

Case Reports

Edge-to-Edge Mitral Valve Repair for Anterior Leaflet Prolapse Associated with Extensive Calcification of the Mitral Annulus: Report of a Case

TOMONOBU ABE¹, TOSHIAKI ITO², MASATOSHI SUNADA², TOMO YOSHIKUMI², AKEMI KAWAMURA², and KOJI YAMANA²

¹Department of Cardiovascular Surgery, Social Insurance Chukyo Hospital, 1-1-10 Sanjyo, Minami-ku, Nagoya 457-8510, Japan

²Department of Cardiovascular Surgery, Nagoya 1st Red Cross Hospital, Nagoya, Japan

Abstract

Extensive mitral annular calcification remains a technical challenge in mitral valve surgery. Decalcification and reconstruction of the mitral annulus is an established technique, but it is time consuming and technically demanding. This report presents the case of an 88-year-old diabetic female patient in whom edge-to-edge repair was completed quickly, with good early results thus being obtained.

Key words Mitral valve repair · Calcification

Introduction

Severe mitral annular calcification is a technical challenge in mitral valve surgery.^{1,2} Although decalcification has been described by several authors,^{2,3} it is a complex and time-consuming technique. This report presents a case in which edge-to-edge mitral valve repair provided good early results. The patient was a small 88-year-old woman. Postoperative echocardiography showed trace mitral regurgitation and no signs of mitral stenosis by means of a standard measurement technique.⁴

Case Report

An 88-year-old woman was referred to our department for mitral valve surgery. She had been hospitalized for congestive heart failure 4 months before surgery, and had New York Heart Association class 3 symptoms after that episode. Echocardiography revealed severe mitral regurgitation.

She had been relatively well for her age until she developed congestive heart failure. The patient was diabetic, and her blood glucose had been controlled by oral medication for 10 years. All other aspects of her medical history were unremarkable except for a history of a hysterectomy and cataract surgery. Her weight was 45.5 kg and her height 147 cm. A grade 3 systolic murmur was heard at the apex. There was no peripheral edema in the extremities. Her creatinine count was normal.

She underwent preoperative cardiac catheterization. Coronary angiograms showed only nonsignificant coronary disease. Left ventriculogram showed severe mitral regurgitation. The mean pulmonary artery pressure was 21 mmHg. Fluoroscopy showed severe calcification of the mitral annulus (Fig. 1). Typical horseshoe-shaped calcification was noted.

Preoperative transthoracic echocardiography showed severe mitral valve regurgitation and mild tricuspid regurgitation (Fig. 2). The measurements are summarized in Table 1. The direction of the regurgitant jet indicated that she had prolapse of the anterior leaflet. The echo also showed posterior mitral annular calcification (Fig. 3).

Timely surgery was desirable because the patient was elderly. Mitral valve repair using an edge-to-edge technique was planned, without the placement of an annuloplasty ring if it could be done. It was necessary to be strict about the results of water testing because the midterm results would be poor if water testing results were suboptimal in this strategy.⁵

At surgery, the patient was placed on cardiopulmonary bypass in the usual manner. The mitral valve was approached via the atrial septum. She had an anterior leaflet prolapse at the anterior edge of A1 segment. A ruptured chord was observed. Her posterior mitral annulus was severely calcified as expected. The annulus did not look dilated, so that an annuloplasty ring was not absolutely necessary to control her mitral valve regurgitation. An edge-to-edge repair was thus selected.

Reprint requests to: T. Abe

Received: January 18, 2009 / Accepted: June 7, 2009

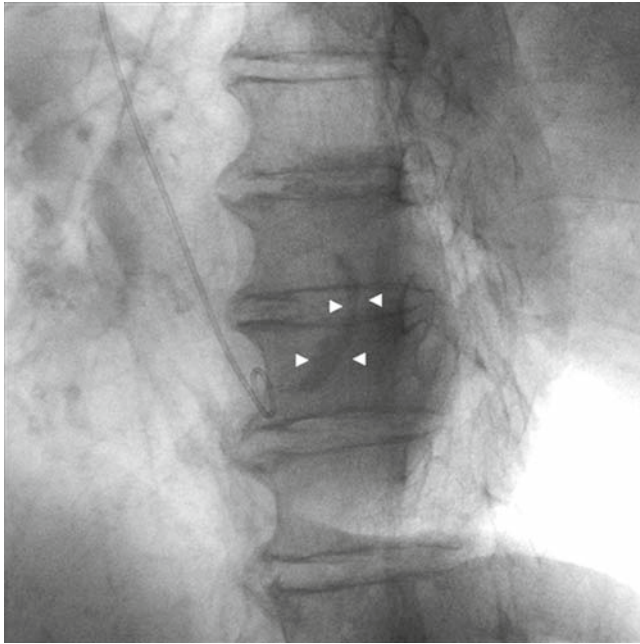


Fig. 1. Preoperative fluoroscopy. White arrows indicate mitral annular calcification

