Primary Mitral Regurgitation: without/with Heart Failure, Age 60 years

Ani C Anyanwu, MD

Professor and Vice-Chairman
Department of Cardiovascular Surgery
The Mount Sinai Medical Center
New York, USA
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. How is the Valve?

2. How is the patient feeling?

3. How is the heart?

4. How is the surgeon and what is the most likely operative result?

5. Is there reasonable expectation of net benefit of surgery?
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How is the Valve?**
   - Severity
   - Etiology
   - Repairability
Figure 4. Indications for Surgery for MR
Figure 4. Indications for Surgery for MR

Mitral Regurgitation

Primary MR

Severe MR
- Vena contracta ≥0.7 cm
- RVol ≥60 mL
- RF ≥50%
- ERO ≥0.4 cm²
- LV dilation

Symptomatic (stage D)

LVEF >30%

NO

MV Surgery* (IIb)

YES

Asymptomatic (stage C)

LVEF 30% to <60%

LVEF >60% and LVESD <40 mm (stage C2)

NO

MV Surgery* (I)

YES

LVEF >60% and LVESD <40 mm (stage C1)

New onset AF or PASP >50 mm Hg (stage C1)

Likelihood of successful repair >95% and Expected mortality <1%

NO

MV Repair (IIa)

YES

Progressive MR
- (stage B)
- Vena contracta <0.7 cm
- RVol <60 mL
- RF <50%
- ERO <0.4 cm²

CABG
- HF Rx
- Consider CRC

Symptomatic severe MR (stage D)

Asymptomatic severe MR (stage C)

Progressive AR (stage B)

Persistent NYHA class III-IV symptoms

MV Surgery* (IIb)

Periodic Monitoring

Class I

Class IIa

Class IIb
Severity of Mitral Regurgitation
(All the surgeon wants to know)

- SEVERE (intervene)
- MODERATE (observe)
- MILD (ignore)
- Or “DON’T KNOW” (seek further diagnostic data)

- Other distinctions, quantitative measurements and categorizations are unhelpful to the surgeon
The Pathophysiological Triad

- **Etiology**
- **Lesions**
- **Dysfunction**

Carpentier et al. J Thorac Cardiovasc Surg 1983;86

**Mr. President,**

I would like to begin by expressing my gratitude to the Association for the privilege of presenting the Honored Guest Lecture at the Sixty-third Annual Meeting of The American Association for Thoracic Surgery. What surprises me the most in this meeting is my presence on this podium, since this honor is usually reserved for more senior and prominent figures in thoracic surgery. I suppose that you wanted to distinguish a team rather than a man, so that I would identify the badge, I observed with great admiration and respect the famous people wearing a white printed badge and seated in a carefully delineated area of reserved seats! Permit me to tell you how proud I am to enter your prestigious circle.

Guests, you are seated outside this circle, but only temporarily! I address you specifically, since you represent the future of thoracic surgery and the future of this august Association.
Lesion based approach to mitral valve repair

Anyanwu AC and Adams DH; J Thorac Cardiovasc Surg 2008;36

Etiology gives rise to lesions. Lesions determine the technique of repair – "one lesion, one technique"
Chordae tendineae

Rupture

Etiology

Degenerative (‘FED’, Barlow’s), endocarditis

Dysfunction

Leaflet prolapse – single or multiple segment. Type II

Treatment

Leaflet resection, chordal replacement

Ruptured chordae – A2 and P2
Chordae tendineae
Fusion, fibrosis, retraction, shortening

Etiology
- Rheumatic, (congenital, iatrogenic, radiation, Barlow’s)

Dysfunction
- Leaflet restriction. Type IIIa

Treatment
- Chordal fenestration, division or replacement, valve replacement

Thickened, fused chords to posterior leaflet
Leaflet Perforation

**Etiology**
- Endocarditis, iatrogenic

**Dysfunction**
- Normal leaflet motion – leak through perforation. Type I

**Treatment**
- Direct suture, leaflet resection, patch closure

Posterior leaflet perforation
Leaflet
Excess tissue - generalized

<table>
<thead>
<tr>
<th>Etiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degenerative (Barlow’s, Forme Fruste)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dysfunction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolapse, billowing. Type II</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resection</td>
</tr>
</tbody>
</table>

