Mitral Valve Repair
Bileaflet Prolapse

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Disclosures

Speaker/consultant
- Edwards Lifesciences
- Medtronic
- Abbott
- Cryolife
- AtriCure
- ClearFlow

Research support
- Abbott
# Barlow’s Disease

- Excess mucopolysaccharides on histology
- Young age at presentation
- **Excess leaflet tissue**
- Annular dilatation
- **Bileaflet prolapse** and/or billowing of leaflets into atrium during systole

<table>
<thead>
<tr>
<th>Fibroelastic deficiency</th>
<th>Barlow disease</th>
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<tbody>
<tr>
<td>Age at diagnosis</td>
<td>&gt; 60 y old</td>
</tr>
<tr>
<td>History of mitral regurgitation</td>
<td>&lt; 5 y</td>
</tr>
<tr>
<td>Annular dilation</td>
<td>↑ (= ≤ 32 mm)</td>
</tr>
<tr>
<td>Leaflet tissue</td>
<td>Thin translucent with some excess tissue</td>
</tr>
<tr>
<td>Segmental distribution</td>
<td>Usually single segment (P2)</td>
</tr>
<tr>
<td>Chordae tendinae</td>
<td>Thin and ruptured</td>
</tr>
<tr>
<td>Calcification</td>
<td>+</td>
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A comparison of outcomes of mitral valve repair for degenerative disease with posterior, anterior, and bileaflet prolapse

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Objective: We sought to compare the clinical outcomes of mitral valve repair for mitral regurgitation in patients with degenerative disease involving the mitral valve with posterior, anterior, or bileaflet prolapse.

Methods: Patients underwent operations from January 1990 to December 2000. In this study, 92 had posterior (mean age, 60.4 years), 92 had anterior (mean age, 65.4 years), and 80 had bileaflet (mean age, 56.4 years) prolapse. Patients with posterior prolapse had higher New York Heart Association functional class (P = .04) and had more associated aortic valve disease (P = .01) and aortic root dilatation (P < .001). Anterior prolapse was associated with a greater degree of mitral annular calcification (P = .03). Bileaflet prolapse was associated with more severe mitral regurgitation (P = .003) and more associated procedures (P = .001). The incidence of mitral regurgitation grade 3 or 4 (P = .001) and severe mitral regurgitation was lower in posterior prolapse (P = .002) compared with anterior prolapse. In multivariate analysis, factors associated with worse outcome were mitral regurgitation grade 3 or 4, bileaflet prolapse, and aortic root dilatation.

Site of Prolapse:

- Posterior Prolapse
- Bileaflet Prolapse
- Anterior Prolapse

(Bar chart showing percentages for each type of prolapse)
Freedom from Reoperation

Freedom from Reoperations (%)

Years Postoperatively

$P=0.019$

David et al. / The Journal of Thoracic and Cardiovascular Surgery ● November 2005
Freedom from Recurrent Moderate or Severe Mitral Regurgitation

Freedom from MR 3+ or 4+ (%)

Years Postoperatively

P=0.0013

David et al. / The Journal of Thoracic and Cardiovascular Surgery ● November 2005
Survival Advantage and Improved Durability of Mitral Repair for Leaflet Prolapse Subsets in the Current Era

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Background. Factors predicting long-term survival and reoperative risk after mitral valve repair for subsets with prolapse involving the anterior leaflet in the current era are unclear.

Methods. Between January 1, 1980 and December 31, 1999, surgical correction of mitral regurgitation was performed in 2,219 patients. We analyzed a subset of 1,411 patients with isolated mitral regurgitation due to leaflet prolapse undergoing mitral repair or replacement (± coronary bypass).

Results. Mean age was 64 years, and 1,003 (71%) were men. Mitral repair was performed in 1,173 (83%) patients. Factors independently predicting overall long-term survival included valve repair, younger age, better functional class, and the absence of significant coronary artery disease. After adjusting for these, smaller preoperative left ventricular end-systolic dimension and lower ejection fraction were associated with increased risk of death following repair as compared to replacement. The risk of reoperation for recurrent or residual mitral regurgitation was not significantly different between repair and replacement. Patients with isolated prolapse of the anterior leaflet benefited from repair to a similar degree as patients with other causes of prolapse (p = 0.86). Repair was associated with a significantly lower rate of infective endocarditis (HR = 0.63, p = 0.03). Repair was associated with a significant survival advantage when compared to replacement among patients with prolapse of the anterior leaflet (p = 0.0001).

