

Early and follow-up results of butterfly resection of prolapsed posterior leaflet in 76 consecutive patients

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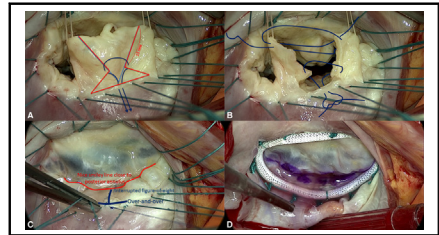
ABSTRACT

Objective: The present study aims to examine the medium-term results of butterfly resection.

Methods: Of 587 consecutive patients who underwent surgery for mitral regurgitation between January 2002 and August 2012, 162 patients underwent valve reconstruction of a prolapsed posterior leaflet. Quadrangular resection (n = 50, Quadrangular group) was primarily used before November 2006 (when we innovated the concept of butterfly resection). After that, we mainly used butterfly resection (n = 76, Butterfly group).

Results: Although there was no sign of systolic anterior motion in the Butterfly group, it occurred in 2 patients in the Quadrangular group. One patient in the Quadrangular group died of stroke at postoperative day 17. The mean follow-up period was 2.2 ± 1.6 years for the Butterfly group and 6.1 ± 2.5 years for the Quadrangular group. During those periods, 2 patients died of noncardiac causes in the Butterfly group and 1 patient died of an unknown cause in the Quadrangular group. One patient in the Quadrangular group required a reoperation for recurrent mitral regurgitation arising from a new lesion of the anterior leaflet. One patient in the Butterfly group required a reoperation for partial dehiscence of suture at the posterior leaflet. The 3-year estimated survivals free from overall death and reoperation for recurrent mitral regurgitation in the Butterfly group and the Quadrangular group were $97\% \pm 2\%$ versus $96\% \pm 3\%$ ($P = .89$) and $95\% \pm 3\%$ versus $96\% \pm 3\%$ ($P = .75$), respectively.

Conclusions: Butterfly resection provides acceptable early and medium-term results. (*J Thorac Cardiovasc Surg* 2015;149:1296-300)



Butterfly resection is designed and performed at the prolapsing posterior leaflet segment.

Central Message

Butterfly resection of mitral valve repair provides acceptable early and medium-term results for a prolapsed posterior leaflet.

Perspective

Butterfly resection is a mitral valve repair technique for prolapsing posterior leaflets. Early and medium-term results of butterfly resection were compared with quadrangular resection. Butterfly group had no SAM but quadrangular group had 2 out of 50. Mortality and valve-related event were not different. Butterfly resection provided comparable early and medium-term results to quadrangular resection.

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The butterfly resection was introduced as an alternative technique of mitral valve repair for prolapsing posterior leaflets.¹ Our group has previously described the excellent short-term outcomes of this technique.² One major drawback was the lack of follow-up data to evaluate the durability of this repair technique. The purpose of the present study is to report the medium-term outcomes of patients who have undergone butterfly resection of a

prolapsed posterior leaflet compared with quadrangular resection.

MATERIALS AND METHODS

Patients

Of 587 consecutive patients who underwent surgery for mitral regurgitation between January 2002 and August 2012 (566 by valve reconstruction and 21 by valve replacement), 162 with isolated posterior leaflet prolapse who underwent mitral valve reconstruction were entered in the study.

Quadrangular resection (n = 50, Quadrangular group), triangular resection (n = 14), and chorda replacement (n = 1) were primarily used for prolapsed posterior leaflets before November 2006, when we innovated the concept of butterfly resection. After that, we used butterfly resection (n = 76, Butterfly group), triangular resection (n = 19), or artificial chorda fixation (n = 2). Quadrangular resection was used in 2 patients: 1 with subacute endocarditis and 1 with a short prolapsing segment. Triangular resection or artificial chorda fixation was used mostly for short and narrow prolapsing lesions with no excess tissue throughout the study period. All procedures were performed by the same surgeon (TA). All patients had

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Abbreviation and Acronym

SAM = systolic anterior motion

previously granted permission for use of their medical records for research purposes. The study was approved by the institutional review board.

End Points

The end points were early mortality, valve-related mortality, and major adverse valve-related event. Early mortality was defined as all-cause deaths that occurred with 30 days of surgery. Valve related complications were defined and recorded according to established criteria.³

Surgical Technique

Our typical procedure would be the following, although this sequence may be adjusted considerably according to individual cases and the results of water tests during the procedure. The mitral valve is exposed using a self-retaining retractor (Delacroix Chevalier, Paris, France). Before a water test, each component of the mitral valve is checked, step-by-step: The anterior leaflet, posterior leaflet, chordae tendineae, anterolateral and posteromedial papillary muscles, and left ventricle are examined. At this point, we measure the heights of 4 segments (A2, P1, P2, and P3) of leaflets perpendicularly from the mitral annulus using a small paper scale. A water test confirms the location of any leaflet prolapse. When the prolapsing segment in the posterior leaflet is redundant and high, we use butterfly resection for that redundant prolapsing segment (Figure 1). We start with a simple triangular resection at the free margin, carried out between 2 intact chordae adjacent to the prolapsing segment. By holding a scale next to the leaflet cut margin, we mark the appropriate length (typically 15 mm for P2) to set the intended height of the resulting leaflet. Then the second resection, a reverse triangular resection, is carried out with its base at the annulus.

