) in patients with Septic Shock and Acute Kidney Injury: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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Objectives: Septic Shock is among the most common causes of death in the intensive care unit (ICU). The underlying pathophysiology involves an overactive immune response. It has been theorized that blood purification technique that reduces the levels of inflammatory cytokines and/or bacterial toxins could mitigate this response. High-volume hemofiltration (HVHF) is a blood purification technique that has been studied to improve outcome associated with septic shock. Our aim is to do a systematic review of randomized controlled trials that assessed the use of HVHF in septic shock.

Methods: A comprehensive literature search from the PubMed, Embase, Cochrane Library, and Ovid was performed with the following search terms: Hemofiltration, Septic Shock, Acute Kidney Injury. The search was limited to randomized-controlled trials that compared HVHF to Conventional (as dictated by the Surviving Sepsis Guidelines) and/or Standard-Volume Hemofiltration (SVHF). Eight prospective clinical trials were selected and analysed using Cochrane Revman v5.3. The primary outcome was 28-day mortality. Other outcomes assessed were dialysis dependence, length of ICU stay, vasopressor dose reduction or vasopressor dependency index (VDI) and adverse events.

Results: Eight trials comprising 663 patients were selected. 330 patients treated with HVHF and 333 patients in the control group were included. Pooled analysis of the 7 trials for 28-day mortality did not show a statistically significant difference between HVHF and control (630 participants, OR: 0.88, 95% CI 0.64-1.22). There were no noted significant difference between groups for any of the secondary outcomes. Adverse events, including electrolyte abnormalities and secondary infections, were more commonly observed in HVHF-treated patients, although reporting was inconsistent across studies.

Conclusions: There is insufficient evidence to support the therapeutic benefit for routine use of high-volume hemofiltration in patients with septic shock. Larger trails are needed to fully assess clinically relevant outcomes as well as cost-effectiveness.

Figure 1. Forest Plot for 28-Day Mortality

Study or Subgroup	HVHF Events	HVHF Total	Control/SVHF Events	Control/SVHF Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Boussekey 2008	3	9	5	10	4.0%	0.50 [0.08, 3.21]
Chung 2017	5	23	5	14	6.1%	0.50 [0.11, 2.19]
Joannes-Boyau 2013	25	66	29	71	21.9%	0.88 [0.44, 1.75]
Meng 2016	6	24	8	27	7.1%	0.79 [0.23, 2.73]
Payen 2009	20	37	17	39	9.6%	1.52 [0.62, 3.76]
Sanchez 2010	2	15	7	15	7.6%	0.18 [0.03, 1.07]
Zhang 2012	81	141	81	139	43.7%	0.97 [0.60, 1.55]
Total (95% CI)		**315**		**315**	**100.0%**	**0.88 [0.64, 1.22]**
Total events	142		152			

Heterogeneity: $Chi^2 = 5.58$, df = 6 (P = 0.47); $I^2 = 0\%$
Test for overall effect: Z = 0.77 (P = 0.44)