

Case Presentation of Anesthesia Management with Deep Hypothermic Circulatory Arrests during Pulmonary Thromboendarterectomy

Roberts Leibuss^{1,2}, Martins Kalejs¹, Agnese Ozolina^{1,2}, Andris Skride¹,
Peteris Stradins^{1,2}, Eva Strike^{1,2}, Romans Lacis^{1,2}

¹Pauls Stradiņš Clinical University Hospital, Latvian Cardiology Center, Latvia

²Rīga Stradiņš University, Latvia

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Introduction. Pulmonary thromboendarterectomy (PTEAE) is an effective treatment for chronic thromboembolic pulmonary hypertension (CTEPH) which requires cardiopulmonary bypass (CPB) with deep hypothermic circulatory arrest (DHCA). DHCA is a technique for providing cerebral protection during surgery. Nevertheless, the early postoperative course may be associated with high risk of neurologic dysfunction.

Aim. The aim of the study is to demonstrate pharmacological and non pharmacological cerebral protection methods during DHCA under CPB for PTEAE.

Material and methods. Retrospective analysis of anesthesia management with DHCA during PTEAE was carried out.

Results. A 31-year-old male was referred for PTEAE in the context of CTEPH which was diagnosed in 2010 (pulmonary artery pressure 102/42 mmHg, mean 64 mmHg). He received treatment with Warfarin and Sildenafil. In 2013, because of progressively worsening of CTEPH with elevated central venous pressure, increasing shortness of breath on exertion, thrombus detected in right and left pulmonary arteries decision of PTEAE was made. Perioperative risk: ASA IV, EuroSCORE 9.51%. Anaesthesia with fentanyl, etomidate, cisatracurium was provided. During standard pulsatile CPB with deep hypothermia (rectal temperature 18 °C) propofol and cisatracurium was used in parallel with normovolemic haemodilution. Bilateral constant measurements of regional cerebral oxygen saturation (SrO₂) were provided. Total CPB time was 242 minutes, aorta occlusion - 125 and reperfusion - 92 minutes. Circulatory arrests in deep hypothermia was performed temporarily three times, for 20, 28 and 8 minutes, maintaining SrO₂ > 40%. Much attention was applied to provide pharmacological (thiopental, propofol, solu-medrol, mannitol) and non-pharmacological cerebral protection (deep hypothermia, low flow CPB, trandelenburga position, local ice applications on the head, normoglycaemia < 10 mmol/l, haemoglobin ≥ 9 g/l, hypocapnia PaCO₂ 25 - 30 mmHg).

Discussion. Effective cerebral protection remains the principle concern during PTEAE surgery. DHCA has been entrenched as the primary neuroprotection mechanism since the 1970s as it significantly decreases brain metabolism. Between 37 °C and 22 °C, CMRO₂ is reduced by 5% to 1 °C, and then the reduction accelerates and reaches 20% at 20 °C and 17% at 18 °C. However, increases in DHCA duration are associated with poorer neurological outcomes, as the incidence of neurological injury is recorded up to 3-12%.

Conclusions. First Latvian experience providing general anaesthesia with DHCA for PTEAE was successful, without neurologic complications in perioperative period. Moreover, it provided good conditions for full extent surgical treatment.