Primary vs Secondary Mitral Regurgitation: Tailoring Treatment to the Patient and Setting

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Northwestern Memorial Hospital
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No Relationships to Disclose
### Stages of Valvular Heart Disease

<table>
<thead>
<tr>
<th>Stage</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Risk of valve disease</td>
</tr>
<tr>
<td>B</td>
<td>Mild - moderate asymptomatic disease</td>
</tr>
</tbody>
</table>
| C     | Severe valve disease but asymptomatic  
C1: Normal LV function  
C2: Depressed LV function |
| D     | Severe, symptomatic valve disease |

*RHD, MVP, HF, post MI*
Mitral regurgitation

Primary MR: primary valve disease
Secondary MR: primary myocardial disease

Degenerative

Functional
Mitral regurgitation

Primary MR: primary valve disease

Secondary MR: primary myocardial disease
Indications for mitral valve surgery for degenerative MR?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

• Symptomatic patients

class I
Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
- LV systolic dysfunction

LVEF <60%

Class I
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction

LVEF <60%
LVSD >40mm
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients  
  - LV systolic dysfunction  
  - Pulmonary hypertension  
- Asymptomatic patients  
  - Pulmonary hypertension

Class:

- Symptomatic patients: class I
- Asymptomatic patients: class IIa
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
- Asymptomatic patients
  - PASP >50 mmHg at rest

class I

class I

class IIa
**Mitral regurgitation**

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients  
  - LV systolic dysfunction  
  - Pulmonary hypertension  
  - Atrial fibrillation  
  
- Asymptomatic patients  
  - LV systolic dysfunction  
  - Pulmonary hypertension  
  - Atrial fibrillation  

- **Class I**
- **Class IIa**
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation
  - Normal LV function, repair feasible?

class I

class I

class IIa

class IIa
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?
- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation
  - Normal LV function, repair feasible?

MV repair to improve survival?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation
  - *Normal LV function, repair feasible?*

MV repair to improve survival? 
What is the natural history?
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation
  - Normal LV function, repair feasible?

Asymptomatic severe primary MR:
66% come to surgery in 5 years because of symptoms, LV dysfunction, pulmonary hypertension or AF
Mitral regurgitation

Indications for mitral valve surgery for degenerative MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - Pulmonary hypertension
  - Atrial fibrillation
  - Normal LV function, repair feasible?

Severe primary MR:
Long-term postoperative survival is worse if surgery is performed after patients become symptomatic
Late Outcomes of Mitral Valve Repair for Mitral Regurgitation Due to Degenerative Disease

Tirone E. David, MD; Susan Armstrong, MSc; Brian W. McCrindle MD; Cedric Manlihot, BSc

Background—The pathogenesis of mitral regurgitation (MR) is broad, and there are many different underlying pathologies. This study examined the long-term survival of patients undergoing mitral valve surgery for MR due to degenerative disease.

Methods and Results—All patients were prospectively followed for a median time of 10.4 years. Clinical, hemodynamic, and echocardiographic variables were recorded. Age, left ventricular ejection fraction, and New York Heart Association functional class were important predictors of survival in both univariate and multivariable analysis. Mitral valve repair (MVr) was the preferred surgical option except for patients with severe MR due to degenerative disease with high degree of myxomatous changes. MVr was associated with improved survival and absence of heart failure symptoms. Freedom from moderate or severe MR was 51% at 10 years.

Conclusions—MV repair for degenerative mitral regurgitation results in good mid-term and long-term outcomes. Improved survival was associated with postoperative NYHA class I or II. (Circulation 2013;127:1485-1492)
Indications for MV repair for asymptomatic primary MR:

- Chronic severe MR
- Preserved LV function
- Experienced surgical center
- Likelihood of durable repair without residual MR > 95%
Mitral regurgitation

Indications for MV repair for asymptomatic primary MR:

- Chronic severe MR
- Preserved LV function
- Experienced surgical center
- Likelihood of durable repair without residual MR > 95%

- Preserved LV function
- Likelihood of durable repair and low risk for surgery, and
- LA dilatation >60 ml/m²
  -- or --
  Exercise PAP >60 mmHg

class IIa

class IIb
Mitral regurgitation

Indications for MV repair for asymptomatic primary MR:

- Chronic severe MR
- Preserved LV function
- Experienced surgical center
- Likelihood of durable repair without residual MR > 95%.

