Redo aortic valve replacement for an incorrectly sized rapid deployment valve

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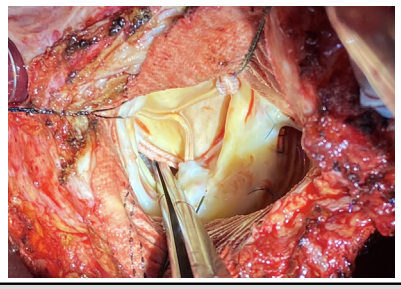

Undersized INTUITY valve with an area of nonapposition.

CENTRAL MESSAGE

An appropriately sized INTUITY valve must be selected to avoid paravalvular leak. Preoperative computed tomographic images may aid in selecting the optimal valve size.

A 64-year-old man with history of hypertension, epilepsy, gastroesophageal reflux disease, bicuspid aortic valve stenosis, and a 56-mm ascending aortic aneurysm underwent surgical aortic valve replacement (AVR) with a #25 INTUITY bioprosthetic valve (INTUITY Valve System; Edwards Lifesciences) and ascending aortic replacement with a #38 Hemashield Dacron graft (Getinge) at an outside hospital. He experienced worsening fatigue and hemolytic anemia after surgery, and he was found to have a moderate paravalvular leak (PVL). Fifteen months after his initial surgery, he received an 8 × 10 × 12-mm Amplatzer duct occluder device at another hospital. This device was placed across the PVL site with complete elimination of the PVL. Unfortunately, he redeveloped fatigue and dizziness after discharge. Transthoracic echocardiogram 3 years after Amplatzer device placement showed severe PVL and a mean gradient of 16.5 mmHg across the aortic valve. The decision was made to proceed with reoperative AVR with a traditional surgical valve. Written consent for publication of data was provided by the patient; institutional review board approval was not required.

After reviewing his preoperative computed tomographic images for re-entry planning, the patient was taken to the operating room and underwent redo sternotomy. The aorta and right atrium were cannulated, and a retrograde cardioplegia cannula was placed. After we initiated cardiopulmonary bypass, a left ventricle vent was placed via the right superior pulmonary vein. The ascending aorta was cross-clamped, and retrograde cardioplegia was delivered. After cardiac arrest, the ascending aortic graft was incised, and the coronary ostia were exposed. Additional direct antegrade cardioplegia was administered via the coronary ostia. Upon inspection of the aortic root, it was noted that the INTUITY valve appeared to be undersized (Figure 1, *A*), and, therefore, there was an area of nonapposition to the ventricular wall. This was determined to be the source of the severe PVL. The Amplatzer duct occluder was also visualized and did not cover the space between the subvalvular skirt and the ventricular wall (Figure 1, *B*). After we removed the securing sutures and with some debridement, the INTUITY valve was removed. The annulus was further debrided, and pledgeted valve sutures were placed through the annulus noneverted, then through a #27 Edwards Magna Ease bioprosthetic valve sewing ring. The valve was seated intra-annularly, and sutures were tied down. The ascending aortic graft was closed with running 3-0 PROLENE sutures (Ethicon), and the heart was de-aired. Crossclamp was then removed, and the heart was reperfused. The patient was weaned off the cardiopulmonary bypass and was closed in the standard fashion. Postcardiopulmonary bypass transesophageal echocardiogram showed normal biventricular function without PVL and an aortic gradient of 8 mmHg. The patient was extubated on postoperative day 0. No blood product was given during the entire hospital stay, and he was discharged home on postoperative day 5. The patient is doing well and is symptom-free 3 months after the operation.

