Primary Mitral Regurgitation: When Is It Time To Intervene?

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Editor-in-Chief
JAMA Cardiology

No Relationships to Disclose
2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

A Report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines

Developed in Collaboration With the American Association for Thoracic Surgery,
American Society of Echocardiography, Society for Cardiovascular Angiography and Interventions,
Society of Cardiovascular Anesthesiologists, and Society of Thoracic Surgeons

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### Stages of Valvular Heart Disease

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

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- RHD, MVP, HF, post MI
Mitral regurgitation

Degenerative MR: primary valve disease

Functional MR: primary myocardial disease
Mitral regurgitation

Primary mitral regurgitation
Secondary mitral regurgitation
Mitral regurgitation

Primary mitral regurgitation

Secondary mitral regurgitation
Mitral regurgitation

Indications for mitral valve surgery
Mitral regurgitation

Indications for mitral valve surgery
Mitral regurgitation

Indications for mitral valve surgery

MR Severity:

- RV = 68 ml
- RF = 60%
- ERO = 0.48 cm²

Severe MR:

- > 60 ml
- > 50%
- > 0.4 cm²
Chronic Mitral Regurgitation

**56 year old healthy man**

Echo findings:
- Dilated left ventricle
- Normal LV systolic function
- Myxomatous leaflets with MVP
- Dilated left atrium
- Normal pulmonary artery pressure
- Severe mitral regurgitation
Chronic Mitral Regurgitation

56 year old healthy man

Issues:
- Surgery?
- Medical therapy?
Chronic Mitral Regurgitation

56 year old healthy man

Issues:

• Surgery?
• Medical therapy?
• Transcatheter repair?
Chronic Mitral Regurgitation

56 year old healthy man

Issues:
• Surgery?
• Medical therapy?
• Transcatheter repair?

Indications for transcatheter MV repair for severe primary MR:
• Chronic severe MR
• Severely symptomatic
• Prohibited surgical risk
• Reasonable life expectancy
(class IIb)
Chronic Mitral Regurgitation

56 year old healthy man

Issues:

• Surgery?
• Medical therapy?
• Transcatheter repair?
Chronic Mitral Regurgitation

56 year old healthy man

Issues:

• Surgery?
• Medical therapy?
• Transcatheter repair?
Mitral regurgitation

Indications for mitral valve surgery for severe primary MR?

• Symptomatic patients class I
Indications for mitral valve surgery for severe primary MR?

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

Indications for mitral valve surgery for severe primary MR?

- Symptomatic patients
- Asymptomatic patients
- LV systolic dysfunction

LVEF <60%

class I

class I
Mitral regurgitation

Indications for mitral valve surgery for severe primary MR?

- Symptomatic patients
- Asymptomatic patients
- LV systolic dysfunction

LVEF <60%
Mitral regurgitation

Indications for mitral valve surgery for severe primary MR?

- Symptomatic patients
- Asymptomatic patients
  - LV systolic dysfunction
  - LVEF <60%
  - LVSD >40mm
Mitral regurgitation

Indications for mitral valve surgery for severe primary MR?

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

Indications for mitral valve surgery for severe primary MR?

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

PASP >50 mmHg at rest
Mitral regurgitation

Indications for mitral valve surgery for severe primary MR?

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

class I

class I

class IIa

class IIa
Mitral regurgitation

Indications for mitral valve surgery for severe primary 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 severe primary 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 severe primary MR?

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

What is the natural history?

MV repair to improve survival?
Mitral regurgitation

Indications for mitral valve surgery for severe primary MR?

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

Asymptomatic severe degenerative MR:

- 66% come to surgery in 5 years because of symptoms, LV dysfunction, pulmonary hypertension or AF
- Long-term postoperative survival is worse if surgery is performed after patients become symptomatic
Surgery for Acquired Cardiovascular Disease

Late outcomes of mitral valve repair for floppy valves: Implications for asymptomatic patients

Tirone E. David, MD
Joan Ivanov, PhD
Susan Armstrong, MSc
Harry Rakowski, MD

J Thorac Cardiovasc Surg 2003;125:1143-1152
Mitral Regurgitation

Survival After Mitral Valve Surgery

Survival (percent)

Time (years)

Expected

n=488

p<0.001

64%

David et al, J Thorac Cardiovasc Surg 2003;126:1143-1152
Mitral Regurgitation
Survival After Mitral Valve Surgery

Surgery for Acquired Cardiovascular Disease

Late outcomes: Implications for clinical practice

Tirone E. David, MD
Joan Ivanov, PhD
Susan Armstrong, MS
Harry Rakowski, MD

FC I-II
58%
n=488
p<0.001

FC III-IV
81%

Survival (percent)
0 20 40 60 80 100
0 2 4 6 8 10 12 14
Time (years)

David et al, J Thorac Cardiovasc Surg 2003;126:1143-1152
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 Manlhiot, BSc

Background—The pathophysiology of mitral regurgitation (MR) is broad, and there are many etiologies and pathologies. This study examined outcomes of mitral valve surgery for degenerative MR.

