Primary Mitral Valve Disease: Natural History & Triggers for Intervention

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Disclosures: GE stock,
56yo woman with MVP and dyspnea

**TTE and TEE:**

- **Barlow’s MVP**
- **EROA = 39mm²**
  - RF=52%
- **normal LV**
  - EF=65%, ESD=34mm
- **LAE: 60 ml/M²**
What are next steps?

1. Full pulmonary function testing for dyspnea
2. Proceed to mitral valve repair
3. Check BNP for heart failure
4. Get a stress echo for pulmonary hypertension
Primary Mitral Valve Disease: Outline

- Definitions/diagnosis
- Staging
- Natural history
- Management
Mitral Regurgitation: common

- **Etiology changing in developed countries.**
  - Decrease in rheumatic heart disease
  - Increase in lifespan

- **Acquired MR**
  - **Primary:** intrinsic lesions of the valve apparatus
    - organic/degenerative/infectious
  - **Secondary:** normal leaflets
    - Functional/ischemia
Carpentier Classification of Dysfunction

I: annular dilation
- Nml leaflet motion

II. Increased leaflet motion
- chordal rupture/elongation
- leaflet prolapse

III. Restricted Leaflet Motion
- a. diastole & systole
- b. during diastole
PM displacement, leaflet tethering
Secondary MR: Ventricular problem

- Anterior leaflet
- Posterior eccentric ROA
Primary, Degenerative MR: Endocarditis, rheumatic, prolapse
MV Prolapse: Barlows vs Fibroelastic Deficiency

- **Barlows: younger, chronic murmur**
  - excess leaflet tissue
    - Thickened, large, billowing leaflets
  - PMVL attaches on LA
  - Annulus large
  - Thickened and elongated chordae

- **FED: older (>60 yrs), newer murmur**
  - Single chordal rupture
  - Prolapse of scallop (P2)
  - anterior leaflet normal size, thickness
Primary Mitral Regurgitation

- Definitions/diagnosis
- Staging
- Natural history
- Management
### Stage of Progression of VHD

<table>
<thead>
<tr>
<th>Stage</th>
<th>Definition</th>
<th>Description</th>
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<tbody>
<tr>
<td>A</td>
<td>At risk</td>
<td>Risk factors for developing VHD</td>
</tr>
<tr>
<td>B</td>
<td>Progressive</td>
<td>Mild to moderate and asymptomatic</td>
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<tr>
<td>C</td>
<td>Severe-a</td>
<td>Asymptomatic and severe VHD</td>
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<td></td>
<td></td>
<td>C1: LV/RV compensated</td>
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<td></td>
<td></td>
<td>C2: LV/RV decompensated</td>
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<tr>
<td>D</td>
<td>Severe-s</td>
<td>Symptomatic from VHD</td>
</tr>
</tbody>
</table>

Nishimura. ACC/AHA guidelines 2014
| Grade | Definition                                      | Valve Anatomy                                                                 | Valve Hemodynamics* | Hemodynamic Consequences                                      | Symptoms       |
|-------|------------------------------------------------|-------------------------------------------------------------------------------|---------------------|----------------------------------------------------------------|----------------|----------------|
| A     | At risk of MR                                  | • Mild mitral valve prolapse with normal coaptation<br>• Mild valve thickening and leaflet restriction | No MR jet or small central jet area <20% LA on Doppler<br>Small vena contracta <0.3 cm | None                   | None           |
| B     | Progressive MR                                 | • Severe mitral valve prolapse with normal coaptation<br>• Rheumatic valve changes with leaflet restriction and loss of central coaptation<br>• Prior IE | Central jet MR 20%–40% LA or late systolic eccentric jet MR<br>Vena contracta <0.7 cm<br>Regurgitant volume <60 mL<br>Regurgitant fraction <50%<br>ERO<br>Angiographic grade 1-2+ | Mild LA enlargement<br>No LV enlargement<br>Normal pulmonary pressure | None           |
| C     | Asymptomatic severe MR                        | • Severe mitral valve prolapse with loss of coaptation or flail leaflet<br>• Rheumatic valve changes with leaflet restriction and loss of central coaptation<br>• Prior IE<br>• Thickening of leaflets with radiation heart disease | Central jet MR >40% LA or holosystolic eccentric jet MR<br>Vena contracta ≥0.7 cm<br>Regurgitant volume ≥60 mL<br>Regurgitant fraction ≥50%<br>ERO ≥0.40 cm²<br>Angiographic grade 3-4+ | Moderate or severe LA enlargement<br>LV enlargement<br>Pulmonary hypertension may be present at rest or with exercise<br>C1: LVEF >60% and LVESD <40 mm<br>C2: LVEF ≤60% and LVESD ≥40 mm | None           |
| D     | Symptomatic severe MR                         | • Severe mitral valve prolapse with loss of coaptation or flail leaflet<br>• Rheumatic valve changes with leaflet restriction and loss of central coaptation<br>• Prior IE<br>• Thickening of leaflets with radiation heart disease | Central jet MR >40% LA or holosystolic eccentric jet MR<br>Vena contracta ≥0.7 cm<br>Regurgitant volume ≥60 mL<br>Regurgitant fraction ≥50%<br>ERO ≥0.40 cm²<br>Angiographic grade 3-4+ | Moderate or severe LA enlargement<br>LV enlargement<br>Pulmonary hypertension present | Decreased exercise tolerance<br>Exertional dyspnea |

*Several valve hemodynamic criteria are provided for assessment of MR severity, but not all criteria for each category will be present in each patient. Categorization of MR severity as mild, moderate, or severe depends on data quality and integration of these parameters in conjunction with other clinical evidence.

