Mitral Regurgitation: Evaluation and Treatment

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Disclosures

None: no financial disclosures

Objectives:
1. Understand functional vs. degenerative MR
2. Understand MR severity grading
3. Understand indications for surgery/intervention
Outline

Epidemiology/Anatomy
Regurgitation Classification
Myxomatous Degeneration
MR Severity Grading
Guidelines for Management
MitraClip Procedural Animation
MitraClip evaluation
Epidemiology

Mitral regurgitation
prevalence (any) 70% by TTE

Significant MR (Moderate-Severe)
2-3% of general population
≈ 7-8 million U.S. adults
≈ 150-200 million world wide
Mitral valve anatomy

Pathophysiology

Chronic MR = Volume ↑↑

Insidious process: Structural Δ’s PRECEDE sx’s

Symptoms:

“Heart Failure”
- Exertional SOB
- Activity Intolerance
- Fatigue
- Edema
- Orthopnea
- Cough

Palpitations (Atrial Fibrillation)

https://emedicine.medscape.com/article/890315-overview#a6
MR Etiology

Degenerative MR
- Primary/Organic
- Structural Δ’s (prolapse, flail, perforation, etc.)

Functional (Secondary) MR
- LV dysfunction/enlargement
- LA/annular dilitation
- Ca^{++}/Rheumatic degeneration
Carpentier Classification
MR Etiology

- FMR, 65%
- DMR, 22%
- Mixed, 13%
Myxomatous Degeneration: Fibroelastic Deficiency (FED)

VEC: Valvular Endothelial Cells
VIC: Valvular Interstitial Cells

Francesca N. Delling, and Ramachandran S. Vasan
Circulation. 2014;129:2158-2170
Myxomatous Degeneration: Spectrum of Disease

Myxomatous Degeneration: Progression of Disease

Gene Carriers with normal MV → Non-diagnostic morphologies → MVP → MR

Years → Years → Years/Months → Years

Stage A → Stage B → Stage C → Stage D

? Use of genetic markers in unaffected relatives of MVP cases
Novel medical therapies targeting:
1) Signaling pathways (TGF-β, SMADs)
2) Progenitor cells
Tissue engineered valves

- ID Mild-moderate MR
- IID Severe MR

Francesca N. Delling, and Ramachandran S. Vasan
Circulation. 2014;129:2158-2170
Regurgitation has four hallmarks:

- Flow convergence
- Flow acceleration
- Turbulence
- Downstream
# Mitral Regurgitation

<table>
<thead>
<tr>
<th>Qualitative</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angiographic grade</td>
<td>1+</td>
<td>2+</td>
<td>3-4+</td>
</tr>
<tr>
<td>Color Doppler jet area</td>
<td>Small, central jet (less than 4 cm² or less than 20% LA area)</td>
<td>Signs of MR greater than mild present, but no criteria for severe MR</td>
<td>Vena contracta width greater than 0.7 cm with large central MR jet (area greater than 40% of LA area) or with a wall-impinging jet of any size, swirling in LA</td>
</tr>
<tr>
<td>Doppler vena contracta width (cm)</td>
<td>Less than 0.3</td>
<td>0.3 – 0.69</td>
<td>Greater than or equal to 0.70</td>
</tr>
</tbody>
</table>

**Quantitative (cath or echo)**

<table>
<thead>
<tr>
<th>Regurgitant volume (ml/beat)</th>
<th>Less than 30</th>
<th>30-59</th>
<th>Greater than or equal to 60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regurgitant fraction (%)</td>
<td>Less than 30</td>
<td>30-49</td>
<td>Greater than or equal to 50</td>
</tr>
<tr>
<td>Regurgitant orifice area (cm²)</td>
<td>Less than 0.20</td>
<td>0.2-0.39</td>
<td>Greater than or equal to 0.40</td>
</tr>
</tbody>
</table>

**Additional Essential Criteria**

<table>
<thead>
<tr>
<th>Left atrial size</th>
<th>Enlarged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Left ventricular size</td>
<td>Enlarged</td>
</tr>
</tbody>
</table>
Follow-up: ASE Guidelines

Mild MR
- Echo: q3-5 years

Moderate MR
- Echo: annual

Severe MR
- Referral (3D TEE +/- intervention)

* Echo for any Δ murmur or symptoms
Treatment

Medical therapy
- BP mgmt. (ARB/ACE-I)
  * MR is dynamic
- diuretics

CAD/Ischemia (IIIB)
- revascularization?
Treatment: ARB?

Animal study with ARB = protective antifibrotic/anti-inflammatory effect. EMT- endothelial to mesenchymal transition.

Clinical Outcomes: Med Rx

1095 patients with Severe MR and HF

FMR 74%, DMR 21%, Other 5%
53% Medical Therapy and 47% Surgery

185-186; DOI: 10.1016/j.jacc.2013.08.723
Treatment

Surgical

- Valve replacement
  - Mechanical (warfarin)
  - Bioprosthetic (90%, warfarin 3-6mo. then ASA)
- Valve repair
  - Ring +/- resection
  - Alfieri stitch

* DMR- prohibitive surgical risk

- Transcatheter repair (MitraClip)
### ACC Guidelines: Surgery

**Table 1: Guideline Recommendations for Surgery for Degenerative Mitral Regurgitation**

<table>
<thead>
<tr>
<th>Indication</th>
<th>ACC/AHA</th>
<th>ESC/EACTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symptomatic patients</td>
<td>Class I</td>
<td>Class I</td>
</tr>
<tr>
<td>Asymptomatic patients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LV systolic dysfunction*</td>
<td>Class I</td>
<td>Class I</td>
</tr>
<tr>
<td>Pulmonary hypertension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PASP &gt; 50 mm Hg at rest</td>
<td>Class IIa</td>
<td>Class IIa</td>
</tr>
<tr>
<td>PASP &gt; 60 mm Hg with exercise</td>
<td>Class IIa</td>
<td>Class IIb</td>
</tr>
<tr>
<td>Atrial fibrillation</td>
<td>Class IIa</td>
<td>Class IIa</td>
</tr>
<tr>
<td>Normal LV function, repair feasible</td>
<td>Class IIa</td>
<td>Class IIa†</td>
</tr>
</tbody>
</table>

This is a simplified table. See full guidelines (1,2) for complete recommendations. *

- Defined as ejection fraction ≤60% or elevated end-systolic diameter (≥40 mm in ACC/AHA guidelines; ≥45 mm in ESC/EACTS guidelines).

