

Use of CytoSorb in a patient with acute liver failure and acute exacerbation of heart failure after cardiac surgery

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This case reports on a 42-year-old male patient (known pre-existing conditions: small intestine resection in 2019, mitral valve regurgitation grade IV and tricuspid valve regurgitation grade III), who was transferred from a peripheral hospital to the Central University Hospital in Łódź with acute heart failure due to progressive mitral valve regurgitation.

Case presentation:

- On admission, due to the seriousness of the clinical condition the patient was transferred straight to the intensive care unit
- Dopamine and norepinephrine infusions were started for hemodynamic stabilization
- Subsequently, the patient underwent surgical mitral valve replacement together with tricuspid valve annuloplasty
- The postoperative course was initially characterized by a good recovery and quick extubation, however with the necessity for low maintenance doses of epinephrine, dopamine and norepinephrine
- Over time, the patient's clinical condition however deteriorated drastically including manifestation of acute heart (left ventricular ejection fraction 21%), renal and liver failure with ascites and a right sided serothorax
- Catecholamine doses had to be increased (norepinephrine 0.1 - 0.5 µg/kg/min, epinephrine 0.15 – 0.3 µg/kg/min, dopamine 5-10 µg/kg/min). Additionally, levosimendan was applied for hemodynamic stabilization
- The patient was still breathing spontaneously (O₂ via face mask), was conscious, fully oriented and cooperative at all times, however at times somnolent
- Laboratory tests revealed clearly elevated markers of liver dysfunction (ALP 232 U/L, ALT 153 U/L, AST 183U/L, direct bilirubin 54 µmol/L, total bilirubin 100 µmol/L, γ-GT 411 U/L), deranged coagulation parameters (aPTT 52 sec, INR 2.4; fibrinogen 120 mg/dL), slightly elevated creatinine levels (210 µmol/L) and increased brain natriuretic peptide levels (BNP, 35,500 pg/ml). Maximum lactate level was 2 mmol/L. Hepatitis B and C virology was negative
- Due to overhydration/hypervolemia and despite only slightly elevated creatinine levels, the decision was made to initiate continuous renal replacement therapy (CRRT)
- Additionally, a CytoSorb hemoadsorber was integrated into the circuit to support hemodynamic stabilization and liver function

Treatment

- One CytoSorb session was performed for 24 h
- CytoSorb was used in conjunction with CRRT (Multifiltrate machine, Fresenius Medical Care) run in CVHD mode

12/2020 Case of the week

- Blood flow rate: 100 mL/min
- Dialysate flow: 2000 mL/h, ultrafiltration rate 150 mL/h
- Anticoagulation: citrate
- CytoSorb adsorber position: pre-hemofilter

Measurements

- Hemodynamics and doses of catecholamine
- Overall clinical status
- Excretory liver function and liver integrity markers
- Coagulation
- Creatinine
- Lactate
- BNP

Results

- One day after CytoSorb application doses of catecholamines were decreased (norepinephrine 0.5 – 0.1 µg/kg/min, epinephrine 0.3 – 0.1 µg/kg/min, dopamine 10-3 µg/kg/min, levosimendan stopped). Within 3 days after cessation of CytoSorb treatment, doses of catecholamines were reduced further and finally discontinued
- CytoSorb therapy was associated with a significant improvement in the overall clinical status of the patient with improvements in all the tested laboratory parameters
- Bilirubin levels clearly decreased (direct bilirubin 38 µmol/L, total bilirubin 70 µmol/L) accompanied by a reduction in liver markers (ALP from 182 U/L to 72 U/L, ALT from 73 U/L to 42 U/L, AST from 72 U/L to 43 U/L, γ-GT from 411 U/L to 262 U/L)
- Treatment also resulted in an improvement in coagulation parameters (aPTT 42sec, INR 1.4, fibrinogen 220 mg/dL)
- Combined CRRT and CytoSorb therapy led to a further decrease in creatinine (101 µmol/L), BNP (12,356 pg/mL) and plasma lactate levels (0.8 mmol/L)

Patient Follow-Up

- During the follow-up period the patient's clinical condition further improved
- The patient was discharged to the normal cardiac surgery unit after a total of 33 days on the intensive care unit
- Eventually, the patient was discharged a further 16 days later in a stable condition
- Since then, he has been accepted on the heart transplant list (ejection fraction 25%)

Conclusions

- In this patient diagnosed with acute liver failure and acute exacerbation of heart failure following cardiac surgery, the combination of CRRT and CytoSorb resulted in significant improvements in the overall clinical status of the patient with improvements in liver function, coagulation and heart function
- According to the medical team, the use of CytoSorb in this case allowed them to extend the time to heart transplantation and saved the patient's life
- Therefore, CytoSorb is a very promising tool for patients with heart failure following cardiac surgery, which is accompanied by acute liver failure and acute kidney injury and CytoSorb might prevent the occurrence and development of multiple organ failures
- CytoSorb was safe and easy to use in combination with CRRT