AZJCVS
AZerbaijan Journal of CardioVascular Surgery

AZJCVS 2024;5(3):94-7
DOI: 10.5455/azjcvs.2024.04.09

Case Report

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Received: 29 April, 2024
Accepted: 21 August, 2024
Published: 07 October, 2024

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CITATION
Sahin MA, Kuralay E. Posterior leaflet division and augmentation technique for repairing rheumatic mitral valve. AZJCVS. 2024;5(3):94-7.

Posterior leaflet division and augmentation technique for repairing rheumatic mitral valve

Abstract

Leaflet mobilization is an important part of rheumatic mitral valve disease repair. Conventional commissurotomy techniques may not allow leaflet mobilization in some patients. We described a new technique for adequate mobilization of the posterior leaflet. First, we performed mitral commissurotomy in both commissures. The posterior leaflet was then separated from the posterior annulus from the anterolateral commissure to the posteromedial commissure. Tertiary and secondary chordae were removed. The posterior leaflet was divided vertically into two parts. After removal of the fibrous attachments, the pericardial patch was sutured to the entire posterior leaflet. The artificial chordae were re-implanted in the neo-P2 region of the porterior leaflet to achieve good coaptation. We did not use a ring after the mitral valve repair was completed.

Keywords: Rheumatic disease, posterior leaflet augmantation, leaflet mobilization

INTRODUCTION

Reconstructive procedures of mitral valve repair for rheumatic mitral valve disease remain controversial. The leaflet and subvalvular apparatus of the mitral valve are commonly involved in rheumatic activity. Inflammation and subsequent fibrosis may cause retraction of all elements of the mitral valve (1,2). Mobilization of both leaflets, chordaes, and papillary muscles are necessary for obtaining good valve function. Commonly rheumatic patients had mixed-type mitral valve dysfunction. Both anterior leaflet prolapse (pseudo-IIa; anterior leaflet pseudo-prolapse) and restricted posterior leaflet motion (IIIp; restricted posterior leaflet motion) may be found echocardiographic examinations. Chauvaud S. called this pathology a mixed-type IIa/IIIp (1). Mitral regurgitation in this mixed functional type is caused by a lack of coaptation, resulting mainly from the significantly restricted motion of the posterior leaflet, not allowing for the anterior leaflet to move up to the annular plane during systole. Herein; we have presented a new posterior leaflet mobilization technique.

CASE REPORT

Surgical Technique

ALIFE hospital ethical committee has approved this study at 2019 and informed consent was obtained from all patients. Average age of our patients (no=11) was 34.2±4.5 years old and seven of them was women whose want to childbirth in near future. Severe mitral stenosis (average mitral valve orifice was almost 0.65 cm^2) and moderate mitral regurgitation (caused by beneath the anterior leaflet) were found on transthoracic echocardiographic examination (TTE) (type IIa/IIIp pathology). Both leaflets and chordaes were thickened. Transesophageal echocardiography (TEE) probe was placed just after general anesthesia in the operating room. Thrombus

on left atrium auricula (LAA) detected in 5 patients of 11 patients. Movement of the posterior leaflet was extremely restricted but anterior leaflet movements were normal. A median sternotomy was done. The pericardium was harvested. The pericardium was stretched on a metal platform and fixed with 0.6% glutaraldehyde for 5-10 minutes. Bicaval and ascending aorta cannulation were done and a cardiopulmonary bypass was initiated. Ascending aorta clamped and superior septal left atriotomy was done. LAA was resected externally by using pericardial strips in all patients. Four annuloplasty sutures were placed to enhance mitral exposure. The posterior leaflet was thickened and movements were strictly restricted. The coaptation surface of the posterior leaflet was also restricted and shortened due to fibrous activity. Chordaes attached to posterior leaflets were thickened so causing restriction of posterior leaflet movement. The anterior leaflet slightly thickened but movements were normal. Commissurotomy was done to both commissure. Despite adequate orifice were obtained after commissurotomy but severe mitral regurgitation was found on the saline test. The posterior leaflet was detached from posterior annulus from the anterolateral commissure to the posteromedial commissure. Tertiary and secondary chordaes were removed. The front part of the detached posterior leaflet divided from the middle of P2 scallop with extreme was given care to avoid primary chordae damage. Two parts of the posterior leaflet were completely mobilized. There was a 10 mm gap between these two parts. The glutaraldehyde-pretreated autologous pericardium was tailored according to the detached posterior leaflet dimension. A ten to fifteen-millimeters dimension square bulge is left on the anterior part to fit the gap between two parts of the posterior leaflet. The pericardium was sutured and the posterior leaflet (Figure 1A). The patch was oriented so that the smooth surface of the pericardium faces the left atrial side to avoid thrombogenesis. The pericardium was sutured to the gap between the two front parts of the posterior leaflet. The pericardium was four millimeters longer than the front part of the posterior leaflet. A single artificial chordae (5/0 PTFE) suture was placed on the posterior branch of the anterolateral papillary muscle (Figure 1B). This suture was passed two times to the gap pericardium and chordal measurement was done nearby chordae which were stretched by nerve hook. PTFE suture was tied after adequate sizing (Figure 2A, 2B). The saline test was re-done and adequate coaptation was obtained. We have not performed ring annuloplasty because annular dilatation was not predominant. We think that sutures on posterior annulus may also prevent annular dilatation. Postoperative TEE were done to all patients in the operating room. Postoperative TEE reveals minimal mitral regurgitation with average 2.5 cm^2 mitral valve area. Early postoperative courses of patients were uneventful and patients were discharged at the five postoperative days. We have not any adverse events in average follow-up period (3.7 years). Three patients got pregnant after two years surgery.

