Title

Percutaneous Veno-Pulmonary Artery Support for Post-Cardiotomy Right-Ventricular Failure in Situs Inversus Totalis

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Introduction

Situs inversus totalis (SIT) can complicate assessment and management due to the reversed anatomy. We describe the procedural feasibility and clinical course of ProtekDuo-based veno-pulmonary artery (V-PA) extracorporeal support for refractory post-cardiotomy right ventricular (RV) failure with SIT.

Clinical Case

A 67-year-old man with SIT and past medical history of an ascending aortic aneurysm measuring 5.4 cm, moderate to severe aortic stenosis (aortic valve area 1.1 cm^2, mean gradient 39 mmHg), and atrial fibrillation underwent elective ascending aorta repair, aortic valve replacement, right coronary artery bypass grafting, and left-atrial appendage closure.

On post-operative day (POD) two, he was hemodynamically unstable with low blood pressure (65/45 mmHg) requiring increasing vasopressor support. Recorded central venous pressure reached 28 cm H_2O. A bedside transthoracic echocardiogram (TTE) revealed an intrapericardial hematoma compressing the right atrium and ventricle. He was returned to the operating room and underwent mediastinal exploration with hematoma evacuation. Hemodynamics improved transiently.

On POD 3, measured thermodilution cardiac index was 0.81 $L/min/m^2$ with transesophageal echocardiogram showing severe biventricular failure. Left ventricular (LV) ejection fraction (EF) was estimated to be 25-30%, while RV fractional area change was markedly reduced. Tricuspid annular plane systolic excursion (TAPSE) was 0.74 cm, compared to 1.8 cm pre-operatively. Epoprostenol was initiated but did not have a profound effect as pulmonary artery pressures were rising while pulmonary artery pulsatility index (PAPi) was reduced (0.75). Left heart catheterization was performed and revealed a patent right coronary artery graft.

Given the refractory shock and exclusion of reversible causes, a 29-Fr ProtekDuo dual-lumen RV assist cannula was inserted via the left (anatomic right) internal jugular vein under fluoroscopic and echocardiographic guidance, and V-PA extracorporeal support was initiated. The mirrored anatomy required deliberate adjustment of imaging orientation to confirm cannula position, with pulmonary-artery flow monitoring to ensure RV unloading. Hemodynamics normalized promptly, and vasopressors were weaned off.

On POD 4, TTE demonstrated good recovery with TAPSE improving to 0.89 cm, and LV EF to 40-45%. On POD 6, repeat TTE showed an estimated LV EF of 55-60% with near-normal RV

size and function. The patient was decannulated on POD 9 and discharged to long-term acute care where he continues to make great recovery.

Discussion

This case demonstrates the technical feasibility of ProtekDuo-facilitated V-PA extracorporeal support in SIT when multimodality imaging is adapted to the reversed thoraco-abdominal orientation. Objective invasive hemodynamics combined with echocardiographic RV indices such as TAPSE can help distinguish expected postoperative instability from evolving RV failure.