Case Reports

Repair of Bicuspid Aortic Valve in the Presence of Endocarditis and Leaflet Perforation

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Aortic valve repair can be a good option in younger patients who have severe aortic regurgitation. A systematic, disease-directed approach can simplify repair. This case report describes how a simplified approach can be successfully applied to complex pathologic conditions of the aortic valve.

A 49-year-old man with a bicuspid aortic valve and a history of endocarditis presented with severe aortic regurgitation and evidence of recurrent infection. Intraoperatively, we found congenital and degenerative aortic anatomy with endocarditis and perforation. We performed aortic valve repair to enable leaflet coaptation and to adjust the coaptation height. After 24 months, the patient remained well, with an intact repair and trivial aortic regurgitation. We describe our systematic repair approach and rationales for targeting repairs to identified lesions. To our knowledge, this is the first description of complex aortic valve repairs in a patient who had simultaneous congenital, degenerative, and infectious conditions. ***(Tex Heart Inst J 2014;41(1):67-9)***

Key words: *Aortic valve/abnormalities/pathology/surgery; aortic valve insufficiency/classification/etiology; cardiac surgical procedures/methods; suture techniques; treatment outcome*

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The conventional treatment for endocarditis and severe aortic regurgitation is aortic valve replacement with a homograft or a bioprosthetic or mechanical valve. Some centers advocate repair in some patients.[1-3] After applying a systematic, disease-directed approach similar to Carpentier's for the mitral valve, El Khoury and colleagues[2] developed a classification system for the aortic valve that can form the framework for a successful approach to valve repair. This approach might prove to be particularly beneficial in younger patients, in whom aortic valve repair poses much lower risk of future endocarditis, bleeding, and thromboembolism than does valve replacement.[2,4,5] Repair techniques have proved to be readily reproducible in treating severe regurgitation caused by isolated valve lesions; however, we found no previous descriptions of complex repairs in patients who had simultaneous congenital, degenerative, and infectious pathologic conditions. The case of our patient illustrates how aortic valve repair techniques can be applied in patients who have endocarditis together with complex leaflet disorders.

Case Report

In October 2010, a 49-year-old man presented with a 2-month history of malaise, night sweats, and shortness of breath. His relevant medical history included bicuspid aortic valve and *Streptococcus viridans* endocarditis that had been treated successfully with intravenous antibiotics 2 years previously. A transesophageal echocardiogram showed small (<1-cm) mobile vegetations on his aortic valve, with severe regurgitation and a posteriorly directed jet (Fig. 1). The anterior mitral valve leaflet also showed evidence of a small vegetation. Because of the bicuspid aortic valve, a computed tomographic scan was performed to look for aortic dilation and other possible foci of infection. The results were negative for other infectious foci, and neither the aortic root nor the ascending aorta was substantially dilated. Despite negative blood cultures, the patient was empirically given intravenous vancomycin and gentamicin, and his symptoms improved markedly. Echocardiographic findings were consistent with severe aortic regurgitation, left ventricular dilation, and aortic and mitral valve vegetations, so the patient was scheduled for surgery.

We performed a midline sternotomy and oblique aortotomy and examined the patient's aortic valve. We identified bicuspid structure with an anterior leaflet composed of fused right and left cusps. A rigid median raphe extended from the top of a pseudocommissure to the mid-body of the anterior leaflet, inhibiting pliability and restricting the belly of the leaflet. Careful valve analysis with use of saline solution instilled into the root revealed a poor length of coaptation between the anterior and posterior leaflets, with prolapse of the anterior leaflet margin below the posterior leaflet margin. Apparent dilation of the aortoventricular junction also contributed to the poor leaflet coaptation. We unexpectedly found a clear perforation on the anterior leaflet approximately 3 mm from the free margin and adjacent to the median raphe (Fig. 2). The irregular contour of the perforation and its association with an adjacent vegetation suggested chronic endocarditis. There was no inflammation, pus, or abscess to suggest active infection. Examination of the mitral valve revealed a small, chronic vegetation as had been seen on the preoperative echocardiogram. This friable, superficial lesion was simply excised, leaving normal leaflet tissue underneath.

The endocarditis and leaflet perforation of a bicuspid valve prompted consideration of valve replacement. However, because of recent success with bicuspid valve repair and the patient's strong wish to avoid mechanical valve implantation, we undertook repair. The approach had 4 elements: first, the perforation of the anterior leaflet was repaired with a small, round piece of bovine pericardium (diameter, 1–1.5 cm) sewn to the leaflet tissue around the perforation circumferentially in a running fashion with use of a 6-0 polypropylene suture. Second, to improve leaflet coaptation, a subcommissural annuloplasty stitch was placed at each commissure with use of pledgeted 2-0 Ethibond suture. Third, the thickened and fibrotic median raphe was shaved from the anterior leaflet with use of a no. 15 blade, thus relieving restriction and enabling more normal leaflet motion. Finally, the free margin of the same leaflet was shortened with use of 6-0 interrupted polypropylene suture: this plicated the central portion of the free margin and brought it to the level of the posterior leaflet free margin, thereby improving the length of coaptation between the 2 leaflets.