†Specifically for patients with flail leaflet and end-systolic dimension ≥40 mm; there is a separate class IIb recommendation for such patients with left atrial volume index ≥60 ml/m².

**LV Dysfxn:**
- EF < 60%
- ESd > 4cm

**IIb- Left Atrial Enlargement**
- EF < 30%
- ESd > 5.5 cm = Med Rx
109 Pts with Asymptomatic MR: Quantified by cMRI
Early Surgery: Asymptomatic Severe MR


![Graph showing event-free survival comparison between OP and CONV groups.]

- OP: 7-yr event-free survival 99 ± 1%
- CONV: 7-yr event-free survival 85 ± 4%

**No at Risk**
- OP: 127, 125, 106, 72, 43
- CONV: 127, 125, 105, 78, 44

**Years**
- 1, 3, 5, 7
? Surgical Risk

High/prohibitive risk patients

- advanced age
- frail

- multiple medical comorbidities:
  - ↓ EF, CKD/ESRD, PHTN, TR
- prior chest/cardiac surgery
- STS and EuroSCORE II risk calculation
Options?

Transcatheter “edge-edge” MV repair
- MitraClip
  - High/prohibitive risk patients
  - Mod-Severe/Severe (3-4+) MR
  - Degenerative etiology (currently…)

COAPT Trial for functional MR
Evaluation

CHI Mitral Valve Clinic
- Coordinator screening and education
- MD H&P, TTE review
- TEE + 3D
- R/L heart catheterization
- Carotid duplex
- 6 min walk test
Evalutation

CT Surgery H&P (Dr. Clements)
Multidisciplinary Team Case Review

If appropriate for MitraClip:
Interventional MD H&P (Drs. Ledford and Thel)
Procedure scheduled

≈ 6-8 week process
The third generation of MitraClip allows you to treat your everyday cases and more complex cases with greater ease. 

MitraClip NTR ———— MitraClip XTR +5 mm"
MitraClip®
Transcatheter Mitral Valve Repair

Procedure Animation

INDICATIONS:
Clip Delivery System: The MitraClip Clip Delivery System is indicated for the percutaneous reduction of significant symptomatic mitral regurgitation (MR ≥ 3+) due to primary abnormality of the mitral apparatus [degenerative MR] in patients who have been determined to be at prohibitive risk for mitral valve surgery by a heart team, which includes a cardiac surgeon experienced in mitral valve surgery and a cardiologist experienced in mitral valve disease, and in whom existing comorbidities would not preclude the expected benefit from reduction of the mitral regurgitation.

Steerable Guide Catheter: The Steerable Guide Catheter is used for introducing various cardiovascular catheters into the left side of the heart through the interatrial septum.
Procedure

Cardiac cath lab vs. hybrid OR
General anesthesia
1.5-4 hours (typical 2-2.5 hours)
Femoral venous access (24 fr device)
PACU recovery
CSSU overnight obs.
LoS 24-36 hours
Post MitraClip
Post MitraClip
Post MitraClip
Follow-Up

TTE post-op day 1

Plavix + ASA for 3-6 months
  - OAC + Plavix if afib or other indication

Diuretics + GDMT as indicated

Procedural antibiotic prophylaxis 1 year

F/U 30 day and 1 year
  - TTE + Mitral Clinic office visit
COAPT Trial

Transcatheter Mitral-Valve Repair in Patients with Heart Failure


Cardiovascular Outcomes Assessment of the MitraClip Percutaneous Therapy for Heart Failure Patients With Functional Mitral Regurgitation - COAPT

COAPT Trial

N = 614 with 3-4+ functional MR and HF
On maximally tolerated GDMT (by HF MD)
- 91% βb, 66% ACE/ARB/ARNI, 50% MRA, 36% CRT

302 Clip + GDMT vs. 312 GDMT alone
LVEF 20-50% (31%)
LVESd < 7cm (6.2cm)

Excluded: life exp < 1 year, NYHA Class IV/Stage D, COPD + O² or chronic steroids, severe PHTN, Mod-Severity RV dysfxn, Severe AR or TR
COAPT Trial - Outcomes

Primary Outcome

Hospitalization for Heart Failure

Control group

Device group

Hazard ratio, 0.53 (95% CI, 0.40–0.70)
P < 0.001

Secondary Outcome

Death from Any Cause

Hazard ratio, 0.62 (95% CI, 0.46–0.82)
P < 0.001

Freedom from device related complications: 96.6% @ 1 year

Conclusions

Degenerative MR - primary valve disease

Functional MR - “secondary” (LV dysfxn, MI, etc.)

Chronic MR is insidious

- structural δ’s typically precede HF signs/symptoms

Medical Therapy - limited role in treatment

Early Surgical Intervention!

- severe MR +/- LVEF < 60% or LVSd > 4.0cm

High risk patients with DMR - MitraClip

COAPT Trial may lead to expanded indications for MitraClip
Thank You


