

Valve-sparing aortic root replacement in a donor heart during orthotopic heart transplantation leads to maximum utilization of the donor hearts



Takuya Nishijima, MD,^a Yoshihisa Tanoue, MD, PhD,^b Tomoki Ushijima, MD, PhD,^a and Akira Shiose, MD, PhD,^a Fukuoka, Japan

From the Departments of ^aCardiovascular Surgery and ^bAdvanced Cardiopulmonary Failure, Kyushu University Hospital, Fukuoka, Japan.

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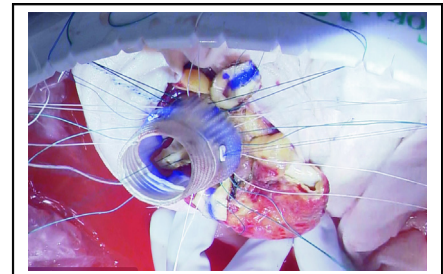
Address for reprints: Akira Shiose, MD, PhD, Department of Cardiovascular Surgery, Kyushu University Hospital, 3-1-1 Maidashi, Higashiku, Fukuoka, 812-8582, Japan (E-mail: shiose.akira.799@m.kyushu-u.ac.jp).

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Donor valve-sparing aortic root replacement in a basin of a preservative solution.

CENTRAL MESSAGE

Bench valve-sparing aortic root replacement is useful for transplantation of donor hearts complicated in the aortic root without valve complications, and leads to maximum utilization of donor hearts.

▶ Video clip is available online.

CASE REPORT

A 53-year-old man with dilated cardiomyopathy had a chance of heart transplantation. He underwent left ventricular-assisted device implantation (HeartMate II; Abbott Laboratories) 1625 days before the transplantation. The donor underwent total arch replacement for acute aortic dissection 10 days before organ donation. Postoperative echocardiography revealed a prolapsed noncoronary aortic cusp of the aortic valve without aortic regurgitation (Figure 1). The ejection fraction was approximately 60%; hence, the heart was deemed acceptable for transplantation. Patient informed consent was orally received. The approval of an institutional review board and patient written consent were not received because there was no potentially identifiable information in this article.

Despite the residual dissection at the sinus of Valsalva over the noncoronary cusp, the aortic valve annulus was preserved (Figure 2, A). The donor heart was retrieved using standard procedures. Cardiac arrest was obtained by antegrade crystalloid cardioplegia infusion from the ascending aorta. Then, the University of Wisconsin solution was

also infused. Bench valve-sparing aortic root replacement (VSARR) was performed using a 28-mm J-Graft Valsalva prosthetic graft (Japan Lifeline) (Video 1). After proximal anastomosis, the graft was filled with saline water and the aortic valve was inspected using an endoscope, which showed nonprolapsed cusps (Figure 2, B). The donor heart was immersed in the University of Wisconsin solution during the bench procedure. After the aortic root repair, blood cardioplegia was infused following steroid administration. The interval between aortic clamping and the initial cardioplegia infusion was 231 minutes. Transplantation was performed using a modified bicaval method. Coronary reconstruction was performed in the pericardial sac after the left atrium anastomosis because coronary anastomosis was easier when the heart was fixed. The donor heart's total ischemic time from aortic clamping to declamping was 300 minutes. Weaning from cardiopulmonary bypass was uneventful. Postoperative echocardiography showed no

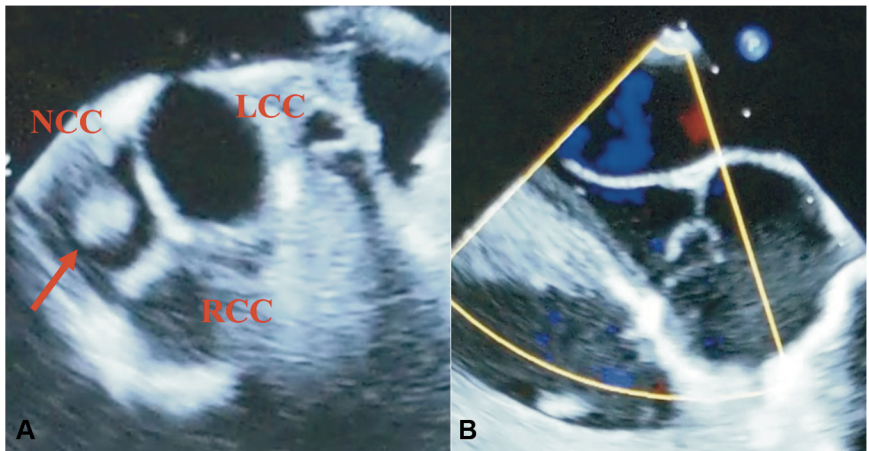


FIGURE 1. Preoperative and postoperative echocardiography of the donor heart. A, A short-axis image of preoperative echocardiography showing prolapse of the noncoronary cusp of the aortic valve (red arrow). B, A long-axis image of preoperative echocardiography showing the absence of aortic regurgitation. NCC, Noncoronary cusp; LCC, left coronary cusp; RCC, right coronary cusp.

dissection at the sinus of Valsalva nor did it show aortic regurgitation (Video 2). The patient is doing well 6 months postoperatively without anticoagulant therapy.