ERO indicates effective regurgitant orifice; IE, infective endocarditis; LA, left atrium/atrial; LV, left ventricular; LVEF, left ventricular ejection fraction; LVESD, left ventricular end-systolic dimension; and MR, mitral regurgitation.
Primary Mitral Regurgitation:
The scope of the problem

- Definitions/diagnosis
- Staging
- Natural history
- Management
Natural History of Primary MR

- Asymptomatic, chronic severe MR
  - All-cause death: 22%/ 5 years
  - Cardiac death: 14%
  - MACE: 33%

Enriquez-Sarano M. Lancet 2009.; 373:1382
Predictors of Outcome in Primary MR

- Age and Symptoms
- Quantitative MR severity:
  - EROA
- Chamber size/function:
  - LA, ESV, EF
- Pulmonary hypertension
- Atrial fibrillation
- New:
  - exercise, BNP, strain
Flail MV: Survival by EROA

465 prospective patients with asymptomatic, organic MR.  

Enriquez-Sarano NEJM 2005
Impact of Left Atrial Volume on Clinical Outcome in Organic MR

Survival After Diagnosis According to LAV

Mortality according to LAV stratified by Moderate or Severe RV

J Am Coll Cardiol. 2010;56(7):570-578.
Impact of pulmonary hypertension on survival in MR due to flail leaflets.

- Death OR = 2
- CV death OR = 2.2
- CHF OR = 1.7

- Adjusted for age, gender, NYHA, EF, AF, MVR

- Registry ‘87-04, 437pts

Barbieri et al. Eur Heart J 2011;32:751-759
Newer prognostic markers

- BNP
  - >105 MACE
  - < 50 NPV

- LV strain/SR

- Exercise PHTN
Primary MR: Survival based on LV-GLS and lnBNP

Event-free survival according to exercise induced pulmonary hypertension and right ventricular function

Primary Mitral Regurgitation: The scope of the problem

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Indications for Surgery for Primary MR

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
  - YES

Asymptomatic (stage C)
- LVEF 30% to ≤60% or LVESD ≥40 mm (stage C2)
- 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%
  - YES
  - NO

MV Surgery* (IIb)
MV Surgery* (I)
MV Repair (IIa)
Periodic Monitoring

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

Nishimura. ACC/AHA guidelines 2014
Indications for Surgery for Primary MR

Vahanian ESC guidelines 2012
Asymptomatic severe MR: Watchful waiting vs early surgery

- ACC/AHA Class IIA
  - If likelihood of successful and durable repair without residual MR >95% and Mortality <1%
  - Ie isolated posterior leaflet MVP

- ESC IIA
  - Also, flail and LVESD≥40mm

- ESC IIB
  - Also, LAV ≥ 60ml/M²
  - or exercise induced PHTN (60mmHg)
Survival with asymptomatic severe degenerative MR managed with watchful waiting strategy

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**Graph 1: Survival (%)**
- **Years**: 0, 1, 2, 3, 4, 5, 6, 7, 8
- **Survival (%)**: 100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0

- **All patients**: Solid line
- **Patients with flail leaflet**: Dotted line
- **Expected survival**: Dashed line

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**Graph 2: Event-free Survival (%)**
- **Years**: 0, 1, 2, 3, 4, 5, 6, 7, 8
- **Event-free Survival (%)**: 100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0

- **Survival free of**:
  - **any event**: Solid line
  - **symptoms**: Dashed line
  - **asympt. LV-dysfunction**: Dotted line
  - **new onset Afib/PHT**: Dash-dotted line

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**Survival rates**:
- **All patients**
  - Pts. at risk: 129, 129, 118, 103, 87, 70, 53, 24, 10
- **Patients with flail leaflet**
  - Pts. at risk: 56, 55, 53, 43, 37, 32, 28, 10, 4

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Rosenhek Circulation. 2006;113:2238-2244
Event-free survival better in operated than conventional treatment (CONV) groups in propensity-matched pairs.

447 consecutive, asymptomatic severe MVP
Ten-year survival of patients with early repair compared with similar patients followed conservatively

**Propensity matched score-adjusted HR:** 5.2 , 4.8, 4.4

Montant P. JTCS. 2009;138: 1339.: 192 w/o ESC indications for MVR (symptoms, LVE/dysf, AF, PHTN

De Bonis, and Bolling Eur Heart J 2013;34:13-19
Early surgery (2mos) after symptoms

- Duke database: 481 patients/20 yrs
  - 168 early (2mos of symptoms)
  - 94 late surgery
  - 219 medically management

- MVA: Early surgery & repair

- Death HR= 0.54

Samad. Heart 2011;97(3):221.
56yo woman with MVP and dyspnea

- Barlow’s MVP
  - EROA = 39mm²
  - RF = 52%
  - normal LVEF, ESD
  - LAE: 60 ml/M²

- stress echo with PHTN
  - Successful MV repair
Primary Mitral Valve Disease

- Definitions/diagnosis
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Thank you for your attention!
Practice Gaps in care of MR

Uncertainty:

- Timing for surgery
  - 50% PCP
- Quantitative MR
  - Limited or no reporting
- Surgical volumes
  - 30% cardiologists/PCP

Wang AHJ. 2016;172:70
Diagnostic Testing and followup

- **TTE:**
  - Assess LVF and LVESD, PASP
- **Stage A:** every 3-5 years
- **Stage B:** every 1-2 years
- **Stage C:** every 6-12 months

- **TEE:**
  - 2D and 3D to assess anatomy and surgical repair
- **Cardiac catheterization**
  - Confirm hemodynamics, assess coronaries
FED: P2 flail with torn chordae
Acute Mitral Regurgitation: Flail MVP