Mitral valve and mitral annulus

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Evaluation of Valve disease

1. Mechanism and Morphology

2. Severity of Valve disease

3. Surg./Interv. Therapy Yes/No/When/How?

+ Clinical Symptoms

Bonow RO. J Am Coll Cardiol 2006; 48:e1-e148
2D TEE segment characterization
2D TEE segment characterization
3D TEE segment characterization

Carpentier A, et al.
Ann Thorac Surg 1995;60

Ao
LAA
3D TEE segment characterization

Carpentier A, et al.
Ann Thorac Surg 1995;60
3D Mitral valve orientation

Surgical perspective

Anatomic orientation

Ao
TV
LAA
A1 A2 A3
P1 P2 P3

PM
P
P1 P2 P3
A3 A2 A1
TV
LAA
AL
## Classification of Mitral insufficiency

<table>
<thead>
<tr>
<th>Functional Classification</th>
<th>Morphologic Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Valvular pathology</td>
</tr>
<tr>
<td>Ia</td>
<td>Normal</td>
</tr>
<tr>
<td>Ib</td>
<td>Leaflet defect</td>
</tr>
<tr>
<td>IIa</td>
<td>Increased</td>
</tr>
<tr>
<td>IIb</td>
<td></td>
</tr>
<tr>
<td>IIc</td>
<td></td>
</tr>
<tr>
<td>IIId</td>
<td></td>
</tr>
<tr>
<td>IIIa</td>
<td>Restricted</td>
</tr>
<tr>
<td>IIIb</td>
<td>Leaflet tethering by LV dilatation</td>
</tr>
</tbody>
</table>

Carpentier A. J Thorac Cardiovasc Surg 1980; 79
MV pathology 2D vs. 3D

FED  FED+  Form Fruste  Barlow’s
MV pathology surgeon’s view vs. 3D
Intraoperative Live 3D TEE
Intraoperative Live 3D TEE
Intraoperative 3D monitoring
Comprehensive 2D/3D analysis
3D measuring of the mitral valve
Tethering of Mitral leaflets
typical functional MR
2D/3D measurements in functional MR
Functional Mitral regurgitation

A3DE = 1110.1 mm²
exposed area of leaflets

P

A0

AL

A

PM

Ao

H A2 = 1.0 mm
height of A2 coaptation.
60 yo, m, asympt., Afib, MI II°

4-CH

VCW = 0.3 cm

2-CH

VCW = 1.8 cm
Asymmetrischer Jetquerschnitt

Kahlert,.., Buck et al., JASE 2008;21(8)
3D planimetry of vena contracta area

Kahlert, .., Buck et al., JASE 2008;21(8)
Asymmetry of vena contracta area

Figure 5 Relationship between asymmetry of VCA and etiology of MR. MR, Mitral regurgitation; MVP, mitral valve prolapse.

Kahlert P, ..., Buck T et al., JASE 2008;21(8)
2D VCA-4CH vs. VCA-3D

Kahlert P,..., Buck T et al., JASE 2008;21(8)
2D TEE cD Baseline
Live3D TEE Baseline
Principle of Treatment

Percutaneous Transvenous Mitral Annuloplasty; Viacor, Inc., Wilmington, USA
Live3D TEE cD Baseline

VR 17Hz 0 140 180
9cm

Full Volume
3D 26%
3D 40dB

CF
50%
4.4MHz

67 bpm
Live3D TEE Final

Herzzentrum Uni Essen

VR 5Hz
4cm

Live 3D
3D 26%
3D 40dB

63 bpm
## Quantitative Comparison

<table>
<thead>
<tr>
<th>Annulus</th>
<th>DAIPm = 40.4 mm</th>
<th>DAIPm = 35.5 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAP = 30.2 mm</td>
<td>DAP = 21.5 mm</td>
<td></td>
</tr>
<tr>
<td>H = 4.3 mm</td>
<td>H = 4.8 mm</td>
<td></td>
</tr>
<tr>
<td>C3D = 124.1 mm</td>
<td>C3D = 99.4 mm</td>
<td></td>
</tr>
<tr>
<td>C2D = 122.8 mm</td>
<td>C2D = 97.4 mm</td>
<td></td>
</tr>
<tr>
<td>A2D = 1100.7 mm²</td>
<td>A2D = 661.7 mm²</td>
<td></td>
</tr>
<tr>
<td>A3D min = 1118.7 mm²</td>
<td>A3D min = 681.2 mm²</td>
<td></td>
</tr>
<tr>
<td>A2D/A3D min = 98.4 %</td>
<td>A2D/A3D min = 97.1 %</td>
<td></td>
</tr>
<tr>
<td>C2D/C3D = 99.0 %</td>
<td>C2D/C3D = 98.0 %</td>
<td></td>
</tr>
<tr>
<td>H/DAIPm = 14.5 %</td>
<td>H/DAIPm = 25.6 %</td>
<td></td>
</tr>
<tr>
<td>E2D = 133.7 %</td>
<td>E2D = 165.3 %</td>
<td></td>
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</tbody>
</table>
Mitral stenosis
postrheumatic Mitral stenosis
MVA planimetry by Live 3D TEE
Importance of accurate MVA alignment
Mitral stenosis b&a PMV

Mitral VTI
Vmax 138 cm/s
Vm 83.4 cm/s
Max PG 8 mmHg
MPG 3 mmHg
VTI 46.4 cm

MVO
Ao
LAA
A2 = 0.45 cm²

MV VTI
Vmax 271 cm/s
Vm 214 cm/s
Max PG 29 mmHg
MPG 20 mmHg
VTI 82.8 cm

MVO
Ao
A1 = 1.35 cm²
Mitral stenosis b&a PMV
Summary

Key issues of MV assessment

→ understanding and use of classification of MV disease

→ standardized quantification (i.e., Scoring)

→ knowledge of inherent limitations of qx (VC, PISA)

→ Live 3D Echo → advanced MV assessment