

Smith C, Gibbons K
University of Michigan , Ann Arbor , MI, USA

Introduction

Systemic air embolism is a potentially devastating complication during the weaning process from cardiopulmonary bypass (CPB). Fortunately, air entrapment in the pulmonary vasculature typically resolves with ventilation and air venting. We would like to report a case in which ventilation could not be resumed following repair of Obstructed Total Anomalous Pulmonary Venous Connection (TAPVC) due to pulmonary vein air entrainment associated with ventilation.

Case Description

Our patient was born at 39 weeks gestational age by repeat cesarean section. During fetal life, our patient had been followed closely by serial ultrasounds due to a sibling with TAPVC, Tracheoesophageal Fistula, and a single ventricle. Despite close observation, our patient's cardiac condition was not diagnosed antenatally. On day one of life, our patient was transferred to our institution for treatment of profound cyanosis and TAPVC diagnosed by echocardiography. Our patient underwent surgical repair consisting of marsupialization of the pulmonary venous confluence, ligation of the vertical vein, and atrial septal defect closure. Upon resumption of mechanical ventilation, the patient developed sudden cardiovascular collapse. Transesophageal echocardiography revealed global cardiac hypokinesis, and copious amounts of air entering the left atrium via the pulmonary veins which lead to air bubbles entering the coronary arteries. Upon closer observation, it was noted that the air entry was associated with each breath delivered by the ventilator. Upon cessation of ventilation, air was no longer seen entering the left side of the heart. Once full flow CPB was resumed without ventilation, the patient became hemodynamically stable and cardiac function returned to normal. The decision was made to transport the patient to the intensive care unit utilizing Veno-Arterial Extracorporeal Membrane Oxygenation (VA ECMO) without ventilation. On post-operative day one, attempts to ventilate the patient using low peak inspiratory pressures resulted in the entrainment of air into the arterial circulation once again. Ventilation was stopped, and the patient remained on VA ECMO until post-operative day seven when high frequency oscillatory ventilation (HFOV) was successfully used to ventilate the patient without air entrainment and allowed for eventual removal of the ECMO canulae.

Discussion

De-airing the pulmonary circulation is always a concern while weaning from CPB. In our patient, this process was complicated by the continuous entrapment of air into the pulmonary veins with ventilation. Broncho-venous fistula is a rare complication of ventilation in neonates; it has been associated with the use of high peak pressures required to ventilate neonates with poor pulmonary compliance. In this case, the use of ECMO allowed us to avoid positive pressure ventilation for an extended period of time, thereby allowing the fistula to heal and eventual discontinuation of ECMO.

References

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