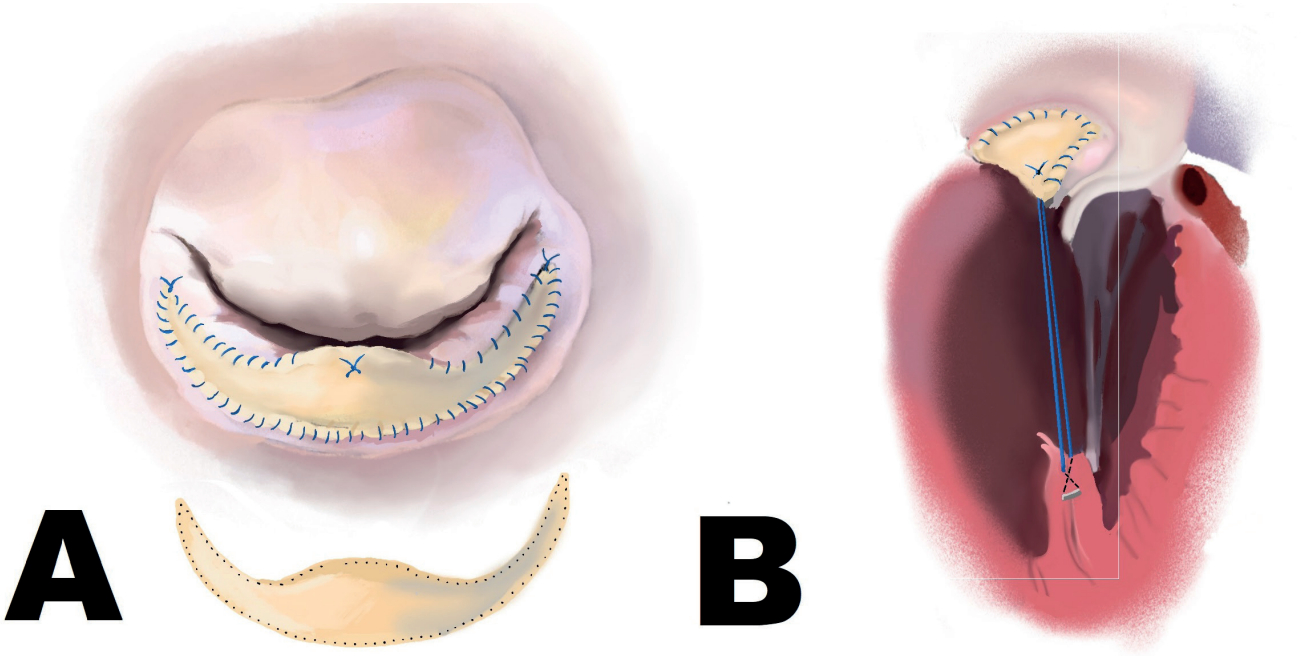

Figure 1. Illustration; **A.** Posterior leaflet was detached from 2 mm away posterior annulus from anterolateral commissure to posteromedial commissure; tertiary and secondary chordaes were removed; the front part of the detached posterior leaflet divided from the middle of the P2 scallop with extreme was given the care to avoid primary chordae damage; **B.** Single artificial chordae were placed to the posterior branch of anterolateral papillary muscle; this suture was passed two times to the gap pericardium and chordal measurement was done nearby chordae that were stretched by nerve hook

