Clinical and echocardiographic findings of intraoperative inferior vena cava obstruction following orthotopic heart transplantation

Montserrat Fontanals, MD, Tam T. Doan, MD, Iki Adachi, MD, and Premal Trivedi, MD, Houston, Tex

Acute intraoperative obstruction of the inferior vena cava (IVC) is an uncommon complication in congenital heart surgery. Diagnosis requires a high index of suspicion and is facilitated by imaging. The case presented here was first diagnosed by imaging, but in retrospect, could have been suspected based on the procedure being performed and the clinical signs that were present. The goal of this case report is to describe these clinical signs and their procedural context such that they may be recognized and considered earlier in similar patients.

The institutional review board at our institution did not approve this study because there was no clinical ethical concern and we used anonymized data. The subject provided informed written consent for the publication of the study data.

CASE DESCRIPTION

The child was a 9-month-old boy presenting for orthotopic heart transplant with complex native anatomy: heterotaxy, right ventricle-dominant atrioventricular septal defect, pulmonary atresia, discontinuous pulmonary arteries supplied by bilateral patent ductus arteriosus, single right superior vena cava (SVC), and left-sided IVC. Following palliation with a right modified Blalock-Thomas-Taussig shunt and centralization of the pulmonary arteries (Figure E1), he was bridged to transplant with a Berlin Heart ventricle assist device for right ventricle (RV) dysfunction and severe atrioventricular valve regurgitation.

Due to his native anatomy with a right-sided pulmonary venous confluence and a left-sided IVC, implantation of the donor heart was challenging. A donor pericardial patch was used to bridge the distance between the right-sided donor IVC and the left-sided native IVC. Care was taken to ensure that this long cuff would not be twisted. On separation from bypass, hemodynamics were notable for hypotension requiring volume and uptitration of vasoactive agents. Transesophageal echocardiography (TEE) revealed a hyperdynamic, underfilled RV. Central venous pressure via the internal jugular vein measured 12 to 17 mm Hg and cerebral near-infrared spectroscopy were acutely decreased to 30% (previously 60-70%). Left atrial pressures were low at 5 to 6 mm Hg. Suspecting potential SVC stenosis, direct pressure measurement revealed no gradient across the SVC anastomosis. Other potential diagnoses included elevated pulmonary vascular resistance or bleeding, but neither explained all of the above findings. TEE assessment of the IVC thereafter revealed a 5-mm Hg gradient (Figure E2). On retracting the diaphragm downward, the obstruction was instantly relieved, with a normalization of hemodynamics and a decreased gradient on TEE (Figure 1). This suggested the cause of obstruction to be compression of the reconstructed IVC cuff by the RV inferior wall and the diaphragm. The diaphragm was thereafter tacked down with a heavy silk suture, which improved hemodynamics significantly. Cerebral near-infrared spectroscopy subsequently returned to baseline, whereas the central venous pressure normalized to single digits (Figures 1 and E3).

Acute obstruction of the IVC during heart transplant is a very rare complication. It has been infrequently reported in the literature, usually in adult settings in which...
obstruction at the IVC-right atrial anastomosis occurs due to a large donor Eustachian valve restricting flow. Prompt reoperation and resection of the Eustachian valve released the obstruction. To our knowledge, there are no reports describing heart transplant complicated by IVC obstruction in a pediatric population. We hope this report will facilitate early recognition of IVC obstruction in patients with complex systemic venous anatomy. In the most recent echocardiography, 8 months after surgery, the patient had no findings of IVC obstruction and had preserved biventricular function.

CONCLUSIONS

Baffle obstruction between the recipient and donor IVC was identified in this child with TEE and was easily resolved with simple stitches to tack down the diaphragm. In the setting of complex systemic venous anatomy, IVC obstruction may be considered as a potential cause of unexplained hemodynamic instability.

Conflict of Interest Statement

The authors reported no conflicts of interest.

The Journal policy requires editors and reviewers to disclose conflicts of interest and to decline handling manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

References


FIGURE E1. Patient’s anatomy following palliation with a right modified Blalock-Taussig-Thomas shunt and centralisation of the pulmonary arteries.

SVC, superior vena cava; IVC, inferior vena cava; LUPV, left upper pulmonary vein; RUPV, right upper pulmonary vein

FIGURE E2. Pre, The left inferior vena cava had been baffled from left to right (dotted arrows) and its anastomosis with the right atrium (arrowheads) is obstructed (mean gradient 5 mm Hg).
FIGURE E3. Post, The left inferior vena cava had been baffled from left to right (dotted arrows) and its anastomosis with the right atrium (arrowheads) is now unobstructed (mean gradient 1 mm Hg).