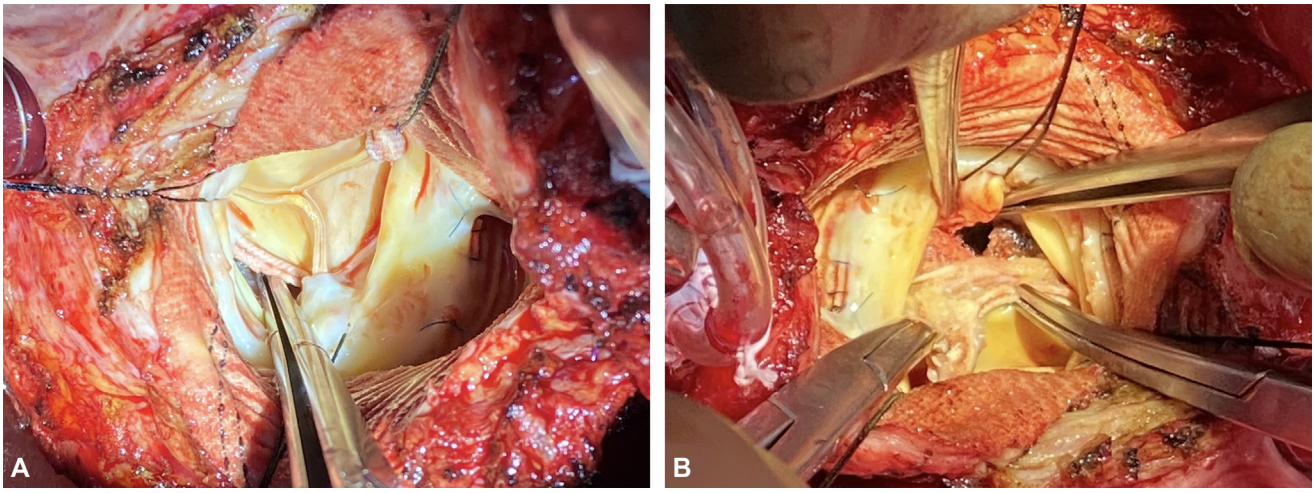

FIGURE 1. Intraoperative photographs of the improperly deployed INTUITY valve. A, The INTUITY valve appeared to be undersized, leading to an area of nonapposition between the subvalvular skirt and the ventricular wall. B, The Amplatzer duct occlude failed to cover the space, resulting in persistent paravalvular leak.

DISCUSSION

The INTUITY valve was developed to decrease the duration of crossclamp and cardiopulmonary bypass times and to allow for minimally invasive procedures.[1] The nitinol-based sutureless valve system allows the valve frame to self-expand and anchor to the aortic annulus.[2] The TRANSFORM and the CADENCE-MIS trials both demonstrated the efficacy of the INTUITY valve.[1,2] In both trials, reduced aortic crossclamp and cardiopulmonary bypass times were noted.[1,2] However, correct sizing of the INTUITY valve is critical. Incorrect sizing could lead to an increased PVL rate.[2] In previous studies, the INTUITY valve was found to have a 0.2% to 1.4% early major PVL rate, a 0.8% late major PVL rate, and a rate of 0.9% to 1.2% late major PVL requiring explant at 1 year.[1,3,4] Because rapid deployment valves are known for a greater risk of complete atrioventricular block due to the radial expansion force exerted on the subannular structures,[1,2] it may be tempting to undersize the valve. However, the use of an undersized prosthesis to avoid atrioventricular block may lead to significant PVL due to insufficient annular sealing.[5] Severe PVL oftentimes requires reoperation, resulting in increased morbidity and mortality. Percutaneous devices like the Amplatzer duct occlude may not be able to address this adequately, especially for patients with large, complex PVL. Therefore, the optimal size of the INTUITY valve must be selected to minimize these postoperative complications. A previous study showed that left ventricular outflow tract and aortic valve annulus dimensions measured from computed tomographic images, alternatively echocardiography, can be highly reliable in predicting postoperative rates of complete atrioventricular block and PVL.[5] Therefore, a judicious analysis of patients' preoperative images, especially before the first index procedure, should be conducted to perhaps select a valve size preoperatively. The final valve size can then be determined after incorporating intraoperative findings.

CONCLUSIONS

This case demonstrates a failed AVR due to incorrect sizing of an INTUITY valve, resulting in severe PVL refractory to transcatheter repair options. A redo-sternotomy and surgical AVR was performed with excellent outcomes. Preoperative images should be reviewed and analyzed to aid in the selection of the optimal INTUITY valve size for implantation.

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 or reviewing 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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