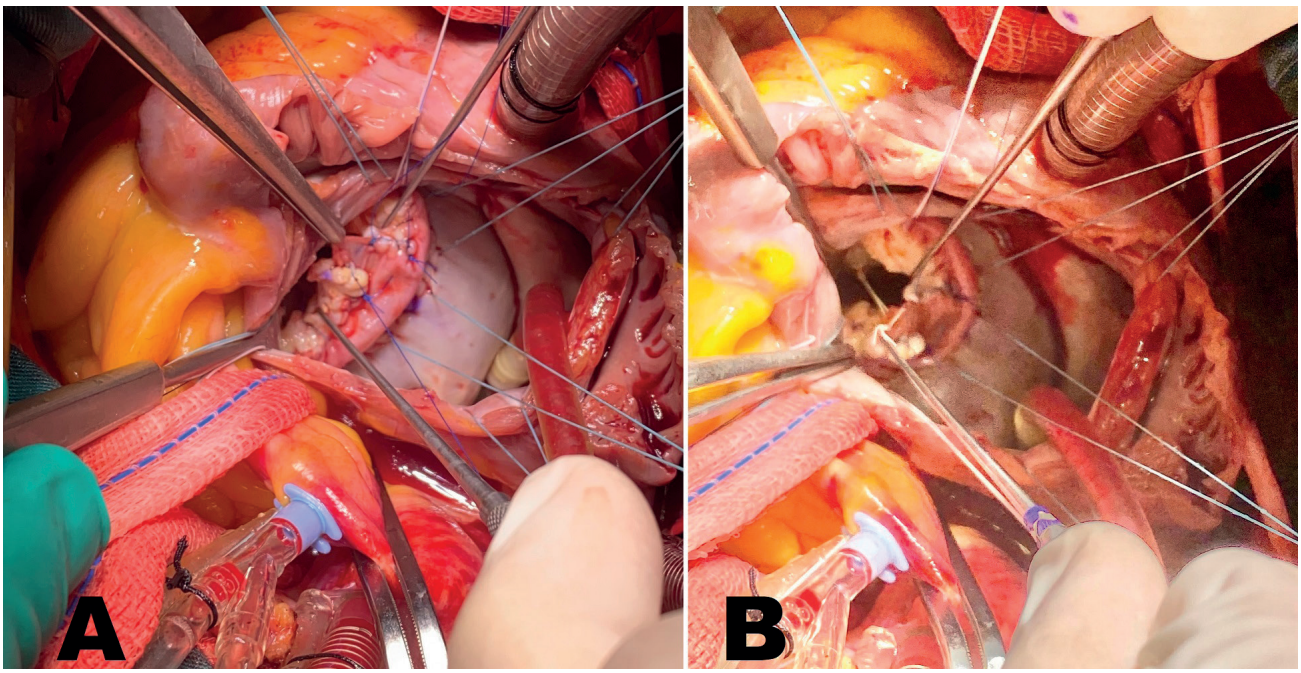

Figure 2. Operating view; **A.** A completed form of mitral valve surgery; the posterior leaflet is augmented with an autologous pericardium and the posterior leaflet is divided at the middle of the posterior leaflet; all secondary and tertiary chordaes were cut and effective leaflet mobilization was obtained; **B.** Artificial chordae was implanted at the bulged part of the pericardium

DISCUSSION

Rheumatic heart disease is still one of the major life-threatening heart diseases worldwide. It most frequently affects the Mitral valve and is the most common cause of mitral stenosis. Fu J and colleagues (3) were advocating that rheumatic mitral valve repair had lower mortality and fewer valve-related complications; meanwhile, it demonstrated a similar risk of reoperation compared with replacement. When repair is feasible, these results suggest that repair is superior to mitral valve replacement in the population with rheumatic disease. Mitral valve repair is the optimal treatment option for complex rheumatic mitral valve pathology (4). Restoring the flexibility and mobility of restrictive leaflets should be accomplished for avoiding mitral regurgitation. Leaflet shaving, leaflet peeling, and decalcification have been used to increase leaflet flexibility. The leaflet extension technique with autologous pericardium is commonly used for mixed-type IIa/IIIp rheumatic mitral pathology. Posterior leaflet mobilization can be increased by cutting restrictive secondary chordae during the posterior leaflet extension procedure. Dillon J and colleagues (5) have reported that 77% of patients had posterior leaflet extension and 13% had anterior leaflet extension, while 10% had both leaflets extended. We have described a relatively new technique to increase posterior leaflet mobility and flexibility. We have used this technique to patients who had severe posterior leaflet restriction. Anterior leaflet restriction/dimensions are challenging pathologies and special techniques should be used for anterior leaflet restrictions and dimensions (6). We have detached the posterior leaflet from the posterior annulus and cut all restricted secondary or tertiary chordae structures. But all these precaution techniques were not satisfactory in terms of posterior leaflet mobility. The restricted anterior part of the posterior leaflet still restricted leaflet motion. We have cut the posterior leaflet at the middle of the P2 segment by preserving primary chordae. Averagely 10 mm pericardial extension can also be made at the P2 segment of the posterior leaflet. Artificial chordae was replaced into the anterior pericardial segment to obtain good coaptation and avoid regurgitation.

CONCLUSION

Mitral valve repair surgery can be performed successfully in rheumatic mitral valve diseases. Especially in type IIa/IIIp pathologies, posterior leaflet restrictions can be removed and posterior leaflet mobilization can be achieved with our technique. Pseudo-prolapse in the anterior leaflet can be disappeared with posterior leaflet mobilization and adequate leaflet coaptation can be achieved. It is a known fact that repair procedures in rheumatic mitral valve pathologies do not provide adequate results in the long term. Patients are protected from prosthetic valve complications, anticoagulant (if the patient is in sinus rhythm), and left ventricular functions are preserved in early and mid-term follow-up period. Mitral valve repair should be used in rheumatic valve patients, especially in women who want to have children.

Conflict of Interests: The authors declare that there are no conflict of interests.

Financial Disclosure: The authors declare that there is no financial support.

Patient Informed Consent: Informed consent forms were obtained from all patients.

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