

Pattern of cytokine removal using an adsorption column CytoSorb® during severe candida albicans induced septic shock

Bracht H, Schneider M, Weiss M, Georgieff M, Barth E
University Clinic for Anesthesiology, University of Ulm, Germany



Introduction: It has been shown that a newly developed hemoadsorption device (CytoSorb) removes both pro- and anti-inflammatory cytokines and improves survival in experimental sepsis. Human data are scarce and all experiments used live bacteria or endotoxin for the induction of sepsis. For the first time we report the effects of hemoadsorption in a case of severe candidemia.

Objective: A 46 old female was admitted to ICU with hypodynamic septic shock and documented candidemia after infection of an i.v. port. On admission she was highly vasopressor and inotrope dependent and developed multiple organ failure. Hemodynamic situation was desperate with accompanying low output syndrome. Continuous renal replacement therapy (CRRT) was started and additional hemoadsorption was initiated for 24 hours. Cytokine levels were measured before and after hemoadsorption therapy.

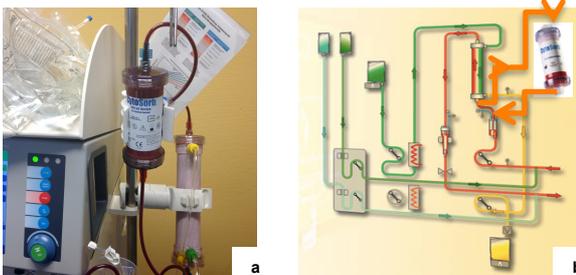


Figure 1: a) Picture of the built-in CytoSorb® Adsorber in the Hemodialysis circuit and b) schematic illustration of the bloodflow through the serial switched hemodialysis filter and the CytoSorb® Adsorber.

Methods: CRRT was started and additional hemoadsorption was initiated for 24 hours. Vasopressor therapy with Norepinehrine was extended to inotropic therapy with Levosimendan with 0.2ug/kg/min due to low output syndrom. Levels of IL-1b, IL-4, IL-8 as well as soluble CD25 (sCD25), lipopolysaccharide binding protein (LBP), Ferritin and tumor necrosis factor α (TNF α) were measured before and after hemoadsorption therapy. Hemodynamic variables and Vasopressor requirements were recorded at baseline and after 24h of hemoadsorption.

Results: After 24 hours of hemoadsorption, norepinephrine requirements decreased dramatically from 0.7 to 0.2 $\mu\text{g}/\text{kg}/\text{min}$ and inotropic support with Levosimendan could be withdrawn. Serum lactate concentration decreased from 15 to 3.4 $\mu\text{mol}/\text{l}$. IL-1 β concentrations remained unchanged, but all other proinflammatory cytokines as well as the acute phase proteins TNF- α and Ferritin decreased dramatically. Lipopolysaccharide binding protein (LBP) was not elevated before and after filtration. The patient showed an improvement in hemodynamic parameters with a decreasing heartrate, stabilized mean arterial pressure and improved cardiac output. Metabolic parameters improved as indicated by elevation in base excess despite normalized paCO_2 . Flow cytometric analysis revealed an almost perfect immunological reconstitution of a variety of immune parameters including HLA-DR.

	baseline	after Hemoadsorption
Heartrate (bpm)	133	100
MAP (mmHg)	62	81
Cardiac Index (L/min/m ²)	1.9	2.9
Stroke volume variation (%)	14	7
Core Body Temperature (°C)	36.2	36.3
Base excess (mmol/l)	-14.5	6.0
paO ₂ (mmHg)	125	128
paCO ₂ (mmHg)	27.1	38.2

Table 1: Hemodynamic, metabolic and gas exchange variables before and after hemoadsorption.

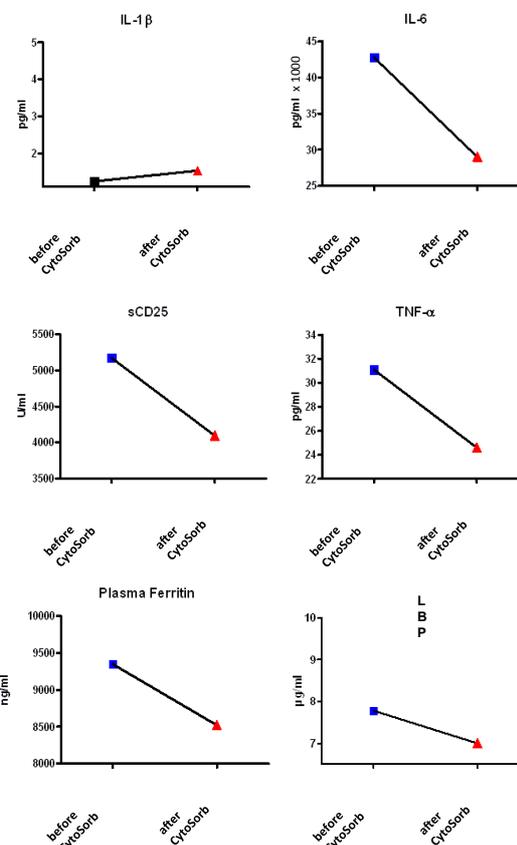


Figure 2: Levels of IL-1 β , IL-6, sCD25, TNF- α , Plasma Ferritin and LBP before and after hemoadsorption.

Conclusion: For the first time we can demonstrate the successful use of a hemoadsorption column during candida sepsis. Whether the improvement in hemodynamic situation was also influenced by simultaneously initiated inotropic support can not be ruled out. Additional, but not yet discovered, accompanying gram-negative or -positive infection could also have contributed to the sustained effects. Further studies need to elaborate indication criteria for hemoadsorption and the differences between bacterial- and fungal-induced severe sepsis and septic shock.