Partial Resection of Mitral Leaflets during Mitral Valve Replacement

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ABSTRACT

Usually, after mitral leaflet tissue is resected, artificial chordae are used to obtain papillary muscle-to-mitral annulus continuity so as to preserve left ventricular performance. A modified technique that does not require resection of the posterior mitral leaflet and permits implantation of an adequate size of prosthesis is described.

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KEYWORDS: Cardiac Surgical Procedures, Heart Valve Prosthesis Implantation, Mitral Valve, Mitral Valve Insufficiency, Mitral Valve Stenosis

INTRODUCTION

Satisfactory results of bileaflet-preserved mitral valve replacement (MVR) have been reported from several institutions, with various modifications.[1,2] These techniques for preservation of the subvalvular apparatus are aimed at preventing the preserved tissue from interfering with prosthetic valve function, allowing implantation of an adequate size of prosthesis, and avoiding left ventricular (LV) outflow tract obstruction. Adequately sized prosthesis implantation may become impossible due to extensive fibrosis and leaflet thickening in rheumatic pathology. Most surgeons resect all of the subvalvular apparatus and leaflet tissue, and annulus-to-papillary muscle continuity is reconstructed with artificial chordae.[3–6] A modified technique that does not require resection of the posterior mitral leaflet and permits implantation of an adequate size of prosthesis is described.

TECHNIQUE

Usually, only the anterior leaflet mitral leaflet and its subvalvular apparatus are resected; the posterior leaflet is commonly left intact. If the posterior leaflet is also thickened, a longitudinal incision is made to implant an adequate size of prosthesis. An elliptic piece of tissue is also resected from the posterior leaflet to reduce its height. A 3/0 e-PTFE pledgetted mattress suture is placed in the mitral anterior papillary muscle and tied at the top of the papillary muscle. This suture is anchored to the mitral annulus in the 10 o'clock position. Another 3/0 e-PTFE pledgetted mattress suture is placed on the posterior papillary muscle and tied. This suture is anchored to the mitral annulus in the 2 o'clock position (Figure 1). The posterior mitral leaflet is plicated using a pledgetted Tevdek suture, and an appropriate size of prosthesis is implanted in the mitral orifice. The 10 and 2 o'clock positions are preferred because these points are close to the right and left fibrous trigones that are the strongest part of mitral annulus. Sutures in these locations interfere less with the leaflets of the prosthesis.

DISCUSSION

This partial resection technique was employed in 12 patients (mean age, 35.7 ± 8.3 years). Four of these patients had combined rheumatic mitral stenosis and regurgitation, and 8 had rheumatic mitral regurgitation. The mitral valve was replaced with a St. Jude Medical mechanical prosthesis (mean prosthesis size, 29 mm) using non-everting 2/0 polyester stitches in 11 patients. A Carpentier-Edwards bioprosthesis was used in one patient. There was no mortality or major morbidity. Echocardiographic studies during the follow-up period showed no evidence of prosthetic valve dysfunction or paravalvular leakage. LV ejection fraction late after the operation (mean, 12 months) was better than that in the early postoperative period (mean, 30 days): $61\% \pm 4\%$ vs. $57\% \pm 2\%$ ($p = 0.045$), and similar to the preoperative value: $66\% \pm 2\%$ ($p = 0.035$). Postoperative LV

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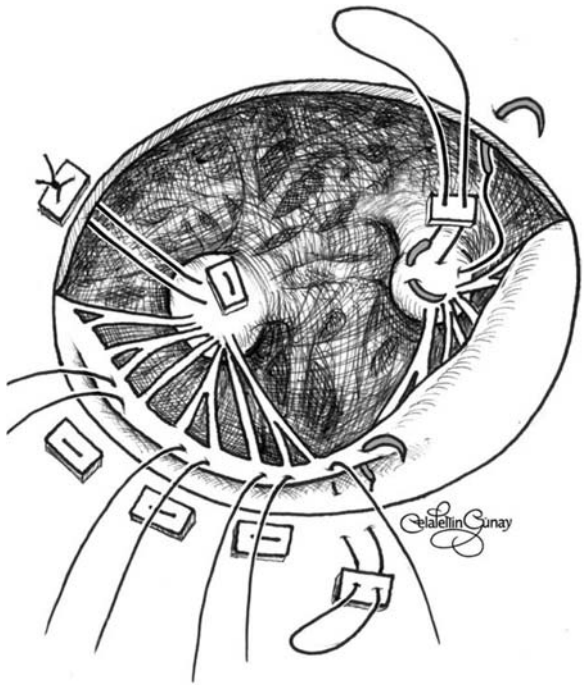

