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Intra-atrial Placement of a Mitral Prosthesis in a Patient with Severe Mitral Annulus Calcification: A Case Report

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ABSTRACT

An 88-year-old woman presented with increasing dyspnea and angina. She was found to have severe aortic stenosis, 2-vessel coronary artery disease, and severe mitral regurgitation. During surgery the patient was noted to have such severe mitral annular calcification that performing a conventional mitral valve replacement would have significantly increased the operative risk. Instead, an 8-mm Dacron graft was sutured onto the sewing cuff of a reversed 23-mm Mosaic porcine aortic valve (Medtronic, Minneapolis, MN, USA). The Dacron graft was then sutured to the left atrial wall surrounding the calcified mitral annulus. A bioprosthetic aortic valve replacement, along with a 2-vessel coronary artery bypass procedure, was also performed.

CASE REPORT

An 88-year-old woman was referred to our hospital with a 3-month history of heart failure of New York Heart Association class IV and accelerated angina. Cardiac catheterization revealed severe aortic stenosis with a valve area of 0.45 cm^2 and obstructive disease of the left anterior descending artery and its first diagonal branch. The peak pulmonary artery systolic pressure was 97 mm Hg (mean, 51 mm Hg). An intraoperative transesophageal echocardiogram revealed severe mitral regurgitation, along with severe calcification of the mitral annulus (Figure 1).

The surgery was carried out through a standard median sternotomy. Cardiopulmonary bypass was established with ascending aortic perfusion and a dual-stage venous cannula. Antegrade and retrograde infusion of cold blood cardioplegia was used for myocardial protection. The left anterior descending artery was bypassed by using the left internal mammary artery, and the diagonal branch was bypassed with a saphenous vein graft. A transverse aortotomy was then performed, and the aortic valve was resected and debrided. A left lateral atriotomy was then performed to expose the mitral valve. The mitral annulus was severely calcified, with calcification involving the posterior and anterior portions of the annulus. Calcification extended deep into the ventricle at the level of the posterior mitral annulus. The anterior leaflet

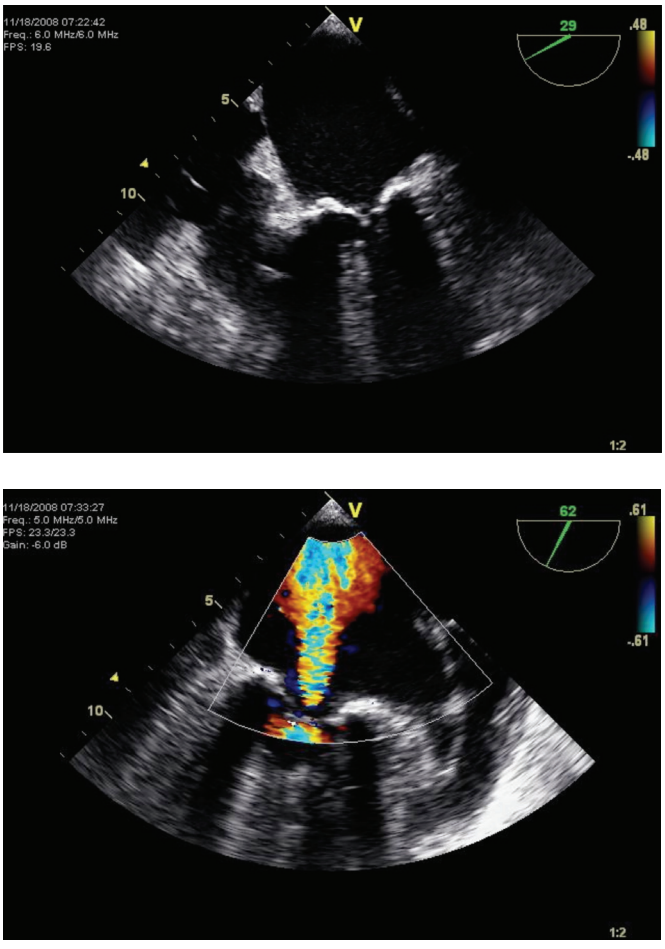

Figure 1. Intraoperative transesophageal echocardiogram without and with color Doppler, showing severe mitral annulus calcification along with severe mitral regurgitation.

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Figure 2. Schematic representation of a bioprosthetic valve with a Dacron collar sutured onto the left atrial wall.