Conclusion. Mitral repair is associated with superior long-term survival and durability when compared to replacement for isolated prolapse of the anterior leaflet.
Reoperation and Site of Prolapse

Long-term results of mitral valve surgery for degenerative anterior leaflet or bileaflet prolapse: analysis of negative factors for repair, early and late failures, and survival

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Abstract

OBJECTIVES: To evaluate the feasibility of mitral valve repair in patients with degenerative leaflets prolapse, to evaluate which factors predisposing patients to replacement. To compare long-term adjusted survival of patients submitted to replacement (Group Replacement), and investigate causes of death in a study of degenerative leaflets prolapse.

METHODS: From January 1992 through December 2012, 768 patients with degenerative leaflets prolapse were included in the study population. Isolated ALP was present in 274 patients (54.7%) and ALP associated with other mitral lesions in 494 patients (45.3%).

RESULTS: Patients with ALP were significantly older (64.4 ± 12.1 vs 54.1 ± 14.1 years, P < 0.001) and with higher incidence of atrial fibrillation (26.2% vs 31.0%, P < 0.001). The adjusted survival rate at 20 years was similar between repair and replacement (80% vs 78.1%, respectively, P = 0.47). The mortality rate of 1.2% (0.3% in the last decade) and no differences related function, previous cardiac surgery, multiple segment prolapse, mitral regurgitation grade 3 and 4, and independent associated with replacement.

G.F. Coutinho et al. / European Journal of Cardio-Thoracic Surgery
Patients over 60 Years

Survival (%) vs. Years after Surgery

Repair
Replacement

$P<0.001$
Repair for Bileaflet Prolapse

- Survival
  - Superior to replacement
- Durability
  - Good
  - Lower than for repair of posterior prolapse
Repair for Bileaflet Prolapse

Best Option
Repair for Bileaflet Prolapse

Repair Strategy
Repair for Bileaflet Prolapse

Jet *Direction* + SAM Risk
SAM Predictors

• Coaptation-septum distance $<$ 25 mm
• Aorto-mitral angle $<$ 120 °
• Posterior leaflet height $>$ 15 mm
• Ant/post leaflet height $\leq$ 1.3
• Basal septal diameter $\geq$ 15 mm
• EDD $<$ 45 mm
• Hyperdynamic ventricle

Varghese et al. European J C-T Surg 2013
SAM Predictors

Too much leaflet tissue

Relative to the ventricle
Repair for Bileaflet Prolapse

Jet Direction + SAM Risk
Bileaflet Prolapse: Jet Direction

- **Central jet**
  - Low SAM risk: Annuloplasty band alone
  - High SAM risk: Posterior leaflet resection/annuloplasty band

- **Anterior jet**
  - Posterior leaflet resection/annuloplasty band
Central Jet: Low SAM Risk
Central Jet: Low SAM Risk

Annuloplasty Band Alone
Simple repair approach for mitral regurgitation in Barlow disease

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ABSTRACT

Objective: Mitral valve repair for myxomatous Barlow disease is a challenging procedure requiring complex surgery with less than optimal results. The use of ring-only repair has been previously reported but never analyzed on follow-up. We investigated this simple valve repair approach for patients with severe and multisegment involvement causing mainly central jet.

Methods: Of 572 patients who underwent mitral valve repair for mitral regurgitation at our medical center, 24 with Barlow disease (aged 47 ± 14 y, 11 male) underwent ring-only repair. Patients were characterized by an enlarged mitral valve annulus, multisegment prolapse involving both leaflets, and demonstrated mainly a central wide regurgitant jet. Surgical approach included only the implantation of a large mitral annuloplasty ring. Immediate and late outcome results were compared with those of the remaining patients who underwent conventional mitral valve repair for degenerative disease (controls).

Results: All ring-only patients presented with moderate-severe/severe MR, regurgitation (vena contracta, 0.6 ± 0.1 cm; regurgitation volume: 52 ± 17 mL), with mainly a central jet and almost preserved ejection fraction (50.8 ± 7.8%). Cardiopulmonary bypass and cross-clamp time were lower. The left ventricle improved in size and function (22.4 ± 15.4% vs 14.3 ± 10.4%) as compared with controls (P < 0.0001).

Zekry et al., JTCS: Volume 150, Number 5
Barlow’s disease is characterized by an enlarged annulus and excess prolapsing leaflet tissue.