- Repair better than mitral valve replacement
- Patients should be referred to centers experienced in repair

class IIa

class I
Mitral repair best practice: proposed standards

B Bridgewater, T Hooper, C Munsch, S Hunter, U von Oppell, S Livesty, B Keogh, F Wells, M Patrick, J Kneeshaw, J Chambers, N Masani, S Ray

Heart 2006;92:939-944

19 criteria for best practice:
- Surgical training
- Intraoperative echocardiography
- Volume thresholds
- Audit
- Cardiology and imaging

Rigorous criteria

Surgeon: >25/yr
Hospital: >50/yr

Operative mortality <1%
5 year reoperation <5%
The Time Has Come to Define Centers of Excellence in Mitral Valve Repair

Robert O. Bonow, MD, MS, David H. Adams, MD

J Am Coll Cardiol 2016;67:499-501

Centers of Excellence in Mitral Valve Repair

Criteria:

- MV surgery volume requirement (center and surgeon)
- Expert periprocedural imaging capabilities
- Access to transcatheter technology
- Transparency regarding outcomes including: repair rates, mortality rates, stroke rates, repair durability
Mitral regurgitation

Indications for transcatheter MV repair for severe degenerative MR:

- Chronic severe MR
- Severely symptomatic
- Prohibited surgical risk
- Reasonable life expectancy

class IIb
Mitral regurgitation

Primary MR: primary valve disease

Secondary MR: primary myocardial disease
Mitral regurgitation

Primary MR: primary valve disease

Secondary MR: primary myocardial disease

• Diagnostic dilemmas
• Therapeutic dilemmas
Defining “Severe” Secondary Mitral Regurgitation
Emphasizing an Integrated Approach

Paul A. Grayburn, MD,‡ Blasé Carabello, MD,† Judy Hung, MD,§ Linda D. Gillam, MD,∥ David Liang, MD,¶ Michael J. Mack, MD,# Patrick M. McCarthy, MD,**, D. Craig Miller, MD,† Alfredo Trento, MD,‡ Robert J. Siegel, MD||

J Am Coll Cardiol 2014;54:2792-2801

What is “severe” secondary MR?
Secondary mitral regurgitation:
...a marker of a sicker LV
- or -
...a contributor to a sicker LV?
Secondary mitral regurgitation: 
...a marker of a sicker LV 
- or - 
...a therapeutic target?
Functional mitral regurgitation can be repaired.

But should it be repaired?
Functional mitral regurgitation can be repaired. But should it be repaired? ... or replaced?
Secondary mitral regurgitation

Guideline-directed medical therapy for heart failure, including CRT

class I
Secondary mitral regurgitation

Guideline-directed medical therapy for heart failure, including CRT

Indications for mitral valve surgery:

- Patients with severe MR undergoing CABG or AVR

class I

class IIa
Secondary mitral regurgitation

Guideline-directed medical therapy for heart failure, including CRT

Indications for mitral valve surgery:

- Patients with severe MR undergoing CABG or AVR
- Severe MR, persistent symptoms despite optimal medical therapy, including CRT
Indications for mitral valve surgery:

- Patients with severe MR undergoing CABG or AVR
- Severe MR, persistent symptoms despite optimal medical therapy, including CRT
- Patients with moderate MR undergoing CABG or AVR

Guideline-directed medical therapy for heart failure, including CRT

class I

class IIa

class IIb
Baseline

Optimized Medical Therapy and Biventricular Pacing
Correction of Mitral Regurgitation in Nonresponders to Cardiac Resynchronization Therapy by MitraClip Improves Symptoms and Promotes Reverse Remodeling

