

# CytoSorb in septic shock with multiple organ failure and ARDS

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This case study reports on a 65-year-old female patient, who was admitted from a peripheral hospital via emergency transport intubated, ventilated and catecholamine-dependent with pneumonia-associated global respiratory insufficiency.

## Case presentation

- Direct admission to the internal intensive care unit in a state of septic shock and manifest hemodynamic instability (Noradrenalin 0.38 µg/kg/min)
- Extensive diagnostics with proof of pneumococcal pneumonia (both in blood culture and in sputum, also detection of influenza A infection)
- Immediate start of antibiotic therapy with clarithromycin + ampicillin/sulbactam and escalation to meropenem and levofloxacin the following day
- Application of the classic sepsis bundle and installation of advanced hemodynamic monitoring using PiCCO
- Sharp increase in inflammatory parameters i.e. IL-6 12,600 pg/ml, PCT 76 ng/ml, CRP 28 mg/dl, leukocyte count 2.0/nl and progressive metabolic acidosis (pH 7.19, lactate 2 mmol/l)
- Patient became progressively hemodynamically unstable necessitating an increase in norepinephrine dosages over the following 8 hours up to peak levels of 1.7 µg/kg/min, Extravascular lung water index (ELWI) was 15 ml/kg
- In addition to her respiratory failure (Horowitz Index PaO<sub>2</sub>/FiO<sub>2</sub> of 102), she developed acute oliguric/anuric renal failure and renal replacement therapy was commenced immediately
- Considering all the findings in the context of the refractory septic shock the patient was in, her lung and renal failure, significantly increased inflammatory parameters and the fact that the sepsis bundle with volume and catecholamine therapy did not have the desired effects, decision made 1.5 hours after the start of renal replacement therapy to also commence CytoSorb therapy

## Treatment

- Three consecutive CytoSorb treatment sessions for 24 hours each
- CytoSorb was used in conjunction with citrate dialysis (Prismaflex; Gambro) in CVVHDF mode
- Blood flow rate: 150 ml/min
- Anticoagulation: citrate
- CytoSorb adsorber position: post-hemofilter

### Measurements

- Hemodynamics and demand for catecholamines as well as ELWI
- Inflammatory parameters (IL-6, PCT, CRP, leucocytes)

### Results

- Significant reduction in norepinephrine doses accompanied by a clear stabilization in hemodynamics – after just 24 hours the norepinephrine dosage was halved (0.95 µg/kg/min), the second treatment resulted in another drop to 0.47 µg/kg/min, after the third adsorber norepinephrine dosages decreased to 0.33 µg/kg/min with further continuously decreasing doses thereafter and complete cessation of catecholamines 14 days after initial admission
- Improvement of ELWI with reduction to 10 ml/kg after 3 treatments
- Decrease in inflammatory parameters during the three treatments - after the first treatment: PCT 25 ng/ml, CRP 26 mg/dl, IL-6 11,630 pg/ml, leukocytes 0.7/nl, after the 2nd treatment: PCT 7.89 ng/ml, CRP 20.3 mg/dl, leukocytes 1.8/nl, after 3 treatments: PCT 3 ng/ml, CRP 17.2 mg/dl, IL-6 3262 pg/ml, leukocytes 6.5/nl with ongoing improvements in all parameters thereafter

### Patient Follow-Up

- Later on it became known that multiple myeloma had been detected a few months earlier, which may have contributed to the immunosuppression and severe course of the disease
- Cessation of continuous renal replacement therapy 13 days after the last CytoSorb treatment and switch to an intermittent procedure due to cast nephropathy
- Development of Critical Illness Polyneuropathy
- In the further course of treatment, application of a dilatation trachetomy and installation of a percutaneous endoscopic gastrostomy
- Discharge to a neurological first stage rehabilitation unit for mechanical ventilation weaning, hemodynamically stable and able to perch sit on a Thekla-chair

## CONCLUSIONS

- Rapid regain of control over the septic shock accompanied by clear stabilization and consolidation of hemodynamics and inflammatory parameters with CytoSorb within 72 hours
- The early use of CytoSorb in this patient with refractory septic shock with at least 2 organ failures was associated with a very good outcome
- Henceforth, a first adsorber change in patients with an excessively high cytokine load (i.e. IL-6 as in the present case) should be performed after 12 hours instead of 24 hours, followed by a 24-hour change interval considering the saturation kinetics of the adsorber
- Handling of the adsorber was easy and safe