

Secondary Ross procedure after failed transcatheter aortic valve replacement



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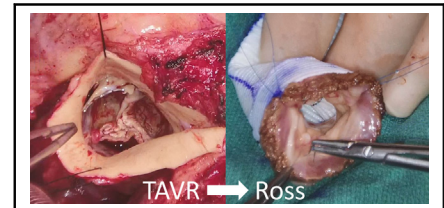
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Secondary Ross procedure after failed transcatheter aortic valve replacement (TAVR).

CENTRAL MESSAGE

Secondary Ross procedure after TAVR is safe and feasible. Considering the excellent long-term outcomes, the Ross procedure is a viable option even in a reoperative and post-TAVR setting.

▶ Video clip is available online.

The ideal valve substitute for young and middle-aged adults remains debated. We report a case with previous coronary artery bypass grafting and transcatheter aortic valve replacement (TAVR) who underwent a secondary Ross procedure for TAVR valve endocarditis.

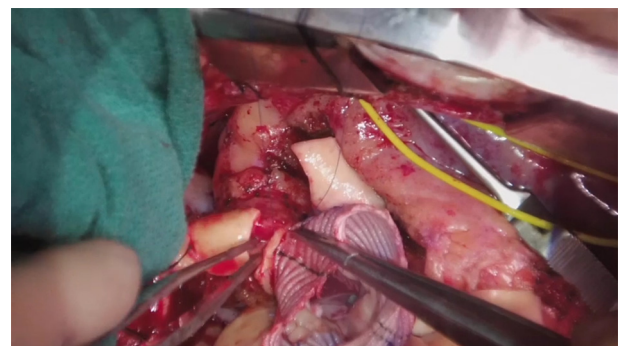
CASE REPORT

This article only involves a case report and was deemed exempt from internal review board approval. The patient provided written informed consent for publication. He was a 53-year-old man with history of type 2 diabetes, coronary artery disease status post-coronary artery bypass grafting at age 49 years, and severe aortic stenosis in the setting of bicuspid valve with associated 45- × 47-mm ascending aortic aneurysm who had undergone a transfemoral TAVR using a 26-mm balloon-expandable device at age 50 years without addressing the aortic aneurysm.

Three years following the TAVR, he presented with bacteremia with *Haemophilus parainfluenzae*, presumably from a recent dental procedure, without echocardiographic evidence of TAVR valve involvement. He was managed medically and discharged home on intravenous antibiotic therapy. He was readmitted 2 weeks later for subtle subarachnoid hemorrhage without neurologic deficit or intracranial mycotic aneurysms and 4 weeks later for stroke in the right middle cerebral artery territory requiring mechanical thrombectomy complicated by hemorrhagic conversion

with resultant left hemiparesis. He was found to have TAVR valve endocarditis resulting in embolic stroke. He was transferred to our facility for further management.

Video 1 highlights the key steps of the operation. The previous saphenous vein and left internal mammary artery conduits were both identified. The leaflets of the TAVR valve appeared diffusely thickened (**Figure 1, A**). The TAVR valve was explanted by using perpendicularly applied 2 Kocher



VIDEO 1. Intraoperative video of the secondary Ross procedure for prosthetic valve endocarditis of transcatheter aortic bioprosthesis in the setting of previous coronary artery bypass grafting with patent conduits. Video available at: [https://www.jtcvs.org/article/S2666-2507\(22\)00438-2/fulltext](https://www.jtcvs.org/article/S2666-2507(22)00438-2/fulltext).

