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Case of the week 17/2018

Perioperative use of the extracorporeal cytokine adsorber CytoSorb in a patient with septic endocarditis

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This case study reports on a 69-year-old female patient (pre-existing medical conditions: chronic heart failure NYHA III, Type 2 diabetes mellitus, multiple myeloma, chronic kidney disease stage 3), who was admitted from another university hospital for cardiac surgery, after she was diagnosed with septic endocarditis, mitral regurgitation (4th degree) and mitral valve abscess.

Case presentation:

- Direct admission to the Cardiac surgery intensive care unit (CICU)
- The patient had heart failure with moderately reduced left ventricular ejection fraction (40%) and elevated right ventricular systolic pressure (30-40 mmHg), but was hemodynamically stable, not requiring inotropic or vasopressor support preoperatively
- She was oliguric and showed elevated creatinine (110 µmol/l) as well as elevated CRP levels (57.5 mg/l)
- At this time APACHE II score was 10 corresponding to an ICU mortality risk of 12% and her operative mortality risk was 25%, as calculated using the EuroSCORE II
- Blood cultures taken before transfer showed growth of S.aureus and Kl.pneumoniae and she was therefore started on empiric antibacterial therapy with oxacillin already at the previous hospital. Based on the antibacterial resistance profile, meropenem was added and the dosages of both antibiotics were reduced in accordance with the decreased glomerular filtration rate
- The next day, cardiopulmonary bypass-assisted (CPB time 99 min) mitral valve prosthesis implantation (Medtronic Hancock II porcine heart valve) was performed
- With the rationale to reduce intra and post-operative inflammatory reaction and vasoplegia, a CytoSorb adsorber was preemptively installed into the CPB circuit
- Intraoperatively during the reperfusion period, patient required brief vasopressor support with norepinephrine (0.05 µg/kg/min) which was discontinued at the end of the operation

Treatment:

- One treatment with CytoSorb for 26 hours - 2 hours intraoperatively in conjunction with CPB, 24 hours in the postoperative period in conjunction with CRRT (Prismaflex, Gambro performed in CVVHD mode)
- CRRT blood flow rate: 150 ml/min
- CRRT anticoagulation: citrate
- CRRT CytoSorb adsorber position: post-hemofilter

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Measurements:

- Hemodynamics and demand for catecholamines
- Inflammatory parameters (TNFa, procalcitonin, CRP levels and leukocyte count)
- Renal function as indicated by creatinine level

Results:

- In the immediate postoperative period the patient again required brief support with norepinephrine to reduce vasoplegia (up to 0.07 µg/kg/min), which was however eventually stopped after 6 hours. On the first postoperative day, in order to provide fluid resuscitation without overloading the right ventricle, inotropic support with milrinone (0.3 µg/kg/min) was initiated
- After application of CytoSorb, there was a decrease in the inflammatory biomarker TNF-a (from 15.0 to 6.9 pg/mL), and no increase in procalcitonin was observed throughout the post operative period. As expected a postoperative increase in CRP level to 308.9 mg/L on the 3rd postoperative day was noted, which gradually decreased reaching pre operative levels on day 7 after operation
- Moderate reduction in creatinine levels with combined CVVHD+CytoSorb treatment in the postoperative treatment period

	Before operation	Operation and CytoSorb start	1st postoperative day and Cessation of CytoSorb	2nd postoperative day.	3rd postoperative day	4th postoperative day	5th	6th postoperative day	7th postoperative day
TNFa (pg/ml)		15.0	6.8						
Procalcitonin (ng/ml)			0.87	0.88					
CRP (mg/l)	57.5	73.6	251.8	291.2	307.9	194.4	113.9	69.2	57.2
WBC (x109/l)	10.2	13.9	12.8	14.9	12.8	11.2	11.1	9.4	8.8
Creatinine (µmol/l)	110	124	70	72	67	82	75	73	106
Norepinephrine (µg/kg/min)		0.07	0	0	0	0	0	0	0
Milrinone (µg/kg/min)			0.03	0.03	0.03	0.03	0.03	0.03	0

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Patient Follow-Up

- In the postoperative period, the patient showed ongoing lactic acidosis and remained oliguric, necessitating CVVH treatment for another 6 days after cessation of CytoSorb with varying ultrafiltration rates (0-100 ml/h) resulting in a gradual recovery of diuresis starting from day 3 onwards
- On the 7th postoperative day, the patient was transferred from CICU to the cardiac surgery ward with unchanged antibacterial therapy
- After readmission to the CICU due to oliguria 9 days later and a change of antibiotic therapy to ceftriaxone, she was transferred back to the cardiac surgery ward followed by discontinuation of antibacterial therapy a few days later and discharge from hospital and transfer to a rehabilitation centre due to decreased mobility (the patient had pronounced degenerative changes in the lumbar spine with L2, L4, L5 compression fractures)

Conclusions

- Perioperative application of CytoSorb in this multi-morbid patient with mitral valve regurgitation and septic endocarditis was associated with a decrease in inflammatory biomarkers in the postoperative period, as shown by the change in TNFa and procalcitonin levels and leukocyte count. The reduced inflammatory response may have contributed to recovery from postoperative vasoplegia allowing rapid discontinuation of vasopressor support with noradrenaline and an inotropic support with milrinone
- According to the medical team, the decrease in inflammatory response achieved with the help of CytoSorb may have promoted recovery of parenchymatic organs as indicated by the gradual return of normal diuresis in this patient allowing cessation of renal replacement therapy on the 6th postoperative day
- Use of Cytosorb in the renal replacement circuit appears not to have require adjustment of antibiotic dosages in this case, as preoperative doses of antibiotics were continued in this patient postoperatively and no signs of worsening bacterial infection (elevated temperature, increase in leukocyte count or procalcitonin levels) were observed
- The application of CytoSorb therapy, both in the CPB and CRRT circuit, was simple and safe