The postoperative transesophageal echocardiogram showed no aortic regurgitation and good leaflet coaptation of 0.9 cm in length (Fig. 3). The annular size of

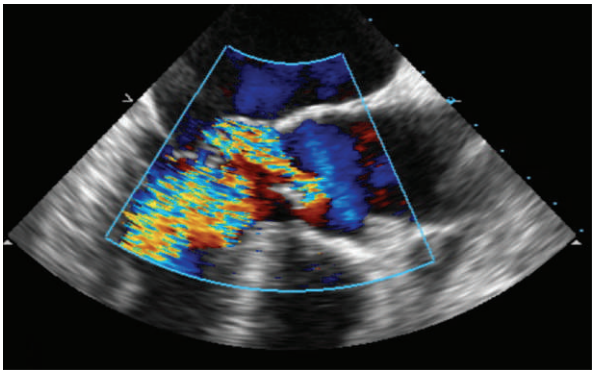

Fig. 1 *Preoperative transesophageal echocardiogram shows severe aortic regurgitation with a large, posteriorly directed jet.*

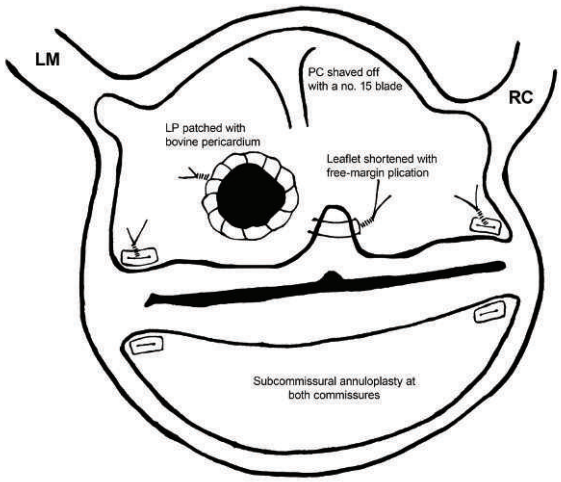

Fig. 2 *Diagram shows repair of the leaflet perforation (LP) and the pseudocommissure (PC) at the mid-portion of the anterior conjoint leaflet.*

LM = left main ostium; RC = right coronary ostium

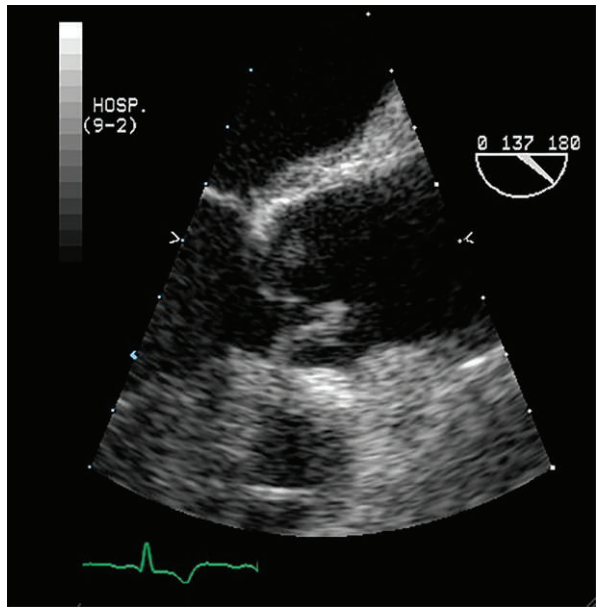

Fig. 3 *Intraoperative transesophageal echocardiogram after aortic valve repair shows a coaptation height above the aortoventricular junction and a coaptation length of 0.9 cm.*

23 mm was smaller than the preoperative 24 mm. No ongoing prolapse was evident, and the height of coaptation was above the level of the aortoventricular junction. After an uneventful recovery, the patient was discharged from the hospital and continued a 6-week course of intravenous antibiotics. After 24 months, he remained well with an intact repair and trivial aortic regurgitation. He moved and was lost to follow-up thereafter.

Discussion

This case illustrates the use of a classification system and the successful application of the corresponding repair techniques, as described by El Khoury and colleagues.[2] The following approach was used for each type of pathologic condition: 1) type Ic with aortic annular dilation was repaired with use of subcommissural annuloplasty stitches, 2) type Id with cusp perforation was treated by means of bovine pericardial patch repair, 3) type III with cusp restriction was managed by resecting the rigid median raphe, and 4) type II with cusp prolapse was repaired by means of free-margin plication to increase the length of leaflet coaptation.[2,5]

Although long-term data on the durability of aortic valve repair are unavailable, some experience suggests that the timeline to valve deterioration is favorable.[2,5,6] Carr and Savage reviewed earlier experience with aortic valve repair and suggested that the 10-year freedom from reoperation was 64%; however, they noted that most failures were in patients with rheumatic disease.[7] As repair techniques have improved, freedom from aortic valve reoperation has been estimated to be 90% to 95% at 8 to 10 years.[2,3,5,6] In addition, in a young patient population, avoiding the bleeding and thromboembolic complications of a mechanical valve prosthesis yields a substantial advantage. Finally, post-repair freedom from bleeding and thrombosis is a favorable 96% at 8 years.[5]

Classification systems for regurgitant aortic valves and new repair techniques have enabled indications to become clearer and repair strategies to emerge. These developments are similar to early experience with the mitral valve, and repair is now the preferred treatment in mitral valve endocarditis. An increasing body of evidence indicates the effective use of aortic valve repair techniques in both trileaflet and bicuspid aortic valves.[8] As surgeons gain experience, even more challenging repairs might be achieved. We chose repair in order to correct our patient's congenitally bicuspid aortic valve, although there was simultaneous degenerative disease and superimposed endocarditis with perforation. The success of the repairs suggests that an aortic valve with regurgitation from multiple causes does not necessarily require replacement—systematically identifying the underlying pathologic conditions and targeting repair strategies to the identified lesions can yield a good technical result.

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