In our case, the noncoronary sinus was solely involved. Despite other options, we replaced the entire aortic root to avoid future complications, such as aortic dissection or dilation. According to Hage and colleagues,¹ patients after heart transplantation develop hypertension due to long-term cyclosporine use and denervation of the heart. They can also develop coronary artery diseases due to chronic rejection and need aortic root catheterization for interventions.

Several studies reported successful bench aortic valve replacement during heart transplantation,^{2,3} but none reported on VSARR. VSARR is superior to aortic valve replacement because postoperative anticoagulant therapy is unnecessary. However, a major disadvantage is the donor heart's prolonged ischemic time. Botta and colleagues reported a case of donor aorta rupture necessitating a Bentall procedure instead of VSARR considering the crossclamping time.⁴ In this case, the bench procedure took 114 minutes, and the total ischemic time was acceptable due to familiarity with the VSARR procedure and short transport time.

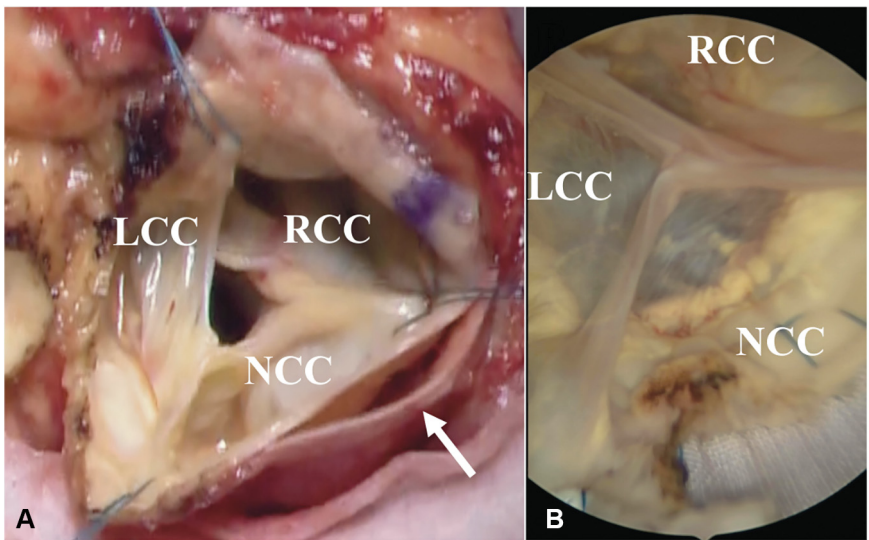
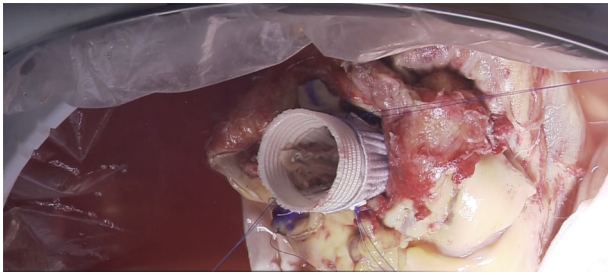
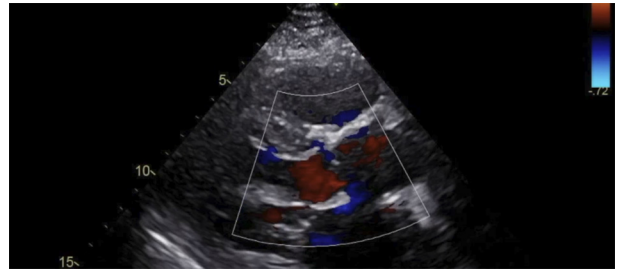


FIGURE 2. Operative findings. A, Root of the donor heart. The white arrow shows residual dissection of the sinus of Valsalva above the noncoronary cusp of the aortic valve. All the cusps were intact. B, Endoscopic image of the aortic valve after proximal anastomosis. No aortic valve prolapse was observed when the graft was filled with water. RCC, Right coronary cusp; LCC, left coronary cusp; NCC, noncoronary cusp.



VIDEO 1. Description of bench valve-sparing aortic root replacement (VSARR) and concomitant heart transplantation, and endoscopic images of the aortic valve just after proximal anastomosis during VSARR. Video available at: [https://www.jtcvs.org/article/S2666-2507\(22\)00467-9/fulltext](https://www.jtcvs.org/article/S2666-2507(22)00467-9/fulltext).



VIDEO 2. Postoperative echocardiography. It shows no dissection at the sinus of Valsalva or aortic regurgitation. Video available at: [https://www.jtcvs.org/article/S2666-2507\(22\)00467-9/fulltext](https://www.jtcvs.org/article/S2666-2507(22)00467-9/fulltext).

Ex vivo perfusion of donor hearts is being studied.⁵ With such systems, the acceptable time for a bench procedure such as VSARR will likely increase along with increased likelihood of donor heart utilization with repairable complications; bench procedures such as VSARR can increase the likelihood of receiving the donor heart successfully. It will help in maximum utilization of donor hearts, and thus, overcome the donor heart shortage in the future.

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