

Reduction aortoplasty of donor ascending aorta aneurysm during heart transplant: A case report



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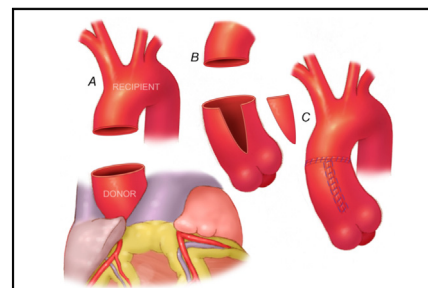


Illustration depicts the technique of reduction aortoplasty of donor ascending aorta.

Literature on managing significant aortic size mismatch between donor and recipient during orthotopic heart transplant (OHT) due to aneurysms is limited. One technique involves replacing the dilated aorta with a prosthetic graft,¹ whereas an alternative approach is reduction ascending aortoplasty (RAA), which avoids prosthetic materials by resecting a portion of the aortic wall and primary closure.² RAA has been reported in recipient but not donor aortas. Herein, we present a successful case of RAA performed on the donor's ascending aorta due to an aneurysm.

CASE DESCRIPTION

A 23-year-old man with dilated cardiomyopathy underwent an OHT in April 2023. The donor was a young woman with history of hypertension. There was a donor ascending aortic aneurysm (40 mm in diameter) (Figure 1, A) resulting in a large discrepancy between the donor's and the recipient's aortas. RAA of the donor ascending aorta was performed by excising a hemi-oval section of the right lateral wall of the donor aorta with the vertex of hemi-oval at the sinotubular junction and the center at the free edge (Figure 2, B). The diameter of hemi-oval excised was calculated as below:

$$\text{Diameter of semi-oval (mm)} = [\pi DD - \pi DR] - 4,$$

where D = diameter, $\pi = 3.14$, πDD = circumference of donor aorta, and πDR = circumference of recipient aorta.

We subtracted 4 mm from the expected width of the aorta to be excised to account for the 2-mm margin of the aorta consumed by both the suturing margins. In our patient, the difference in circumference was almost 24 mm. We excised a hemi-oval aorta with a 20 mm diameter to effectively reduce the donor aorta to 30 mm. The aorta was closed using 2-layer 4-0 polypropylene, with the initial horizontal mattress suture taking 2 mm from each cutting edge. RAA added an extra 5 minutes to aortic end-to-end

anastomosis. The rest of the procedure was uneventful. He was extubated 4 hours after OHT, transferred to the floor on postoperative day 4, and discharged home with good biventricular function on postoperative day 10. Chest contrast-enhanced computed tomography (CT) performed before discharge demonstrated uniform size ascending aorta (27 mm) (Figure 1, B). Five months after OHT, the patient was doing well, New York Heart Association functional class I, with no rejection episode. Left ventricular ejection fraction on echocardiography was 59%. The patient provided written informed consent for publication data, and institutional review board approval was not required.

DISCUSSION

In heart transplantation, especially in pediatric populations, discrepancy between donor and recipient aortic sizes is common. Table 1 shows techniques that can be used to address this problem, and their pros and cons.^{1,2} Smaller discrepancies are managed by adjusting the suture placement during anastomosis. However, larger discrepancies, resulting from donor or recipient aortic aneurysm, necessitate aortic replacement or aortoplasty. Published experience

CENTRAL MESSAGE

Reduction aortoplasty is a safe technique to manage donor ascending aortic aneurysm with a minimal increase in allograft ischemic time and reducing the risk of future dilatation.

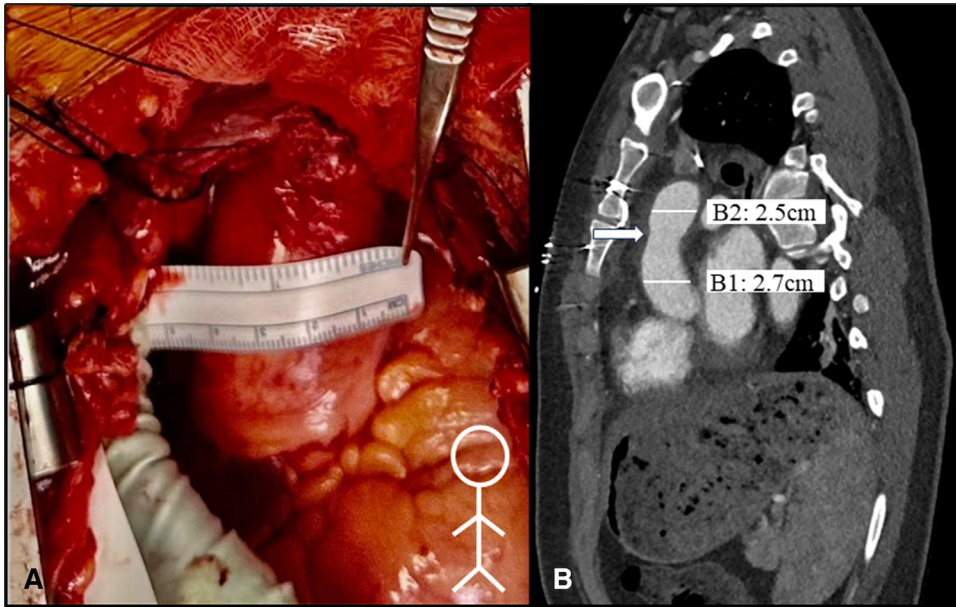


FIGURE 1. A, Operative photograph of donor heart showing ascending aortic diameter of approximately 4 cm. B, Posttransplant contrast-enhanced computed tomography image of the chest showing donor (B1) and recipient (B2) aortic diameters. *White arrow* points at the site of anastomosis.