Methods and Results—All consecutive patients who underwent mitral valve repair or replacement were prospectively followed at a mean of 10.4 years. Clinical, hemodynamic, and echocardiographic data were collected at baseline and annually. Survival was estimated using the Kaplan-Meier method. Multivariable analysis was performed with Cox proportional hazards modeling. Most patients had repeat MV surgery during follow-up. One patient in the control group had severe MR developed in 3 years. The greatest degree of myxomatous change was associated with increased risk of death and freedom from moderate or severe MR.

Conclusions—MV repair for degenerative MR was associated with improved outcomes compared to medical therapy. (Circulation 2013;127:1485-1492)

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**Mitral Regurgitation**

**Survival After Mitral Valve Surgery**

![Graph showing survival rates over time for different functional classes (FC) of mitral regurgitation.](image)

- **FC I**
  - 75% survival
- **FC II**
  - 66% survival
- **FC III**
  - 52% survival
- **FC IV**
  - 32% survival

**Survival (percent)**

- n=840
- p<0.001

**Time (years)**

0 2 4 6 8 10 12 14 16 18 20

---

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%.

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

class Ia

class I
Mitral repair best practice: proposed standards

B Bridgewater, T Hooper, C Munsch, S Hunter, U von Oppell, S Livesly, 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%
Predictors of Mitral Valve Repair: Clinical and Surgeon Factors

Steven F. Bolling, MD, Shuang Li, MS, Sean M. O’Brien, PhD, J. Matthew Brennan, MD, Richard L. Prager, MD, and James S. Gammie, MD

Section of Cardiac Surgery, University of Michigan, Ann Arbor, Michigan; Duke Clinical Research Institute, Durham, North Carolina; and Division of Cardiac Surgery, University of Maryland, Baltimore, Maryland


28,507 patients
1,088 surgeons
639 hospitals
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Ann Thorac Surg 2010;90:1904-17

Mitral Regurgitation 2005-2007

28,507 patients
1,088 surgeons
639 hospitals

Mean rate of repair: 41%
Median number of MV operations: 5

>50/year: 16 surgeons
>100/year: 3 surgeons
Mitral valve repair rates correlate with surgeon and institutional experience

Damien J. LaPar, MD, MSc, Gorav Ailawadi, MD, James M. Isbell, MD, MSCI, Ivan K. Crosby, MD, John A. Kern, MD, Jeffrey B. Rich, MD, Alan M. Speir, MD, and Irving L. Kron, MD, Investigators for the Virginia Cardiac Surgery Quality Initiative

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Investigators for the Virginia Cardiac Surgery Quality Initiative

Hospital volume, mitral repair rates, and mortality in mitral valve surgery in the elderly: An analysis of US hospitals treating Medicare fee-for-service patients

Christina M. Vassileva, MD, a Christian McNeely, BS, a John Spertus, MD, b Stephen Markwell, MA, a and Stephen Hazelrigg, MD a

J Thorac Cardiovase Surg 2015;149:762-8

Medicare data 2000-2009
1239 hospitals performing MV surgery

Number of MV operations/year:
• 91% performed ≤40
• 51% performed ≤10
• 29% performed ≤5

Number of MV repairs/year:
• 94% performed ≤20
• 65% performed ≤5
• 23% performed ≤1
Mitral regurgitation: Determinants of referral for cardiac surgery by Canadian cardiologists

Karine Toledano MD, Lawrence G Rudski MD, Thao Huynh MD, François Béïque MD, John Sampalis MD, Jean-François Morin MD


La régurgitation mitrale : Les déterminants d’aiguillage en chirurgie cardiaque par les cardiologues canadiens
Mitral regurgitation: Determinants of referral for cardiac surgery by Canadian cardiologists

Karine Toledano MD, Lawrence G Rudski MD, Thao Huynh MD, François Béique MD,

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### CLINICAL STUDIES

**Mitral regurgitation: Determinants of referral for cardiac surgery by Canadian cardiologists**

Karine Toledano MD, Lawrence G Rudski MD, Thao Huynh MD, François Béique MD,


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VALVULAR HEART DISEASE

Failure of Guideline Adherence for Intervention in Patients With Severe Mitral Regurgitation

David S. Bach, MD, Mazen Awais, MD, Hitinder S. Gurm, MD, Sarah Kohnstamm, MD

J Am Coll Cardiol 2009;54:860–5

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<tr>
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<th>All Patients</th>
<th>Unoperated</th>
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<tbody>
<tr>
<td>n</td>
<td>112</td>
<td>53</td>
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<tr>
<td>Symptoms</td>
<td>53</td>
<td>24</td>
<td>45%</td>
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<tr>
<td>LVIDS ≥45 mm</td>
<td>11</td>
<td>6</td>
<td>55%</td>
</tr>
<tr>
<td>LVEF ≤60%</td>
<td>50</td>
<td>24</td>
<td>48%</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>26</td>
<td>12</td>
<td>46%</td>
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<tr>
<td>RVSP &gt;50 mm Hg</td>
<td>25</td>
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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