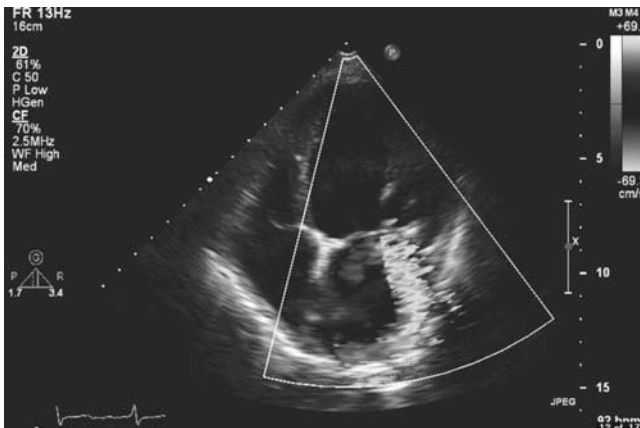


Fig. 2. Preoperative color Doppler echocardiography. The direction of the regurgitant jet suggested a prolapse of the anterior leaflet

Table 1. Preoperative echographic measurement

Left atrium	4.3cm
Interventricular septum	1.0cm
Left ventricular posterior wall	0.9cm
Left ventricular diastolic diameter	5.7cm
Left ventricular systolic diameter	4.4cm
Fractional shortening	20.7%
Ejection fraction	41.7%
End-systolic volume	97.3ml
Stroke volume	69.7ml

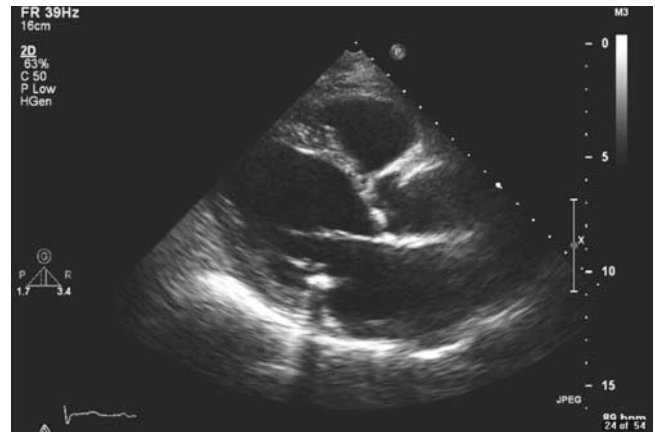


Fig. 3. Preoperative echocardiography. Posterior mitral annular calcification is noted

A paracommissural repair was done by sewing the A1 to P1 with three interrupted 5-0 polypropylene sutures (Fig. 4). The valve became competent, showing no leakage by water testing. The left atrium was closed. She was easily weaned off bypass. The mitral valve was competent according to an intraoperative transesophageal echo. Cardiac arrest was 33 min, pump time was 56 min, and operation time was 140 min.

The patient was extubated in 10h. She stayed in the intensive care unit for 1 day. She developed atrial fibrillation on postoperative day 6, and did not suffer from any other complications.

A postoperative echo showed only trace mitral regurgitation. The mitral valve area was 4.10cm² according to pressure half-time method, the mean pressure gradient was 2mmHg across the mitral valve, and there was no sign of mitral stenosis. Although her postoperative course was uneventful apart from the atrial fibrillation, her hospital stay had to be relatively long for rehabilitation. She was able to be discharged from the hospital at 26 days after surgery.

Discussion

Mitral annular calcification is a technical challenge in mitral valve surgery.^{1,2} Decalcification is usually necessary to complete mitral valve repair or replacement in mitral valve regurgitation.^{1,2} David et al. described their technique of mitral annular decalcification and reconstruction of the annulus with a pericardial patch.³ Carpentier et al. applied “sliding atrioplasty” of the left atrium to cover the area of decalcification.² Both techniques apparently work well and can provide excellent long-term results.^{1,2} However, they may be too complex and time consuming for poor-risk patients. A surgical