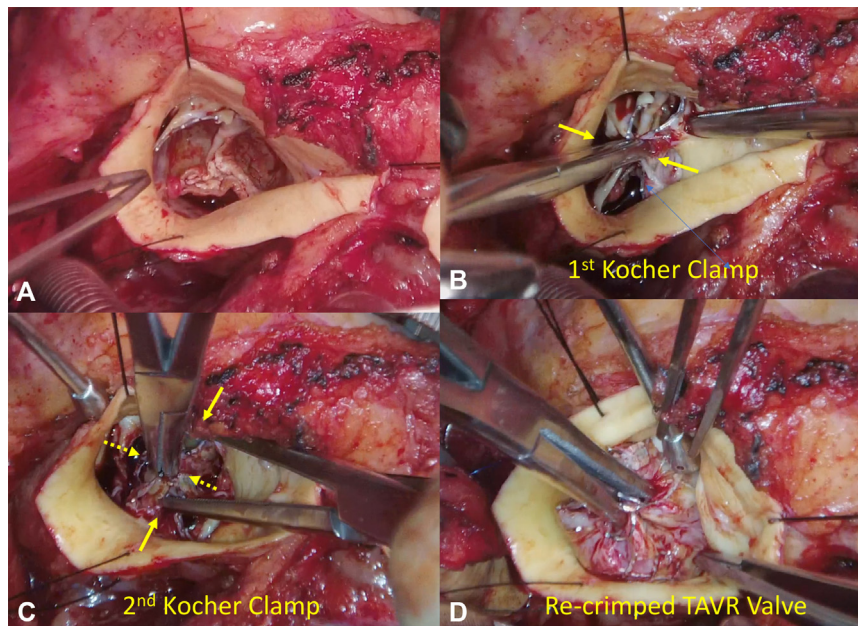


FIGURE 1. Explantation of the balloon-expandable transcatheter valve. A, Well-incorporated valve with diffusely thickened leaflets. B, The first Kocher clamp application (*yellow arrows* represent clamp directions). C, The second Kocher application (*yellow arrows*) perpendicular to the first Kocher clamp (*dashed arrows*). D, Recrimped transcatheter valve by the 2 Kocher clamps.

clamps (Figure 1, B-D). The aortic and autograft annulus size was measured at 23 mm and 24 mm, respectively. A 26-mm (autograft size + 2 mm) Hemashield graft was chosen and the end of the graft was everted. To assure commissural symmetry, corresponding autograft commissure locations were marked on the Hemashield (Figure 2, A). The autograft was inserted from the everted end (Figure 2, B). Once this was completed, the everted graft end was unfolded (Figure 2, C) and trimmed into 5 mm, serving as a “skirt” of the composite Hemashield–autograft conduit (Figure 2, D). Each commissure was reimplanted at the equal height. Next, only the skirt of the composite graft without autograft was sewn to the native aortic annulus, creating a supra-annular configuration of the autograft (Figure 2, E). All 3 sinuses of the autograft were scalloped and then the running suture lines for the sinuses were made. The remainder of the procedure was completed in the usual fashion. The cardiopulmonary bypass and aortic crossclamp times were 207 and 174 minutes, respectively. The results of routine valve culture were negative.

Intraoperative transesophageal echocardiography showed no autograft stenosis or insufficiency with mean pressure gradient of 4 mm Hg. Postoperative course was uneventful. He completed 6 weeks of antibiotics.

DISCUSSION

TAVR has been approved across the board regardless of clinical risk profile.¹ However, extrapolating trial results to real-world practice requires extreme caution. The present

case illustrates the importance of closing the gap between evidence and practice. Previous studies reported a strikingly high proportion of nonoperative management for post-TAVR endocarditis.² It is our speculation that the observed frequent nonoperative management was likely due to poor surgical candidacy rather than intentional medical management.

The Ross procedure demonstrated improved long-term outcomes compared with conventional bioprosthetic or homograft aortic valve replacement including survival, rates of reintervention, stroke, and endocarditis.^{3,4} Considering his young age, lifetime risk of intracranial hemorrhage and endocarditis, the Ross procedure was deemed the best option in the present case. In contrast, application of the Ross procedure in patients with previous cardiac surgery is rarely performed due to various reasons. Intuitively, one would think secondary Ross procedure would pose additional risks, such as re sternotomy and dissection of adhesions. However, it is safe and feasible even in a reoperative and post-TAVR setting in experienced hands.