Excess tissue both in height and transversely
Lesions in Mitral Valve Disease

**Leaflet**
Thickening, retraction, fibrosis, calcification

**Etiology**
- Rheumatic, post-surgical, radiation

**Dysfunction**
- Restricted leaflet motion.
- Type IIIa, stenosis

**Treatment**
- Leaflet ‘shaving’, leaflet decalcification, limited resection, valve replacement

Thickened non-pliable anterior leaflet with microcalcifications
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How is the valve?**
   - Is regurgitation severe
   - What is pathology and is it likely repairable?
CLASS IIa

1. Mitral valve repair is reasonable in asymptomatic patients with chronic severe primary MR (stage C1) with preserved LV function (LVEF >60% and LVESD <40 mm) in whom the likelihood of a successful and durable repair without residual MR is greater than 95% with an expected mortality rate of less than 1% when performed at a Heart Valve Center of Excellence (39,86,415–419). (Level of Evidence: B)
Is likelihood of durable repair greater than 95%?

• Degenerative – yes (in centers of excellence)
• Annular dilatation – yes
• Endocarditis – depends on pathology and surgical skill available
• Rheumatic – No (except in favorable pathology)
• Others – depends on expertise and pathology
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How is the Valve?**
   - Not Severe – watch. Severe – go to question #2

2. **How is the patient feeling?**
Symptomatic Patients

• Surgery is recommended regardless of etiology of mitral regurgitation except
  – Very depressed LV function (EF <30%)
  – Very high patient risk

• Surgery prolongs quality and quantity of survival
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How much MR?**  
   - Not Severe – watch. Severe – go to question #2

2. **How is the patient feeling?**  
   - Bad (dyspnea) – Surgery. Good – go to question #3
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. How much MR?
   - Not Severe – watch. Severe – go to question #2

2. How is the patient feeling?
   - Bad (dyspnea) – Surgery. Good – go to question #3

3. How is the heart?
Indications for surgery in the asymptomatic patient

Class I
- LVESD 40mm* (45mm †) or more
- LVEF 0.60 or less* †

Class IIa
- New onset Atrial Fibrillation* †
- Rest PASP > 50 mmHg* †
- LVESD 40 mm or more if flail leaflet and repairable †
- Any asymptomatic patient if probability durable repair > 0.95 and mortality <1% in center of excellence*

Class IIb
- Left atrial enlargement > 60ml/m² †
- Exercise PASP ≥ 60 mmHg †
  Provided low surgical risk and very high likelihood of repair

* AHA/ACC 2014
† ESC 2012

LVESD – left ventricular end systolic dimension
LVEF – left ventricular ejection fraction
Asymptomatic Patients

• **Rationale for surgery**
  – Prevent onset of symptoms
  – ? Prolong life

• **Indications for surgery remain controversial**
  – No good early discriminators of patients who will do poorly without surgery
  – Existing triggers for intervention reflect very advanced disease
  – No robust data demonstrating benefit of surgery in patients without triggers
  – Surgery is not risk free and can fail
Triggers for surgery in severe mitral valve regurgitation

- Symptomatic patients – presence of symptoms alone indicates surgery

- Asymptomatic patients – echocardiographic or hemodynamic triggers
  - Transthoracic Echocardiography
  - TEE
  - MRI
  - Exercise testing
What is new in 2014 Guidelines?