The conserved margins of leaflet are then rotated toward the annulus and secured with 5-0 polypropylene. The free corners of the cut leaflet are then brought together and secured, at least temporarily, with another suture in a figure-of-8 style. The cut edges already approximated to the annulus are then sutured to the annulus, using the free end of the first suture, in an over-and-over fashion. In each step, the water test is repeated to check the leaflet shape and coaptation line. The procedure is completed by mitral annuloplasty with a semi-rigid Carpentier-Edwards Physio II Annuloplasty Ring (Edwards Lifesciences, Irvine, Calif) selected in accordance with the true size of the anterior leaflet.

Antithrombotic Management

Oral anticoagulation therapy, warfarin sodium, was initiated on postoperative day 1. The international normalized ratio was targeted at 2.0 to 2.5. In patients who were in sinus rhythm, anticoagulation therapy was discontinued at 3 months after surgery. In patients with atrial fibrillation, permanent anticoagulation therapy was applied. Oral antiplatelet drug, acetylsalicylic acid, was initiated on postoperative day 1 and continued permanently.

Follow-up

The patients were assessed at Shiga University of Medical Science 3 months after their initial surgery, and subsequent follow-up data were obtained annually or biennially through direct visits. The clinic visits included a history and physical examination, electrocardiogram, chest radiograph, and transthoracic echocardiogram. The mean follow-up period was 2.2 ± 1.6 years (median, 2.0; maximum, 5.5) for the Butterfly group and 6.1 ± 2.5 years (median, 6.2; maximum, 10.1) for the Quadrangular group. Clinical and echocardiographic follow-up information was available for 100% in the Butterfly group and for 94% in the Quadrangular group. The grade of mitral regurgitation was classified as none, trace, mild, moderate, or severe according to the American College of Cardiology/American Heart Association 2006 guidelines.⁴

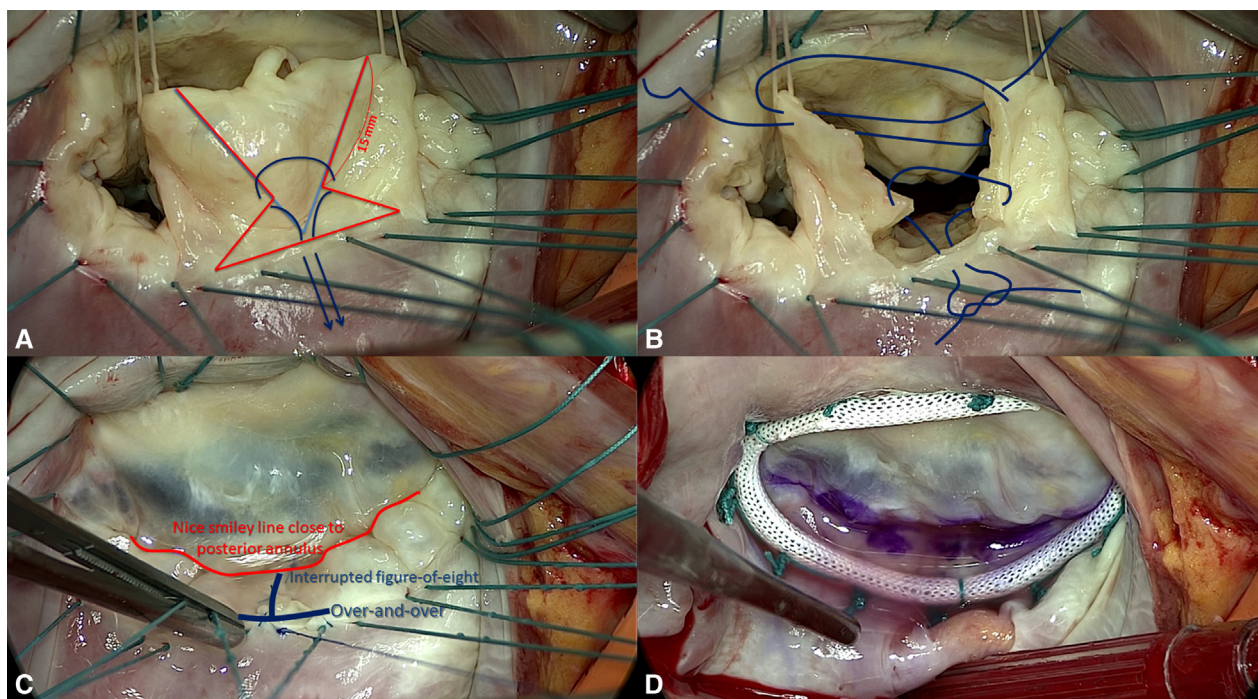


FIGURE 1. Details of butterfly resection: A, Butterfly resection is designed at the posterior leaflet segment, measuring the free edge. B, Conserved margins are being brought to the annulus. C, Symmetric coaptation line is formed close to the posterior annulus. D, After the ring annuloplasty, adequately wide coaptation area is confirmed.

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