Figure 1. The pledgetted mattress sutures are placed on the mitral anterior and posterior papillary muscle, and tied on the top of the papillary muscles. The sutures are anchored in the 10 and 2 o'clock positions on mitral annulus.

end-diastolic diameter (43.1 ± 2.2 mm) was maintained at the same size as preoperatively (46.2 ± 0.6 mm, $p = 0.066$). The mean left atrial dimension was 62.48 ± 3.23 mm preoperatively and 50.48 ± 2.53 mm ($p = 0.001$) at 1 year postoperatively. Eleven patients were in New York Heart Association class I and one was in class II in the postoperative period.

The partial resection technique can be used safely with a minimal number of artificial chordae, and may be effective for preservation of LV function after MVR in patients with rheumatic mitral valve disease. The mean length of the artificial chordae was 23.1 ± 2.1 mm, as Okita and colleagues[3] reported. MVR with preservation of both anterior and posterior leaflets and all chordae tendineae improved LV performance, and the postoperative ejection fraction increased during both rest and exercise after the operation.

Results of bileaflet preservation forced several institutions to improve the technique, and several modifications have been described. Thickened mitral valve leaflets are usually a great obstacle in leaflet-preserving MVR. Complete leaflet resection and artificial neochordal repair techniques have been used in MVR.[3–7] Most of these techniques preserve LV performance and avoid LV outflow tract obstruction. However, complete resection of both anterior and posterior leaflets may predispose to atrioventricular disruption. Isolated posterior leaflet preservation preserves LV performance better than conventional MVR. Both anterior and posterior leaflet preservation has a more beneficial effect on LV performance than isolated posterior leaflet preservation. This technique preserves the posterior leaflet and also provides papillary muscle-to-anterior mitral annulus continuity.

Two major problems should be resolved by this technique. The first is whether an adequate size of prosthesis can be used with a retained rheumatic thickened posterior leaflet. This can be confirmed by the mean size of 29 mm prosthesis implanted in this series. A longitudinal incision from the middle of the posterior leaflet to the posterior mitral annulus was made to reduce posterior leaflet height, and an elliptical section of leaflet tissue was removed from the thickened posterior leaflet. The second problem is how to manage the length of the artificial chordae. The mean length of artificial chordae in the 2 and 10 o'clock positions was 23.1 ± 2.1 mm, as Okita and colleagues[3] described. This partial resection technique can be used safely with a minimal number of artificial chordae to decreases the risk of leaflet-suture interference. It also avoids the risk of posterior mitral annulus disruption. Vertical incision of the posterior leaflet may allow implantation of a larger prosthesis.

REFERENCES

1. Feikes HL, Daugharthy JB, Perry JE, Bell JH, Hieb RE, Johnson GH. Preservation of all chordae tendineae and papillary muscle during mitral valve replacement with tilting disk valve. J Card Surg 1990;5:81–8.
2. Sintek CF, Pfeffer TA, Kochamba GS, Khonsari S. Mitral valve replacement: technique to preserve the subvalvular apparatus. Ann Thorac Surg 1995;59:1027–9.
3. Okita Y, Miki S, Ueda Y, Tahata T, Sakai T, Matsuyama K. Mitral valve replacement with maintenance of mitral annulo-papillary muscle continuity in patients with mitral stenosis. J Thorac Cardiovasc Surg 1994;108:42–51.
4. David TE. Mitral valve replacement with preservation of chordae tendineae: rationale and technical considerations. Ann Thorac Surg 1986;41:680–2.
5. Bernhard A, Sievers HH, Nellesen U, Maurer I. Improved mitral valve replacement. Eur J Cardiothorac Surg 1990;4: 224–5.
6. Soga Y, Nishimura K, Yamazaki K, Komeda M. Simplified chordal reconstruction: 'oblique' placement of artificial chordae in mitral valve replacement. Eur J Cardiothorac Surg 2003; 24:653–5.
7. Athanasiou T, Chow A, Rao C, Aziz O, Siannis F, Ali A, Athanasiou T, et al. Preservation of the mitral valve apparatus: evidence synthesis and critical reappraisal of surgical techniques. Eur J Cardiothorac Surg 2008;33:391–401.