MITRAL REGURGITATION

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MITRAL VALVE

ANATOMY

ANNULUS
LEAFLETS
CHORDAE
PAPILLARY MUSCLES

FUNCTION

LEFT ATRIUM
ANNULUS
LEAFLETS
CHORDAE
PAPILLARY MUSCLES
LEFT VENTRICLE
VALVE ANALYSIS

Etiology

The Cause of Valve Disease

Lesions

The Result of the Disease Process

Dysfunction

The Result of the Lesions
LESIONS

Quality of tissue (Pliability of leaflet)

Quantity of tissue

Calcifications (Leaflet, LV wall)
DYSFUNCTION: CARPENTIER’S CLASSIFICATION

TYPE I: NORMAL LEAFLET MOTION
- ANNULAR DILATION
- LEAFLET PERFORATION

TYPE II: EXCESSIVE LEAFLET MOBILITY
- PROLAPSE
- FLAIL

TYPE III: REDUCED LEAFLET MOBILITY OR MOTION
- CHORDAE SHORTENING, LEAFLET THICKENING
- INCOMPLETE COAPTATION
CAUSES

ETIOLOGY

MECHANISM  NON-ISCHEMIC  ISCHEMIC

ORGANIC    Rheumatic, prolapse, flail  Ruptured PM
leaflet, endocarditis, etc

FUNCTIONAL  Cardiomyopathy  Post-MI
DEGENERATIVE (Barlow, FED, Marfan) balloononing, prolapse, flail

Mitral annulus is saddle shaped
Parasternal Long Axis View
Barlow disease

Fibroelastic Deficiency

Thickened (> 5mm), Redundant tissue

P2 Prolapse
FUNCTIONAL MR

Normal leaflets, Annular dilation, LV dilation + spherical +
Altered geometry + PMs displacement + WM abnormalities
Type II P2
(long axis 130-150°)

Type II P2
(bi comissural 45-60°)
Post Commissure – P3

Type II P3
Anterior commissure – P1
Mitral valve analysis: recommendations

1. TTE is recommended as the first-line imaging modality for mitral valve analysis.
2. TEE is advocated when TTE is of non-diagnostic value or when further diagnostic refinement is required.
3. 3D-TEE or TTE is reasonable to provide additional information in patients with complex mitral valve lesion.
4. TEE is not indicated in patients with a good-quality TTE except in the operating room when a mitral valve surgery is performed.
Limitations

- Technical factors (Gain settings, PRF), Direction of the jet (Coanda effect)
- Loading conditions, Left atrial size

Color flow mapping

- Aliasing velocity of 50-60 cm/s
- Optimize color gain setting
- Need blood pressure evaluation
- Value ??? (separate mild to severe)

NOT VALID FOR MR QUANTIFICATION
VENA CONTRACTA WIDTH

The narrowest portion of the MR jet downstream from the orifice

- 2 orthogonal planes, Color sector as narrow as possible
- Zoom to optimize visualization
- Maximal lateral and temporal resolution
- Mild MR < 0.3 cm, Severe MR ≥ 0.7 cm

Limitations
- Lateral resolution
- Phasic changes
- Multiple jets
- Non-circular orifice
VENA CONTRACTA WIDTH

APICAL 4-CV

APICAL 2-CV

> 8 mm

VC
PISA METHOD

1. Optimize 2-D color
2. Zoom or RES
3. Shift the color scale
4. Measure the PISA
5. MR CW Doppler
6. Calculate mitral ERO/RV

BENEFITS

1. Less affected by hemodynamic factors
2. Etiology of MR or Other valve disease do not affect ERO calculation
3. Can be used with eccentric jets
## Integrating indices of MR severity

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Qualitative</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitral valve morphology</td>
<td>Normal/Abnormal</td>
<td>Normal/Abnormal intermediate</td>
<td>Flail leaflet/ ruptured PMs</td>
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<tr>
<td>Colour flow MR jet</td>
<td>Small, central jets</td>
<td>Intermediate</td>
<td>Very large central jet or eccentric jet adhering, swirling and reaching the posterior LA wall</td>
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<tr>
<td>Flow convergence zone</td>
<td>No or small</td>
<td>Intermediate</td>
<td>Large</td>
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<tr>
<td>CW signal of MR jet</td>
<td>Faint/Parabolic</td>
<td>Dense/Parabolic</td>
<td>Dense/Triangular</td>
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<tr>
<td><strong>Semi-quantitative</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC width (mm)</td>
<td>&lt; 3</td>
<td>Intermediate</td>
<td>≥ 7 (&gt;8 for biplane)</td>
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<tr>
<td>Pulmonary vein flow</td>
<td>Systolic dominance</td>
<td>Systolic blunting variable</td>
<td>Systolic flow reversal</td>
</tr>
<tr>
<td>Mitral inflow</td>
<td>A wave dominant</td>
<td>Intermediate</td>
<td>E wave dominant (&gt;1.5 cm/s)</td>
</tr>
<tr>
<td>TVI mit/TVI Ao</td>
<td>&lt; 1</td>
<td>Intermediate</td>
<td>≥ 1.4</td>
</tr>
<tr>
<td><strong>Quantitative</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>EROA (mm²)</td>
<td>&lt; 20</td>
<td>20-29 ; 30-39!</td>
<td>≥ 40</td>
</tr>
<tr>
<td>R Vol (ml)</td>
<td>&lt; 30</td>
<td>30-44 ; 45-59!</td>
<td>≥ 60</td>
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<tr>
<td>+ LV and LA sizes + sPAP</td>
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</table>
CONSEQUENCES

- LV DIMENSION AND EF
- LV SHAPE, LA SIZE
- PULMONARY PRESSURES
  - < 50 mmHg at rest
  - < 60 mmHg at exercise
- VENTRICULAR FUNCTION ?
- DYNAMIC COMPONENT AT EXERCISE

GUIDELINES REFER TO M-MODE MEASUREMENTS

Variability ↑ in a spherical LV
WHAT TO FOLLOW IN AN ASYMPTOMATIC PATIENT WITH NORMAL LV FUNCTION

Moderate MR → clinical every year + echo every 2 years
Severe MR → clinical every 6 months + echo every 1 year
* or if EF 60-65% (ESD 40-45 mm) → echo every 6 months

- PROGRESSION OF MR : MARKED INDIVIDUAL DIFFERENCES

- PROGRESSION OF LESION :
  - NEW FLAIL LEAFLET
  - INCREASE OF ANNULUS SIZE

- EVOLUTION OF LV END-SYSTOLIC DIMENSION OR VOLUME
  - LV EJECTION FRACTION
  - LA SIZE AND AREA
  - PULMONARY SYSTOLIC PRESSURE
  - EXERCISE CAPACITY

- OCCURRENCE OF ATRIAL ARRHYTHMIAS
European Association of Echocardiography recommendations for the assessment of valvular regurgitation. Part 2: mitral and tricuspid regurgitation (native valve disease)

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