• Before excluding a patient from having a Class I indication for surgery (and therefore opening up a choice of watchful waiting)
  – Confirm asymptomatic status (exercise testing)
  – Confirm the volume and function measurements from TTE are reliable
    • If doubt use TEE or CMR to validate LV volume and dimensions
CLASS IIa

2. Mitral valve repair is reasonable for asymptomatic patients with chronic severe nonrheumatic primary MR (stage C1) and preserved LV function (LVEF >60% and LVESD <40 mm) in whom there is a high likelihood of a successful and durable repair with 1) new onset of AF or 2) resting pulmonary hypertension (pulmonary artery systolic arterial pressure >50 mm Hg) (363,415,420–425). (Level of Evidence: B)
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How much MR?**
   - Not Severe – watch. Severe – go to question #2

2. **How is the patient feeling?**
   - Bad (dyspnea) – Surgery. Good – go to question #3

3. **How is the heart?**
   - LV dysfunction or dilatation – Surgery
   - LA dilatation, AF, pulm HTN – May consider Surgery
   - “Not” dilated or dysfunctional – go to question #4
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How much MR?**
   - Not Severe – watch. Severe – go to question #2

2. **How is the patient feeling?**
   - Bad (dyspnea) – Surgery. Good – go to question #3

3. **How is the heart?**
   - LV dysfunction or dilatation – Surgery
   - LA dilatation, AF, pulm HTN – May consider Surgery
   - “Not” dilated or dysfunctional – go to question # 4

4. **How is the surgeon and what is the most likely operative result?**
CLASS IIa

1. Mitral valve repair is reasonable in asymptomatic patients with chronic severe primary MR (stage C1) with preserved LV function (LVEF >60% and LVESD <40 mm) in whom the likelihood of a successful and durable repair without residual MR is greater than 95% with an expected mortality rate of less than 1% when performed at a Heart Valve Center of Excellence (39,86,415–419). (Level of Evidence: B)
What is new?

• Heart Valve Centers of Excellence

CLASS IIa

1. Mitral valve repair is reasonable in asymptomatic patients with chronic severe primary MR (stage C1) with preserved LV function (LVEF >60% and LVESD <40 mm) in whom the likelihood of a successful and durable repair without residual MR is greater than 95% with an expected mortality rate of less than 1% when performed at a Heart Valve Center of Excellence (39,86,415–419). (Level of Evidence: B)

2014 AHA/ACC Guideline for the Management of Patients With Valvular Heart Disease

Heart Valve Centers of Excellence: A national effort to improve patient outcomes for valvular heart disease. Heart Valve Centers of Excellence 1) are composed of experienced healthcare providers with expertise from multiple disciplines; 2) offer all available options for diagnosis and management, including complex valve repair, aortic surgery, and transcatheter therapies; 3) participate in regional or national outcome registries; 4) demonstrate adherence to national guidelines; 5) participate in continued evaluation and quality improvement processes to enhance patient outcomes; and 6) publicly report their available mortality and success rates. Decisions about intervention at the time of diagnosis are based on these outcomes.

What is new in 2014 guidelines?

- Class IIa recommendation for Early Surgery for any asymptomatic patient with severe MR, provided:
  - Probability of repair is more than 95%
  - Probability of residual mitral regurgitation is less than 5%
  - Repair is likely to be durable
  - Operative mortality is below 1%
  - AND patient is in a “center of excellence”

- Otherwise operate only for a Class I trigger (onset of symptoms or LV dilatation or dysfunction)

- Note Class IIa triggers (pulmonary hypertension, atrial fibrillation) also mandate high reparability and durable repair in 2014 guidelines
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How much MR?**
   - Not Severe – watch. Severe – go to question #2

2. **How is the patient feeling?**
   - Bad (dyspnea) – Surgery. Good – go to question #3

3. **How is the heart?**
   - LV dysfunction or dilatation – Surgery
   - LA dilatation, AF, pulm HTN – May consider Surgery
   - “Not” dilated or dysfunctional – go to question # 4

4. **How is the surgeon and what is the most likely operative result?**
   - High likelihood of repair AND low operative risk – Consider Surgery
   - Otherwise periodic medical surveillance (‘watchful waiting’)

Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How much MR?**
   - Not Severe – watch. Severe – go to question #2

2. **How is the patient feeling?**
   - Bad (dyspnea) – Surgery. Good – go to question #3

3. **How is the heart?**
   - LV dysfunction or dilatation – Surgery
   - LA dilatation, AF, pulm HTN – May consider Surgery
   - “Not” dilated or dysfunctional – go to question #4