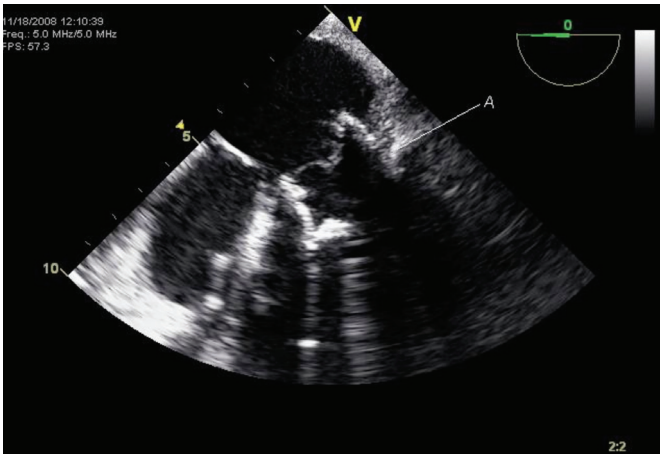

Figure 3. Postoperative transesophageal echocardiogram demonstrating the mitral bioprosthesis located in the atrium above the mitral annulus (A).

was resected; however, the annulus and leaflets were densely calcified. To avoid an atrioventricular disruption, we sutured an 8-mm Dacron graft to a reversed 23-mm Mosaic porcine aortic valve (Medtronic, Minneapolis, MN, USA), which was then sutured to the atrial wall with continuous 3-0 Prolene suture (Figure 2). A 21-mm Mosaic porcine valve was then placed in the aortic position. The cross-clamp time was 203 minutes, and the bypass time was 235 minutes. A postoperative transesophageal echocardiogram showed the mitral prosthesis located in the atrium above the mitral valve, and we noted no mitral regurgitation (Figure 3). The patient did well throughout the rest of her hospital stay and was discharged on postoperative day 7.

DISCUSSION

The mitral valve may become calcified because of a degenerative process involving the base of the leaflets. This calcification is most commonly observed in the posterior leaflet and usually involves the entire posterior annulus from trigone to trigone in a horseshoe configuration, with variable extension to the ventricular myocardium and anterior leaflets. Occasionally, the calcification may involve the entire circumference of the mitral valve annulus [Ng 2000].

Such calcification of the posterior mitral apparatus can pose a significant challenge to performing surgery on the mitral valve. In these circumstances, mitral valve repair can be successfully performed by decalcification of the posterior annulus combined with a sliding plasty technique, as described by Carpentier et al [1996]; however, extensive decalcification carries the risks of atrioventricular rupture, damage to the circumflex artery, and/or cerebrovascular events due to fragmentation of calcium debris [Carpentier 1996].

Although repair of the mitral valve has advantages over replacement, the mitral annulus can at times become so heavily calcified that valve replacement may be the only option available. Even then, bulky calcification may interfere with suture placement and prosthesis implantation and thereby cause a higher incidence of periprosthetic leakage [Goksel 2008]. Our patient needed to have 2-vessel bypass surgery, along with replacement of the aortic and mitral valves. The mitral annulus was so heavily calcified that we felt that the chances of successfully performing a standard mitral valve replacement were low and that such an operation would have significantly prolonged the surgery, thereby increasing the operative risk. By placing the 8-mm Dacron graft as an intact tube and suturing it to the sewing ring of the bioprosthetic valve, we essentially created a very large and compliant neo–sewing ring. By taking this step, we reduced the complications noted for mitral valve replacement associated with these circumstances; it also reduced the operative time.

A similar procedure was described by Nataf et al [1994]. They enlarged the circumference of the sewing ring by placing a 1.5 cm–wide Dacron collar around the prosthesis in 36 patients. The patients either had the mitral annulus destroyed by endocarditis or had extensive annular calcification. The prosthesis was implanted with a running 3-0 suture at 0.5 cm to 1.5 cm above the mitral valve between the free edge of the Dacron collar and the left atrial wall. When the mitral annulus was partially affected, the collar was attached to the atrial wall that was calcified, and the remainder of the prosthetic circumference was implanted to the mitral annulus. These investigators concluded that this technique could be performed in patients at a high operative risk when mitral valve replacement is impossible by conventional techniques.

We successfully performed a double-valve surgery in an 88-year-old patient, in which the mitral valve was replaced by using a Dacron collar on an inverted aortic valve placed onto the mitral position in a patient with severe mitral annulus calcification. The operation was performed without any

complications. This method may be considered an alternative to conventional mitral valve replacement in the presence of severe mitral annulus calcification, especially in fragile elderly patients.

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