Reducing annular size with ring reduces triangular base → mitral leaflets are pushed down toward the left ventricle to coapt at the left ventricle level.
Central Jet & High SAM Risk OR Anterior Jet Quadrangular Resection & Sliding Repair
Anterior Jet
Bileaflet Prolapse
Normal anatomy: leaflet coaptation occurring at the annular level

Anterior chords intact but loss of posterior leaflet support to anterior leaflet at the zone of coaptation allows anterior leaflet prolapse
Sliding Repair
“True” Bileaflet Prolapse
Pronounced Bileaflet Pathology

- Jets
  - Multiple
  - Anterior and posterior
- Bileaflet repair
  - Posterior leaflet: sliding repair
  - Anterior leaflet: artificial chordae
Minimally Invasive Approach?
Robotic Mitral Valve Repair for Anterior Leaflet and Bileaflet Prolapse

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Background. Centers have expanded indications for robotic mitral valve repairs to include complex pathologic features. We studied our results after robotic mitral valve repair for anterior leaflet or bileaflet prolapse.

Methods. Data were collected contemporaneously on 289 patients operated on from May 2000 to September 2006. Every patient underwent preoperative transesophageal echocardiography. Follow-up consisted of serial echocardiograms, clinic visits, and phone conversations with patients and their physicians.

Results. A total of 66 patients (anterior leaflet, n = 14; and bileaflet, n = 52) were identified. Mean age was 52.6 ± 7.1 years, and 57 (86%) patients had New York Heart Association functional class II or III symptoms. Cardiopulmonary bypass and cross-clamp times were 171 ± 52 and 132 ± 39 minutes, respectively. The 30-day and late mortality rates were 3% (n = 2) for each time point. There were no device-related or perfusion-related complications or sternotomy conversions. Complications included 2 strokes (3%), 2 bleeding reexplorations (3%), and 10 pleural effusions requiring intervention (15%). The length of hospital stay for surviving patients was 5 ± 3 days, and time to extubation averaged 9.5 ± 13 hours. A total of 6 (9%) patients required valve reoperation. Mean follow-up was 795 ± 495 days, and echocardiographic mitral regurgitation (n = 60) was none or trace (n = 35, 58.3%), mild (n = 19, 31.6%), moderate (n = 2, 3.3%), and severe (n = 4, 6.7%).

Conclusions. Robotic mitral valve repair for anterior leaflet and bileaflet prolapse is feasible and safe. Outcomes and degree of late mitral regurgitation are similar to series using conventional techniques. Long-term follow-up is required to formally address the efficacy of robotic repair techniques.

Minimally invasive mitral valve repair in Barlow’s disease: Early and long-term results

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Objective: Barlow’s disease remains a challenging surgical pathology in patients presenting with mitral regurgitation. We reviewed our early and long-term results for patients with Barlow’s disease who underwent minimally invasive mitral valve surgery.

Methods: Between 1999 and 2010, 145 patients with Barlow’s disease underwent minimally invasive mitral valve repair at Leipzig Heart Center. Preoperative echocardiography and intraoperative valve analysis confirmed annular dilatation, bileaflet prolapse, and excessive leaflet tissue in all cases. We retrospectively reviewed mitral valve repair techniques, early and late postoperative clinical outcomes, and follow-up echocardiographic data.

Results: Successful mitral valve repair was performed in 94.5% of patients (n = 137), initial mitral valve replacement was performed in 2.8% of patients (n = 4), and mitral valve replacement after unsuccessful mitral valve repair was performed in 2.8% of patients (n = 4). Mean aortic crossclamp time was 99 ± 33 minutes, cardiopulmonary bypass time was 153 ± 47 minutes, and total duration of surgery was 200 ± 44 minutes. Mitral valve repair techniques consisted of ring annuloplasty and a variety of other methods (not mutually exclusive): “loop” neochordae (72% of patients), posterior mitral leaflet resection (28%), Alfieri stitch (17%), commissural plication (9%), chordal transfer (9%), and anterior mitral leaflet resection (7%). Concomitant procedures consisted of cryoablation for atrial fibrillation (28%), tricuspid valve repair (6%), and closure of an atrial septal defect/patent foramen ovale (12%). Thirty-day mortality was 1.4% (n = 2), rethoracotomy for bleeding was required in 4.1% of patients (n = 6), and conversion to sternotomy was required in 1 patient (0.7%). Long-term clinical follow-up was obtained in 100% of patients, and long-term echocardiographic data was obtained in 99% of surviving patients. Long-term survival was 80.7% at 5 years for patients who underwent minimally invasive mitral valve repair.
Freedom from MR >2+

Cumulative freedom from MR > 2+ (%)

Time since surgery (years)

5-year: 90.2% ± 3.4%
10-year: 88.4% ± 3.9%

Borger et al., JTCS: October 2014
Cumulative freedom from reoperation (%)

5-year: 96.8% ± 1.6%
10-year: 93.8% ± 2.6%

Borger et al., JTCS: October 2014
Barlow’s

Valve repair

- Preferable
- Possible in most
- Guided by jet direction and SAM risk
- Minimally invasive approach not precluded
Thank You