Surgical repair of anomalous pulmonary venous connection shunting from left atrium to superior vena cava

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Partial anomalous pulmonary venous connection (PAPVC) causes a left-to-right shunt from the anomalous pulmonary vein (PV) to a systemic vein. We herein report an extremely uncommon case of PAPVC in which the right upper PV drained into both the superior vena cava (SVC) and the left atrium (LA), demonstrating retrograde shunting from the LA to the SVC via the anomalous PV. The anomaly was surgically repaired.

Clinical Summary

A 5-year-old boy with a systolic heart murmur at routine pediatric checkups was admitted to our hospital. Echocardiogram showed a volume-loaded right ventricle and right atrium, a patent foramen ovale, and patent ductus arteriosus. Color Doppler echocardiogram demonstrated retrograde blood flow in the right upper PV. To clarify the exact anatomy, a cardiac catheterization was performed, which revealed a PAPVC from the right upper lobe into the SVC. Angiograms projected in the LA demonstrated retrograde blood flow from LA to SVC through the right upper PV (Figure 1).

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Moderate left-to-right shunt (pulmonary/systemic flow ratio 2.4) was due to the shunt from the LA to the SVC. Interventional closure of the patent ductus arteriosus was done.

The elective operation was performed at the age of 6 years. After right lateral thoracotomy and longitudinal pericardectomy, we encountered a Y-shaped right upper PV draining into both the SVC and the LA (Figure 2, A). The anomalous PV was dissected and divided (Figure 2, B).

Discussion

PAPVC of the right upper PV is most commonly attached to the low SVC or the SVC-right atrial junction.¹⁻³ In this case, the right upper PV connects both to the SVC and to the LA, showing a moderate left-to-right shunt through retrograde flow from the LA.⁴ To the best of our knowledge, there has been no prior report of surgical repair for

Figure 1. A, Angiogram of LA injection showed retrograde blood flow from LA to SVC via the RUPV (white triangles). B, Diagram of the anatomy of venous return. LA, Left atrium; RUPV, right upper pulmonary vein; SVC, superior vena cava.

Figure 2. Intraoperative drawings. A, There are Y-shaped RUPV connections both to SVC and to LA. B, Anomalous RUPV connected to SVC was dissected and divided. RA, Right atrium; RUPV, right upper pulmonary vein; SVC, superior vena cava; RPA, right pulmonary artery. *Anomalous pulmonary vein connected to SVC.

such cases. Accurate diagnosis and hemodynamic assessments by cardiac catheterization were necessary before surgical repair. Surgical repair was successfully done by division of the anomalous PV without cardiopulmonary bypass. Our case showed the possibility of coexistence of normal and anomalous PVs in the common situation of PAPVC of the right upper PV. Surgeons must keep in mind this rare anomaly and its repair.

Conclusion

We reported surgical repair of PAPVC of the right upper PV, which connected both to the SVC and to the LA, showing retrograde blood flow from the LA to the SVC.

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Biventricular mechanical assist for complex, acute post-infarction ventricular septal defect

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Post-infarction ventricular septal defects (PI-VSDs) represent a catastrophic complication after acute myocardial infarctions. Despite advances in surgical and postoperative management, operative mortality is still 10% to 60%.¹ Furthermore, little has been written describing the options in managing the severe and often biventricular failure that is associated with PI-VSD and that is a significant factor influencing postoperative morbidity and mortality. We describe a patient with complex PI-VSD who, despite appropriate and prompt surgical management, required biventricular mechanical assist devices (biVADs) as a bridge to recovery.

Case Report

A 53-year-old man was admitted to an outside hospital with vague abdominal symptoms and a presumed diagnosis of acute cholecystitis. Severe hypotension and a new murmur shortly developed. Echocardiography revealed a large posteroinferior PI-VSD. After the patient was urgently transferred to our medical center, cardiac catheterization revealed a complete right coronary artery occlusion with critical left anterior descending coronary artery and ramus diseases. Because the patient was in profound cardiogenic shock requiring multiple high-dose pressors and intraaortic counter pul-

sation, he was taken urgently to the operating room. Intraoperatively, the patient's heart was diffusely erythematous, and there was a large inferior wall infarct, an akinetic right ventricle, and severe mitral regurgitation from a ruptured papillary muscle. Transesophageal echocardiography demonstrated a 4 × 4-cm posteroinferior VSD extending to the annulus of the mitral valve. After standard bicaval cannulation, cardiopulmonary bypass, and antegrade and retrograde cardioplegic arrest, an incision was made parallel to the posterior descending artery. The defect was closed with a large bovine pericardial patch with pledgeted sutures through healthy-appearing tissue. Coronary artery bypass grafting was performed in the diseased vessels. A mechanical mitral valve was inserted using standard techniques. Secondary to severe intraoperative right ventricular failure, a right ventricular assist device (Abiomed 5000, Abiomed Inc, Danvers, Mass) was placed. However, with increasing right ventricular assist device flows, left to right shunting across a residual VSD increased. Because of the perceived technical and physiologic difficulties associated with attempts at closure, combined with worsening left ventricular function, a left ventricular assist device (Abiomed 5000) was placed. The patient was stabilized and weaned from bypass. His initial intensive care unit course was unremarkable as he was rapidly extubated and weaned from pharmacologic support. After several months of aggressive rehabilitation, the patient underwent explantation of his biVAD and residual VSD closure. The patient tolerated this procedure well, and after pharmacologic optimization of his chronic heart failure he was transferred to an outpatient rehabilitation facility. At 18 months post-infarction, the patient was well.

Discussion

PI-VSDs complicate up to 0.02% of myocardial infarctions.² Despite advances in the surgical care of these moribund patients, operative mortality still approaches 50% with major risks, including cardiogenic shock, renal failure, right and/or left ventricular

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