Anesthetic Considerations for Catheter-Based Intervention in Neonates Born with Obstructed Total Anomalous Pulmonary Venous Return

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INTRODUCTION

Infradiaphragmatic total anomalous pulmonary venous return (TAPVR) is a congenital cardiac lesion frequently associated with obstructed venous return. This can lead to immediate hemodynamic compromise upon separation from fetal circulation. Interventions for obstructed TAPVR traditionally include extracorporeal membrane oxygenation or surgical repair. Stenting of the ductus venosus (DV) has recently been described in neonates with obstructed TAPVR to relieve the pulmonary venous congestion and delay high-risk surgical repair until 3-5 weeks of age. We describe the anesthetic management of three infants with obstructed TAPVR who underwent DV stenting in the early post-natal period.

CASE PRESENTATION

Case No. 1:
A full-term 3.3kg male neonate with obstructed infradiaphragmatic TAPVR diagnosed via post-natal echo was transferred to UCLA intubated and on a prostaglandin infusion. On day of life 1, he underwent DV stenting. After the stent was deployed, the patient became profoundly hypoxic. On echocardiography and angiography, it was evident that the stent may be obstructing the portal system as well as the vertical vein. The patient was emergently brought to the operating room to be placed on ECMO and undergo a complete TAPVR repair, atrial septal defect closure, and patent ductus arteriosus (PDA) ligation.

Case No. 2:
A full-term 3.2kg male neonate with obstructed infradiaphragmatic TAPVR, double outlet right ventricle and pulmonary stenosis diagnosed via pre-natal echo underwent DV stenting on day of life 0 after a scheduled cesarean section. Stent deployment led to initial improvement in oxygen saturation; however the patient’s pulmonary congestion persisted. The decision was made to immediately proceed to the operating room for TAPVR repair, Blalock-Taussig (BT) shunt, and pulmonary artery (PA) banding.

Case No. 3:
A full-term 2.5kg female with obstructed infradiaphragmatic TAPVR, complete atrioventricular canal and pulmonary atresia diagnosed on pre-natal echo underwent DV stenting on day of life 0 after a scheduled cesarean section. Stent deployment led to improvement in pulmonary vascular congestion. The patient underwent TAPVR repair, BT shunt, and PDA ligation on day of life 5.

DISCUSSION

This case series presents the management of three neonates who underwent catheter-based DV stenting for obstructed infradiaphragmatic TAPVR. While this treatment option has previously been described as a measure to delay surgical intervention, we report two cases in which patients required emergent surgical intervention despite attempted percutaneous first step palliation. With prenatal diagnosis, the coordinated efforts of the neonatal intensive care, cardiac, surgical, and anesthesia teams are paramount. The anesthesiologist plays a key role in the risk stratification of the neonate and coordinating immediate care following birth. These cases highlight the need for further investigation to assess the efficacy of novel procedures and the importance of multidisciplinary coordination and planning for adverse outcomes when implementing such interventions. The increased manpower needs as well as the costs associated with standby ORs and cardiac surgery/perfusion teams must be weighed against the potential benefits of catheter-based palliation without the need for cardiopulmonary bypass in the immediate newborn period.

REFERENCES