Our surgical approach to the Ross procedure has evolved. Modification with “skirt” has been preferably used in a reoperative setting. Although anecdotal, we observed frequent substantial reverse size mismatch between the aortic annulus and autograft in patients with failed aortic valve surgery, where aortic annulus being much smaller and autograft being much larger, opposite size mismatch pattern of the most commonly observed in adults.⁵ This technical modification using the Hemashield skirt with

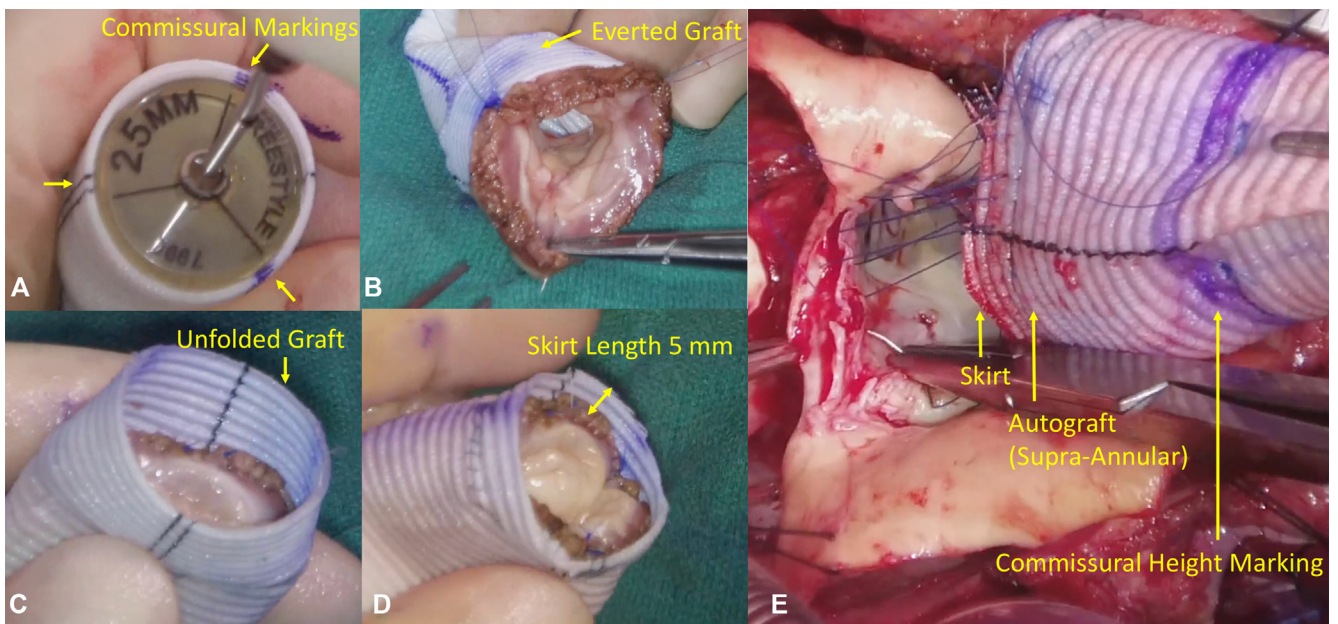


FIGURE 2. Key steps of the modified supra-annular Ross procedure with skirt. A, Three commissure markings to assure autograft symmetry. B, Inclusion of the autograft within the everted Hemashield. The autograft was inserted from the everted end of the Hemashield and sutured with running 5-0 PROLENE (Ethicon, a Johnson & Johnson company). C, Unfolded Hemashield serving as a skirt of the composite conduit. D, Trimmed skirt at 5 mm in length. E, Implantation of the composite conduit with supra-annular configuration. Only the skirt of the composite graft without autograft annulus was sewn to the native annulus with running 4-0 PROLENE. The commissure height was determined by pulling up the autograft and Hemashield graft together. Utmost care was used to ensure perfectly equal 3 commissural heights.

supra-annular configuration simply addresses the reverse size mismatch without anterior aortoventriculoplasty (Konno procedure) or compromising the autograft geometry. Ultimately, we found this technique is reproducible and versatile for any pathologies or anatomies.

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