with either technique in heart transplant patients is limited. Aortic replacement with polyethylene terephthalate graft effectively reduces aortic size and eliminates the risk of future dilatation, but prolongs the donor heart's ischemia time and exposes the graft to infection,³ especially in immunosuppressed patients. In case of discrepancies due to aortic

aneurysms <50 mm, RAA offers a viable alternative with minimal impact on donor heart ischemia time.²

RAA on recipient's aortas during OHT has been reported in 5 patients.² Ours is the only reported instance of RAA performed on a donor aorta. Published data on RAA for ascending aortic aneurysms in elderly patients and in

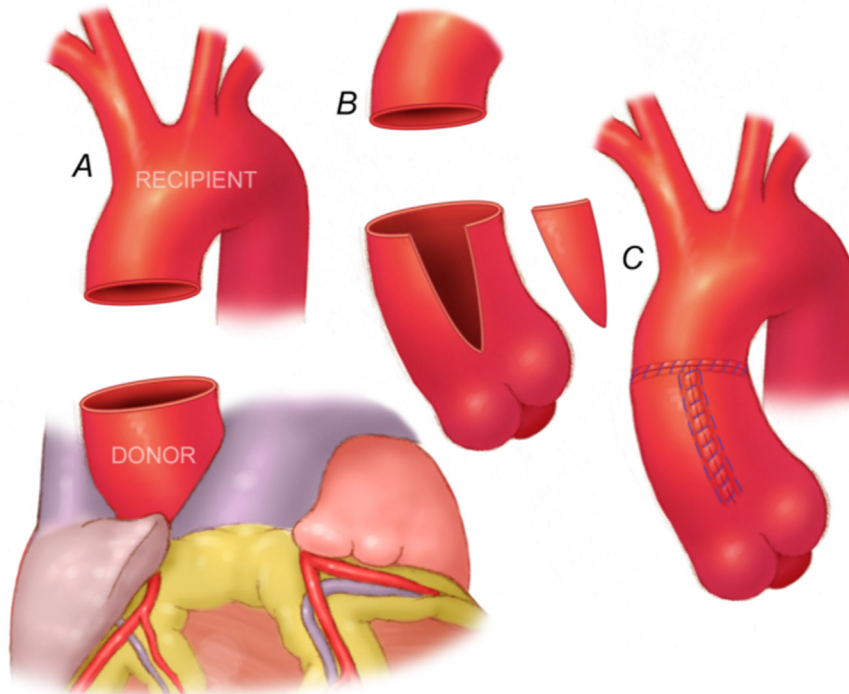


FIGURE 2. Illustration of the technique of the reduction aortoplasty of the donor's ascending aorta. Donor's and recipient's aortas before (A), during (B), and after (C) reduction aortoplasty and anastomosis.

TABLE 1. Techniques for management of aortic size discrepancy during orthotopic heart transplant and their pros and cons^{1,2}

Technique	Pros	Cons
Unequal distribution of stitches to align donor/recipient aortic margins	<ul style="list-style-type: none"> • Technically simple • No additional increase in allograft ischemia and surgery time • No increase in infection risk 	<ul style="list-style-type: none"> • Minimal increase in risk of bleeding from suture line • Useful only when size discrepancy is <20%
Replacement of ascending aorta with a polyethylene terephthalate graft	<ul style="list-style-type: none"> • Size of ascending aorta can be reduced to desired size • Useful for any size discrepancy • No risk of future dilatation 	<ul style="list-style-type: none"> • Additional increase in allograft ischemia and surgery time • Increased risk of graft infection in immuno-compromised patient • Increased risk of bleeding
Reduction aortoplasty	<ul style="list-style-type: none"> • The size of ascending aorta can be reduced to desired size • Minimal risk of future dilatation • No increase in infection risk 	<ul style="list-style-type: none"> • Increased risk of bleeding from additional longitudinal incision • Recommend for ascending aneurysm <5 cm • Contraindicated in Marfan syndrome, collagen vascular disease, and cystic medial necrosis

patients with significant comorbidities who undergo concurrent procedures show benefits, including shorter intensive care stay, reduced perioperative and long-term mortality, and only 3% to 6% incidence of aortic re-dilatation.^{4,5} Furthermore, reduction in aortic diameter to <35 mm with RAA significantly reduces the aortic wall stress and long-term risk of re-dilatation.⁴

As reference points, a chest CT scan before discharge is crucial for distinguishing between residual and recurrent aortic aneurysms in the future. Recurrent ascending aortic aneurysms have been observed in the recipient aorta, not the donor aorta, suggesting a genetic rather than a biologic cause.^{E1} This, coupled with a low recurrence rate after RAA, emphasizes the importance of continued monitoring for re-dilatation with echocardiography or chest CT.

CONCLUSIONS

RAA is a viable alternative to aortic replacement for moderate ascending aortic aneurysm during OHT. It reduces aortic wall tension, thus lowering the risk of future aneurysm development, and minimizes donor heart ischemic time and perioperative bleeding. Long-term moni-

toring with echocardiography and/or chest CT scan is crucial for ensuring sustained positive outcomes.

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.

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