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Case of the week 31/2022

First Hemoadsorption during Cardiopulmonary Bypass in Neonate with Complex Cardiac Malformation

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This case reports on a 5 day old male full term newborn with congenital hypoplastic left heart syndrome who was scheduled for a corrective procedure.

Case presentation

- His left heart syndrome involved an absent mitral valve and exceedingly small aortic annulus, ascending aorta and aortic arch. Perfusion of the aortic arch was retrograde through a persistent patent ductus arteriosus. Right ventricular systolic function was normal
- Shortly after birth, the neonate required continuous positive airway pressure (CPAP) and then invasive ventilation with permissive hypercapnia
- He received levosimendan 12 h before surgery, and maintenance with a prostaglandin E1 infusion
- Five days after birth, the patient underwent a Norwood stage I palliation with interatrial septum resection, aortic arch reconstruction and the creation of a Blalock-Taussig shunt
- Cardiopulmonary bypass (CPB) duration was 227 min, aortic cross-clamping duration 180 min. Selective cerebral perfusion was 27 min at a central core temperature of 27.8° Celsius
- In order to reduce the pre-operative and intra-operative inflammatory process, a CytoSorb hemoadsorption device was pre-emptively integrated into the CPB circuit

Treatment

- The CytoSorb cartridge was inserted between the oxygenator outlet (QUADROX-i neonatal HMO 11000® MAQUET) and the venous line, assisted by a roller pump slave to the blood pump
- The minimum flow rate through the cartridge was 100 ml/min. The servo control was 14% of the patient's theoretical flow, indexed to 3.0 l/min/m2 to compensate for the drop induced by CytoSorb and to ensure a flow rate of 2.4 l/min/m2 to the patient
- Priming was performed using "ventilated reconstituted whole blood" to ensure homeostatic conditions at CPB initiation requiring 385 ml of blood, of which 120 ml were used for priming the CytoSorb

Measurements

- Hemodynamics and requirements for vasoactive substances
- Overall clinical course

Results

- The patient returned to the intensive care unit (ICU) intubated with infusions of norepinephrine, dopamine and milrinone. Thereafter, hemodynamic adaptation was good, with rapid weaning off all amine infusions and definitive weaning off norepinephrine on post-operative day 5
- Surgery was successful and correction was adequate, with unobstructed flow through the interatrial communication and inside the aortic arch, and with good ventricular function. Despite the severity of his condition, the baby had an uneventful post-operative course, without renal, digestive, or infectious complications

Patient Follow-up

- The patient was extubated on post-operative day 6
- He left the ICU on day 22 and was discharged home on day 45

Conclusions

- The authors describe the clinical course post-operatively as remarkable with shortened ICU and hospital lengths of stay due to the lack of (anticipated) complications. They state that previous similar cases have required much longer support on ventilation and longer ICU stays. They also believe the expected benefits to the anti-inflammatory processes are worth the large homologous blood use
- As the use of CytoSorb was the only differentiating factor, its use likely helped to reduce the pre-operative and intra-operative inflammatory process, and thereby helped with the positive clinical course and outcome. The authors conclude with stating that by reducing cytokine levels, CytoSorb may have significantly reduced catecholamine infusion time, intubation time, and ICU stay