Mitral Valve Repair Using an Annuloplasty Ring Made of Artificial Woven Dacron Graft

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A woven Dacron ring made of artificial graft was successfully used in combination with a modified Kay’s annuloplasty for mitral valve repair. In this procedure, after excision and repair of the redundant prolapsed leaflets, Kay’s annuloplasty was performed at both commissures to reduce the posterior annulus and to coapt the leaflets. A woven Dacron ring was then seated and tied to the annulus to provide long-term stabilization and prevent its further dilatation. The mitral orifice of the patient was reduced from 33 mm to 21 mm in diameter, and neither mitral regurgitation nor stenosis was found in the postoperative evaluation. (Jpn Circ J 1995; 59: 176—179)

Surgical repair techniques for mitral regurgitation are well established and generally produce good results. An essential component of such repair is remodeling or stabilization of the mitral annulus with a rigid or flexible ring. To be effective, an annuloplasty ring should hold the suture securely, resist infection, and allow integration into the annulus.

In this paper, we report a successful repair for mitral regurgitation using a woven Dacron tube graft as an annuloplasty ring in combination with a modified Kay’s method.

CASE REPORT

A 60-year-old woman was referred to our institution with a diagnosis of mitral regurgitation which had been identified ten years previously. She had suffered from congestive heart failure twice in the last year. At admission, she was in New York Heart Association (NYHA) class III. Regurgitant systolic murmur of Levine IV/VI was auscultated at the apex. Electrocardiogram showed atrial fibrillation, and chest X-ray revealed a cardiothoracic ratio of 62% with pulmonary congestion. Two-dimensional echocardiography showed a prolapse of the anterior and posterior mitral leaflets at the anterolateral side together with marked dilatation of the posterior annulus. Color-flow mapping showed a severe mitral regurgitation. Moderate tricuspid regurgitation was also found with annular dilatation. Catheterization study showed a mean pulmonary artery pressure of 23 mmHg, a mean pulmonary capillary pressure of 13 mmHg and a cardiac index of 2.2 L/min/m². Left ventriculography also showed a severe mitral regurgitation (Fig. 1A) with enlargement of the left ventricular cavity (left ventricular end-diastolic and end-systolic volume indices of 161 ml/m² and 80 ml/m² respectively). Surgery was performed using total cardiopulmonary bypass with moderate hypothermia. For myocardial protection, continuous blood cardioplegia was applied in a retrograde fashion via the coronary sinus. The extend-

Key words:
Mitrail regurgitation
Mitrail annuloplasty
Dacron annuloplasty ring

(Received May 21, 1994; accepted August 1, 1994)
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ed transseptal approach was used to expose the mitral valve, in which a vertical transseptal incision was extended onto the superior dome of the left atrium. Prolapse of the anterior and posterior mitral leaflets was found at the anterolateral side due to chordal rupture and elongation with marked dilatation of the entire posterior annulus (Fig. 2A). The redundant leaflets were excised rectangularly and direct suture was performed using 4-0 polypropylene interrupted sutures to repair the excised leaflet. The dilated posterior annulus was reduced using a modified Kay's method at both commissures to further adjust the leaflets (Fig. 2B). A leakage test in which saline solution was infused with a bulb syringe through the mitral valve showed no mitral valve leakage. Eight horizontal mattress sutures of 4-0 polypropylene were placed around the mitral annulus, and a 3 mm-wide ring cut from a woven Dacron tube graft (Hemashield® prosthesis) was seated and tied in place to provide long-term stabilization of the mitral annulus and prevent its further dilatation (Fig. 2C). By this procedure, the mitral orifice was reduced from 33 mm to 21 mm in diameter. The atrial septum and left atrium were closed with 3-0 polypropylene suture, and tricuspid
annuloplasty was performed by Kay’s method after aortic declamping. Cardiopulmonary bypass was gradually withdrawn. Intraoperative transesophageal echocardiography showed no residual mitral regurgitation. Postoperative ventriculography showed no mitral regurgitation, and the left ventricular end-diastolic and end-systolic volume indices were 118 ml/m² and 63 ml/m² respectively (Fig. 1B). A continuous-wave Doppler echocardiogram showed a mitral valve area of 2.98 cm². The patient underwent an uneventful postoperative course, and was discharged 30 days after the operation in NYHA class I.

DISCUSSION

In mitral valve repair, an annuloplasty ring is used to obtain a better coaptation of the leaflets and to reduce or prevent annular dilatation. The rigid Carpentier ring, the flexible Duran ring, and the new flexible and adjustable ring are often used for mitral annuloplasty. The accumulated clinical and experimental data suggest that a flexible ring gives the mitral annular apparatus some degree of mobility during the cardiac cycle and provides a better ventricular performance. An additional advantage of the flexible and adjustable annuloplasty ring is that it can provide a further adjustment after implantation. In the present case, a modified Kay’s annuloplasty was first performed to coapt the leaflets and reduce the posterior mitral annulus after valvuloplasty. Thereafter, a 3 mm-wide ring cut from a woven Dacron tube graft was seated and tied in place to provide long-term stabilization of the mitral annulus and prevent its further dilatation (Fig. 3). Cooley et al generally sew a ring cut from a 20 mm knitted Dacron tube graft directly in cases of mitral annuloplasty. However, the knitted Dacron graft presents the possibility of gradually stretching in the long term. Therefore, we used a ring cut from a 30 mm woven Dacron tube graft, which is less likely to stretch than a knitted graft, and fixed it on the annulus where Kay’s annuloplasty was performed. This procedure allows for superior annular settlement in combination with valvuloplasty. In addition, this material has economic advantages. Thus far, we have repaired mitral regurgitation using this procedure in 2 cases. In both cases, the mitral orifice was reduced to 21 mm in diameter with no mitral regurgitation or stenosis. Since there is a possibility that thrombosis could form around the Dacron ring and residual mitral regurgitation could cause hemolysis, a close observation is mandatory with this procedure.

REFERENCES


