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The combined use of left ventricular assist device and extracorporeal membrane oxygenation in a patient with severe heart failure due to myocardial infarction after stent thrombosis

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A 56-year-old male patient was transferred to our hospital with severe heart failure due to acute myocardial infarction after stent thrombosis of the left anterior descending artery. He progressed to multi-organ failure requiring intubation and maximal doses of multiple inotropic agents. Invasive cardiac output monitoring was implemented using the Swan Ganz pulmonalis catheter system. Circulatory support was first provided by an extracorporeal membrane oxygenator (ECMO) due to low-output related right ventricular (RV) failure with enhanced pulmonary artery pressures (pulmonary mean pressure 50 mmHg and pulmonary wedge pressure 40 mmHg) demonstrating poor LV unloading. The hemodynamic worsening was also triggered by concomitant development of pneumonia yielding septic shock caused by an Acinetobacter baumannii infection. Five days after ECMO implantation the patient was partially weaned from the ventilator, being completely awake and speaking with the help of a tracheostomy tube.

The first weaning attempt from the ECMO system, one week after implantation, failed. Cardiac index parameters, determined by the Fick principle, were very low between a rate of 1.4 to 1.6 L/min/m2. Echocardiographic findings revealed a severely reduced systolic cardiac function with a LV ejection fraction of 15%. Besides, the patient developed heparin induced thrombocytopenia with several hemoglobin relevant bleedings from the ECMO puncture sites. Thus heparin was replaced by argatroban with no longer major bleeding events at follow-up. At day 8, the patient developed pulmonary edema due to fluid overload yielding RV decompensation and subsequent LV compression after required enhancement of the ECMO flow. Facing this massive LV failure on ECMO, we decided to perform LV decompression with a percutaneous cardiac assist device. Immediately after Impella positioning, right-sided pressures, left-sided volumes, and pulmonary edema rapidly decreased (Impella outflow 2,0 L/min, pulmonary mean pressure 20 mmHg, and pulmonary wedge pressure 14 mmHg), paralleled by an average systemic arterial mean pressure of 70 mmHg under low-dose dobutamin and an ECMO flow of 2l/min. However, the second ECMO weaning attempt under Impella support also failed, indicating the poor cardiac function, verified by echocardiographic parameters. Therefore we decided a biventricular unloading until admission to a heart center, where a Levitronix CentriMag system was implanted. Unfortunately the patient died 5 days after implantation due to diffuse haemorrhage related to hyperfibrinolysis.

To conclude the implantation of ventricular assist devices is a logistical and ethical challenge and needs to be evaluated very carefully with a clearly defined ‘exit strategy’ for the patient.