Regurgitation through a stentless prosthesis treated with aortic root banding

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Stentless aortic valves are known to have superior hemodynamics and good long-term surgical outcome. Central prosthetic regurgitation, however, is a recognized complication. It is associated with dilatation of the sinotubular junction (STJ). We present one of the treatment options for this complication.

Clinical Summary

A 71-year-old woman presented with mixed aortic valve disease. She underwent aortic valve replacement with a size 27 Elan stentless valve (scallop porcine prosthesis, Aortech Europe Ltd) implanted in a subcoronary position. The ascending aorta was noticed to be thin. The operation and postoperative recovery were uneventful. Echocardiography at discharge revealed moderate central prosthetic regurgitation, with dilatation of the STJ (from 30 to 32 mm) but not the annulus. The left ventricular end-diastolic diameter (LVEDD), however, was reduced (from 55 to 48 mm), with improved left ventricular ejection fraction.

The patient reported great symptomatic improvement on her 2-month follow-up. A repeat echocardiogram 11 months after the operation was unchanged.

The patient had significant symptomatic deterioration 13 months after the operation, with clinical signs of heart failure. Echocardiography confirmed severe regurgitation, with an increase in LVEDD to 54 mm and STJ to 34 mm, but the annulus diameter was unchanged. In view of this, a further operation was undertaken.

At the time of the operation, the ascending aorta was separated from the pulmonary artery. A 5-cm-wide polytetrafluoroethylene strip was applied tightly around the STJ and the ascending aorta, reducing the diameter of the former from 34 to 30 mm. This Teflon corset sat just distal to the coronary artery origins and the sinuses of Valsalva. This abolished the regurgitation on transesophageal echocardiography. The valve was well seated and opened well, with a normal gradient. The leaflets appeared normal. Both edges of the strip were secured to each other with the suture, including the aortic adventitia, thereby fixing the band in position and avoiding its distal migration (Figure 1). Postoperatively, the patient recovered uneventfully. PredischARGE echocardiography showed trivial aortic regurgitation, with reduction of LVEDD to 48 mm (Figure 2). Six months after the operation, the patient was asymptomatic, and the echocardiogram was unchanged.

Discussion

Stentless aortic bioprostheses were introduced into clinical practice more than 15 years ago.^{1,2} They have been found to have superior hemodynamics (lower transvalvular gradients, bigger effective orifice area with more rapid left ventricular mass regression, and functional improvement)³ and might offer better survival when compared with those of stented bioprostheses. However, there have been concerns regarding the incidence of prosthetic regurgitation and its implication on prosthetic durability.

It has been noticed that STJ dilatation causes stentless regurgitation⁴ because the dilated STJ will pull the commissures apart, reducing the coaptation area. If untreated, the regurgitation is associated with an increase in the incidence of structural prosthetic failure.⁴

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Figure 1. A, Intraoperative view of the band (*) applied around the ascending aorta (AA). RV, Right ventricle. B, The band secured around the ascending aorta. RA, Right atrium.

Figure 2. Doppler echocardiogram: long-axis view. A, Before banding, there is severe regurgitation (jet diameter to valve diameter ratio = 0.4). B, After banding, the regurgitation is minimal (jet diameter to valve diameter ratio = 0.05).

It is widely known that reducing the size of the aortic root by remodeling will control the aortic regurgitation in those cases in which the regurgitation is caused by STJ dilatation or poststenotic dilatation.

External banding at the time of valve replacement has been advocated as a prophylactic measure.⁴ Late banding has not been reported because prosthetic degeneration or aneurysmal dilatation of the ascending aorta usually necessitates prosthetic or root replacement. In our case, banding was possible because the aortic prosthesis was functioning well, with no sign of leaflet degeneration, and the aorta, although thin, was not aneurysmal. Therefore, we performed the banding rather than more aggressive replacement of the valve or the aortic root in an elderly woman with pulmonary edema. The avoidance of cardiopulmonary bypass was another bonus.

Although the patient has done well in this early period, long-term evaluation of the procedure is required.

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