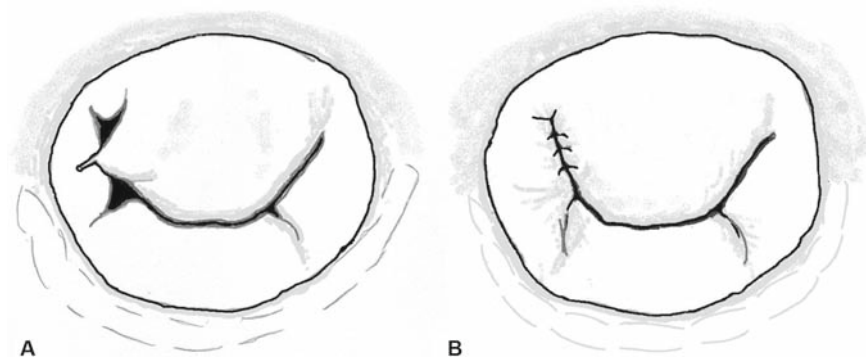


Fig. 4A,B. Repair. **A** The mitral valve had anterior leaflet prolapse at the A1 segment with ruptured chordae. The posterior mitral annulus was severely calcified. **B** A paracommissural edge-to-edge repair was done by sewing the A1 to P1 with three interrupted 5-0 polypropylene sutures

mortality of up to 9% has been in patients undergoing extended decalcification procedures.¹

Edge-to-edge mitral valve repair is a relatively new technique introduced by Alfieri et al.⁶ This procedure is appealing for the treatment of patients with annular calcification, because the lesions can be treated by acting only on leaflets without the need for annuloplasty. However, Massiano et al. reported suboptimal results of 70% ± 15.0% freedom from reoperation at 5 years in this patient population.⁵ From another point of view, their freedom from reoperation was excellent in patients whose water testing results were perfect: it was 98% ± 1.8% at 5 years. Their data suggest that one should therefore have a lower threshold of accepting suboptimal water testing results in patients with annular calcification. No degree of leakage should be accepted. Since this patient's water testing results were perfect, good midterm results could therefore be expected.

The current patient was an 88-year-old woman. The average life expectancy of her age and sex was 6.4 years according to the life table published by the Japanese Ministry of Health, Labor and Welfare.⁷ Her chance to require a reoperation should be smaller because of her limited life expectancy.

Even with 33 minutes of cardiac arrest, the patient required hospitalization for more than 20 days. This particular patient may have required more time to recover and had more chance to develop postoperative complications if decalcification had been performed.

Other techniques, such as artificial chordae or triangular resection of the anterior leaflet, could have been used instead of the edge-to-edge technique to treat this patient. However, the lack of annuloplasty ring is generally associated with poorer long-term durability in mitral valve repair.⁸ The long-term results of isolated artificial chordate or triangular resection without ring annuloplasty is largely unknown. Edge-to-edge repair was chosen in this particular case because it was necessary to minimize the surgical time, and there was no

evidence showing other techniques were better in this patient population.

A careful follow-up is mandatory. Patients should be carefully selected for this strategy because of the previously reported suboptimal results in the literature.

Conclusions

Mitral valve regurgitation with severe mitral annular calcification was repaired in an 88-year-old woman using an edge-to-edge technique. This was achieved quickly and simply, with good early results being observed.

References

1. Feindel CM, Tufail Z, David TE, Ivanov J, Armstrong S. Mitral valve surgery in patients with extensive calcification of the mitral annulus. *J Thorac Cardiovasc Surg* 2003;126(3):777–82.
2. Carpentier AF, Pellerin M, Fuzellier JF, Relland JY. Extensive calcification of the mitral valve annulus: pathology and surgical management. *J Thorac Cardiovasc Surg* 1996;111(4):718–29; discussion 29–30.
3. David TE, Feindel CM, Armstrong S, Sun Z. Reconstruction of the mitral annulus. A ten-year experience. *J Thorac Cardiovasc Surg* 1995;110(5):1323–32.
4. Sezai A, Umeda T, Hata M, Niino T, Unosawa S, Tokai K, et al. A transesophageal echocardiographic and cine-fluoroscopic evaluation of an ATS prosthetic valve opening. *Surg Today* 2009; 39(4):300–5.
5. Maisano F, Caldarola A, Blasio A, De Bonis M, La Canna G, Alfieri O. Midterm results of edge-to-edge mitral valve repair without annuloplasty. *J Thorac Cardiovasc Surg* 2003;126(6): 1987–97.
6. Alfieri O, Maisano F, De Bonis M, Stefano PL, Torracca L, Oppizzi M, et al. The double-orifice technique in mitral valve repair: a simple solution for complex problems. *J Thorac Cardiovasc Surg* 2001;122(4):674–81.
7. Japanese Ministry of Health, Labor and Welfare. The 20th life table. 2007. Available at: <http://www.mhlw.go.jp/toukei/saikin/hw/life/20th/index.html> Accessed January 15, 2009.
8. Gillinov AM, Blackstone EH, Alaulaqi A, Sabik JF 3rd, Mihaljevic T, Svensson LG, et al. Outcomes after repair of the anterior mitral leaflet for degenerative disease. *Ann Thorac Surg* 2008;86(3):708–17; discussion -17.