4. **How is the surgeon and what is the most likely operative result?**
   - High likelihood of repair AND low operative risk – Consider Surgery
   - Otherwise periodic medical surveillance (‘watchful waiting’)

5. **Is there reasonable expectation of net benefit of surgery?**
Is there reasonable expectation of net benefit from surgery

• Is there reasonable expectation of benefit?
• Does the expected benefit outweigh the risks?
**Is there benefit from surgery?**

<table>
<thead>
<tr>
<th>Asymptomatic patients</th>
<th>Symptomatic patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Only benefit is improved life expectancy and event free survival</td>
<td>• Expected benefit is improved quality of life (and possibly survival)</td>
</tr>
<tr>
<td>• Patient must live long enough (several years) to derive tangible benefit from surgery</td>
<td></td>
</tr>
<tr>
<td>– Not elderly</td>
<td>– Reasonable belief that symptoms are due to MR</td>
</tr>
<tr>
<td>– No major systemic disease</td>
<td>– Reasonable expectation that quality of life will improve with MR correction</td>
</tr>
<tr>
<td>– No socioeconomic factors that limit survival</td>
<td></td>
</tr>
</tbody>
</table>
CLASS I

1. Mitral valve surgery is recommended for symptomatic patients with chronic severe primary MR (stage D) and LVEF greater than 30% (365,376). *(Level of Evidence: B)*

When might the ventricle be too sick for primary mitral valve repair?

- Very depressed ejection fraction (<20%)
- Very remodeled left ventricle (LVEDD > 65 mm)
- Lack of contractile reserve
- Evidence of myocardial scar or fibrosis
- Co-existing severe right ventricular dysfunction
Is operative risk excessive?

- Chances of achieving long-term benefit are low if upfront risk is high
- If high operative risk, decision for surgery will depend on
  - Symptom severity
  - Patient choice
  - Available alternatives to mitral valve surgery
Is (current) quality of life very limited?

• Will surgery likely improve quality of life?
  – If dominant cause of poor quality of life is cardiac, then worth considering surgery
  – If dominant cause of poor quality of life is non-cardiac then surgery likely futile
    • Severe neurological injury
    • Limited mobility for non-cardiac reasons
    • Severe COPD
    • Severe adverse psychosocial factors
Consider other options

• If benefit uncertain or risks excessive
  – MitraClip (approved)
  – TMVR (investigational)

• If left ventricular dysfunction is too advanced
  – Transplantation
  – Left Ventricular Assist Device
  – Palliative Care
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. How is the valve?
   - Not Severe – watch. Severe – go to question #2

2. How is the patient feeling?
   - Bad (dyspnea) – Surgery. Good – go to question #3

3. How is the heart?
   - LV dysfunction or dilatation – Surgery
   - LA dilatation, AF, pulm HTN – May consider Surgery
   - “Not” dilated or dysfunctional – go to question #4

4. How is the surgeon and what is the most likely operative result?
   - High likelihood of repair AND low operative risk – Consider Surgery
   - Otherwise periodic medical surveillance (‘watchful waiting’)

5. Is there reasonable expectation of net benefit of surgery?
   - Yes – Mitral surgery. No – Medical therapy, percutaneous, other
Primary Mitral Regurgitation: Surgeon's Perspective. *Five Questions to Ask*

1. **How is the Valve?**
   - Not Severe – watch. Severe – go to question #2

2. **How is the patient feeling?**
   - Bad (dyspnea) – Surgery. Good – go to question #3

3. **How is the heart?**
   - LV dysfunction or dilatation – Surgery
   - LA dilatation, AF, pulm HTN – May consider Surgery
   - “Not” dilated or dysfunctional – go to question #4

4. **How is the surgeon and what is the most likely operative result?**
   - High likelihood of repair AND low operative risk – Consider Surgery
   - Otherwise periodic medical surveillance (‘watchful waiting’)

5. **Is there reasonable expectation of net benefit of surgery?**
   - Yes – Mitral surgery. No – Medical therapy, percutaneous, other
Thank you