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Case of the week 34/2021

Intraoperative use of CytoSorb in a mitral valve replacement redo procedure due to infective endocarditis

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This case reports on a 18-year-old male patient, who was admitted to a secondary hospital due to febrile symptoms (38.5-39°C) and headache with deterioration of his neurological status (bradypsychia, deviation of gaze and vomiting) after outpatient antibiotic management following suspected neuro-infection.

Case presentation

- Known medical history included Marfan syndrome, bacterial endocarditis at the age of 16 as well as mitral valve replacement with a mechanical prosthesis 8 months before the current hospitalization
- Antibiotic therapy at this time point consisted of vancomycin (870 mg every 12 hours), rifampicin (300 mg every 8 hours) and gentamicin (60 mg iv every 8 hours)
- Following admission, he was evaluated and after diagnostic brain CT imaging and laboratory analysis, initial working diagnosis was either endocarditis and/or septic embolism in the brain
- Due to his medical history, he was then referred to the Clínica Colsubsidio Calle 100, Bogota, being a tertiary referral centre
- Subsequent transesophageal echocardiography showed preserved contractility and systolic function, with a left ventricular ejection fraction (LVEF) of 58%, mechanical prosthesis in mitral position with elevated transvalvular gradients, echo-dense mass described in anterior portion of prosthetic ring compatible with a vegetation, and at least moderate anterior paravalvular leak
- Over the following 4 days, the patient was evaluated for potential surgical treatment. However, due to the unknown etiology of his cerebrovascular event, additional studies were performed including checks for potential infectious diseases (e.g. COVID-19), and more advanced laboratory tests
- Contrast magnetic resonance imaging (MRI) then confirmed an ischemic event in the late subacute evolutionary phase of probable embologenic etiology (septic) being the most likely cause, however micro-abscesses were also considered as differential diagnosis
- Four days later, further neurological examinations reconfirmed an ischemic acute cerebrovascular event without hemorrhagic transformation and micro-abscesses. The antimicrobial management was deemed appropriate and was proposed to be continued for at least 4 weeks
- Prior to surgery, the patient showed profound hemodynamic instability with a decreased systemic vascular resistance index (SVRI, 620 dyn*s*cm5*m²) requiring massive doses of vasopressors (vasopressin 3 IU/h, norepinephrine 0.5 µg/kg/min)
- Additionally, hemodynamic disturbances translated into profound lactic acidosis (4.4 mmol/l)
- As there were no contraindications for surgery nor for the use of anticoagulants, the redo procedure was scheduled for the next day and consisted of mitral valve replacement (MVR) with a mechanical prosthesis and tricuspid annuloplasty
- Given the young age of the patient, his extensive medical history, the infectious profile as well as the hemodynamic instability, a CytoSorb hemoadsorber was integrated into the cardiopulmonary bypass (CPB) circuit with the rationale to stabilize hemodynamics and to reduce the hyperinflammatory response, which was anticipated would be triggered by this major procedure in a patient with considerable cardiac history

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Treatment

- CytoSorb was used in conjunction with the cardiopulmonary bypass machine (SARNS 8.000, Terumo. Additionally BP-80 Centrifugal pump, Medtronic) for a period of 100 minutes, cross clamp time was 90 min
- Anticoagulation: heparin
- Blood flow rate: 500 ml/min
- ACT: 418 - 527 - 483 – 144 sec
- Total heparin: 32,500 IU
- Protamine: 30,000 IU
- Ultrafiltration rate: 2.200 cc
- Administered blood components during surgery: 2x fresh frozen plasma, 6x cryoprecipitate, 1x red blood cell concentrate

Measurements

- Hemodynamics and catecholamine requirements
- Lactate values
- Inflammatory parameters
- Postoperative bleeding rate

Results

- Perioperatively, his vasopressor demand increased transiently and dobutamine had to be added. However, already 60 minutes after completion of the procedure, dosages of vasopressors could be decreased considerably (vasopressin 1 IU/h, norepinephrine: 0.05 µg/kg/min). Six hours after the procedure, vasopressin and norepinephrine infusion could be stopped and dobutamine was kept at 2.5 µg/kg/min to support contractility
- This was accompanied by a decrease in plasma lactate concentrations from 4.4 mmol/l pre-treatment to 2.9 mmol/l during CPB and 2.5 mmol/l post CPB
- Also levels of C-reactive protein (CRP) decreased under CytoSorb therapy: CRP pre 4.77 mg/l, CRP during CPB 3.3 mg/l, CRP post CPB 2.8 mg/l

Patient Follow-Up

- Extubation 12 hours after leaving the operating theatre
- Clinical evidence of good peripheral perfusion
- No bleeding complications occurred and surgical drains were removed after 48 hours
- Examination of valve cultures later confirmed colonization with S. hominis so it was decided to maintain antibiotic treatment with vancomycin for another 6 weeks
- The patient developed a complete AV block postoperatively, and the electrophysiology department opted for permanent pacemaker implantation, while neurology recommended continuation of treatment initially in the intensive care unit
- Transfer of the patient to the normal ward 6 days after the procedure and back home 9 days later with continued antibiotic and anticoagulation therapy

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Conclusion

- The intraoperative use of CytoSorb incorporated into the CPB circuit in this patient with infective endocarditis undergoing a mitral valve replacement redo procedure was associated with an improvement of the perioperative hemodynamic situation accompanied by resolution of lactic acidosis and control of the anticipated hyperinflammatory response
- Due to the excellent results both in modulation of the inflammatory response and in the postoperative bleeding rate, the surgical team now routinely consider the intraoperative use of CytoSorb in patients with a diagnosis of infective endocarditis
- Integration into the CPB circuit was easy and safe. No adverse events were recorded