CytoSorb in pneumogenic septic shock after mitral valve reconstruction

Dr. Bastian Huschens, Dr. Ender Demircioğlu, Department of Thoracic and Cardiovascular Surgery, University Hospital Essen

This case study reports on a 45-year-old female patient with mitral valve regurgitation III° and tricuspid valve regurgitation I-II° who underwent elective mitral valve reconstruction and then gradually deteriorated during her postoperative intensive care course.

Case presentation

- On the 3rd postoperative day (POD) development of a ventilator-associated pneumonia culminating in pneumogenic sepsis with accompanying ARDS
- Increased plasma levels of inflammatory parameters: PCT 29.4 ng/ml, CRP 21.2 mg/dl, elevated lactate 6.1 mmol/l
- Antibiotic regimen: ciprofloxacin, tazobactam/piperacillin
- Septic shock with multiple organ failure: hemodynamics (norepinephrine dose on the 2nd POD 1.5 µg/kg/min), lung, kidney, liver
- Development of sepsis-associated liver dysfunction (bilirubin 3.9 mg/dl on the 1st POD and further increasing levels with a peak value on the 6th POD of 20 mg/dl)
- Further deterioration of renal function, initially oliguric but trending towards decreasing excretion culminating in anuria and initiation of continuous renal replacement therapy (CVVH) on POD 5
- Pre-ECMO therapy: kinetic positioning for 4 days
- Initial stabilization of the circulatory situation (epinephrine dose on the 7th POD 0.05 µg/kg/min)
- Second septic insult along with hemodynamic deterioration on POD 8 with 0.2 µg/kg/min and worsening liver failure (plasma bilirubin levels with peak value of 38.5 mg/dl, quick 24%, hepatic encephalopathy), lactate at 3.1 mmol/l
- Escalation of antibiotic therapy from ciprofloxacin, tazobactam/piperacillin to imipenem/cilastatin
- Due to acute renal- and respiratory failure, sharp increase in inflammatory markers and progressive need for vasopressors as well as further increase in bilirubin levels indicative of progressive liver failure, CytoSorb was installed into the CVVH circuit on the 8th POD

Treatment

- 8 CytoSorb treatment sessions for 24 hours each and a total treatment period of 8 days
- CytoSorb was used in conjunction with citrate dialysis (Multifiltrate; Fresenius Medical Care) in CVVHDF mode
- Blood flow rate: 100 ml/min
- Anticoagulation: initially heparin, after recovery of liver function change to citrate
- CytoSorb adsorber position: pre-hemofilter
Measurements

- Demand for catecholamines
- Inflammatory parameters (PCT, CRP)
- Renal function (excretion)
- Lactate
- Bilirubin
- Ammonia

Results

- After implementation of CytoSorb there was an initial deterioration of the hemodynamic situation with increasing needs for catecholamines from 0.2 to 0.6 µg/kg/min for the first 24 hours, however there was a significant stabilization of hemodynamics in the further course of combined CVVH-CytoSorb treatment with a clear reduction in norepinephrine requirements. After 48 hours norepinephrine could be significantly reduced and was completely tapered off on the 12th POD.
- Reduction of inflammatory parameters during the course of treatments: PCT from 43.5 ng/ml on the first treatment day to 7.42 ng/ml on the 2nd and 1.35 ng/ml on the last treatment day; CRP from 31.8 mg/dl on the first treatment day to 21.3 mg/dl on the 2nd and 14.7 mg/dl on the last treatment day.
- Lactate from 1.3 mmol/l on the first treatment day to 4.6 mmol/l on the 2nd and 2.0 mmol/l on the last treatment day.
- Bilirubin from 25.6 mg/dl on the first treatment day to 17.2 mg/dl on the 2nd and 4.7 mg/dl on the last treatment day.
- Ammonia from 64 µg/dl on the first treatment day to 55 µg/dl on the 2nd, 135 µg/dl on the 4th, 201 µg/dl on the 5th and 6th treatment day and 47 µg/dl after the last treatment.
- No recovery of renal function.

Patient Follow-Up

- Patient still dialysis-dependent on POD 24.
- Regressive hepatic encephalopathy along with significant neurological improvement (vigilance).
- Patient is free of catecholamines, complete regeneration of liver function including stabilization of coagulation disorder even without substitution.
- CPAP without pressure support, alternated with nightly BiPAP training.
- Transfer of the patient to a weaning clinic while awake, oriented and hemodynamically stable.

Conclusions

- The most obvious effect was the significant and rapid stabilization of liver function and neurological improvement.
- Acute phase of septic shock could be overcome surprisingly quickly.
- Clear stabilization and consolidation of hemodynamics and inflammatory mediators with CytoSorb.
- Handling of the adsorber was easy and safe.