Angelo Auricchio, MD, PtlD,* Wolfgang Schillinger, MD,‡ Sven Meyer, MD,§ Francesco Maisano, MD,§ Rainer Hoffmann, MD,¶ Gian Paolo Ussia, MD,¶ Giovanni B. Pedrazzini, MD,* Jan van der Heyden, MD,# Simona Fratini, MD, PtlD,** Catherine Klersy, MD, MSc,†† Jan Komtebedde, DVM,* Olaf Franzen, MD,‡ on behalf of the PERMIT-CARE Investigators

Lugano, Switzerland; Göttingen, Hamburg, and Aachen, Germany; Milan, Catania, L'Aquila, and Pavia, Italy; and Nieuwegein, the Netherlands

J Am Coll Cardiol 2011;58:2183–9
Secondary mitral regurgitation

Indications for transcatheter MV repair for severe secondary MR:

- Severe secondary MR
- Severely symptomatic
- Prohibited or high surgical risk
- Reasonable life expectancy
Prevalence of MR in Patients with LV Dysfunction

<table>
<thead>
<tr>
<th>Authors</th>
<th>Journal</th>
<th>Year</th>
<th>N</th>
<th>Prevalence MR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yiu et al</td>
<td>Circulation 2000</td>
<td>2000</td>
<td>128</td>
<td>63%</td>
</tr>
<tr>
<td>Grigioni et al</td>
<td>Circulation 2001</td>
<td>2001</td>
<td>303</td>
<td>64%</td>
</tr>
<tr>
<td>Koelling et al</td>
<td>Am Heart J 2002</td>
<td>2002</td>
<td>1436</td>
<td>49% *</td>
</tr>
<tr>
<td>Trichon et al</td>
<td>Am J Cardiol 2003</td>
<td>2003</td>
<td>2057</td>
<td>56%</td>
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<tr>
<td>Robbins et al</td>
<td>Am J Cardiol 2003</td>
<td>2003</td>
<td>221</td>
<td>59%</td>
</tr>
<tr>
<td>Cleland et al</td>
<td>N Engl J Med 2004</td>
<td>2004</td>
<td>605</td>
<td>50% *</td>
</tr>
<tr>
<td>Grayburn et al</td>
<td>J Am Coll Cardiol 2005</td>
<td>2005</td>
<td>336</td>
<td>77%</td>
</tr>
<tr>
<td>Bursi et al</td>
<td>Circulation 2005</td>
<td>2005</td>
<td>303</td>
<td>50%</td>
</tr>
<tr>
<td>Acker et al</td>
<td>J Thorac CV Surg 2006</td>
<td>2006</td>
<td>300</td>
<td>66%</td>
</tr>
<tr>
<td>Di Mauro et al</td>
<td>Ann Thorac Surg 2006</td>
<td>2006</td>
<td>239</td>
<td>75%</td>
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<tr>
<td>Rossi et al</td>
<td>Heart 2011</td>
<td>2011</td>
<td>1300</td>
<td>74%</td>
</tr>
<tr>
<td>Deja et al</td>
<td>Circulation 2012</td>
<td>2012</td>
<td>599</td>
<td>63%</td>
</tr>
<tr>
<td>Onishi et al</td>
<td>Circ Heart Fail 2013</td>
<td>2013</td>
<td>277</td>
<td>48% *</td>
</tr>
</tbody>
</table>

*Patients with moderate to severe MR
Average hospital mortality: 8.8%
• Low volume centers: 13.0%
• High volume centers: 6.0%

Data from national Medicare database 1994-1999
684 hospitals
142,488 AVRs

Prevalence of Heart Failure
United States

Source: NHANES, CDC, and American Heart Association
Prevalence of Atrial Fibrillation
The ATRIA Study

Go et al, JAMA 2001;285:2370-2375
Average hospital mortality: 8.8%

- Low volume centers: 13.0%
- High volume centers: 6.0%

Data from national Medicare database 1994-1999

684 hospitals
142,488 AVRs

Prevalence of Mitral Valve Disease