Spectral Doppler Cases

Gerard P. Aurigemma MD
ASE Board Review Course
2016
No Relevant Disclosures
This spectral Doppler profile may be seen in:

1. HCM
2. Hypertensive LVH
3. AS
4. 1-3
5. None of above
42 year old woman with a murmur

*Diagnostic possibilities include all of the following except:*

1. High output heart failure
2. PDA
3. Severe MR
4. Coronary sinus ASD
A 65 year old with MVP and MR. What do you conclude from these spectral profiles?:

1. He has normal diastolic function
2. The MR is probably not very significant
3. The MR is likely to at least moderate to severe
4. Cannot tell with certainty
85 year old with known AS to calculate AVA you would:

1. Use 1.6 M/s as your V1
2. Cath the patient
3. Give beta blocker then repeat study
4. Send sonographer back to bedside
The spectral Doppler indicates:

1. Restrictive filling pattern in someone with AF
2. Severe PR
3. RV systolic dysfunction
4. Severe AR
Dx?

1. Severe TR
2. RV systolic dysfunction
3. both
4. neither
This spectral Doppler profile may be seen in:

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2. Hypertensive LVH
3. AS
4. 1-3
5. None of above
Various Doppler Profiles in HCM
<table>
<thead>
<tr>
<th>LVOT</th>
<th>Mid cavity</th>
<th>MR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Late peaking</td>
<td>Late peaking</td>
<td>Starts early</td>
</tr>
<tr>
<td>Gentle slope</td>
<td>Very sharp</td>
<td>Parabolic</td>
</tr>
<tr>
<td>4.5 M/s</td>
<td>Lower velocity than LVOT signal</td>
<td>Can be as high as 8 M/s</td>
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<td>MR</td>
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</tr>
<tr>
<td><img src="image1.png" alt="Diagram" /></td>
<td><img src="image2.png" alt="Diagram" /></td>
<td><img src="image3.png" alt="Diagram" /></td>
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42 year old woman, recently immigrated from Iraq

History of Murmur
LVVd = 126 cc
LVVs = 55 cc
SV = 71 cc
LVVdi = 74 cc/M²
ULN (ASE)

Table 2: Normal values for 2D echocardiography according to gender

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>LV internal dimension (mm)</td>
<td></td>
</tr>
<tr>
<td>Diastolic</td>
<td>45.0 ± 3.6</td>
</tr>
<tr>
<td>Systolic</td>
<td>28.2 ± 3.3</td>
</tr>
<tr>
<td>LV volumes (biplane)</td>
<td></td>
</tr>
<tr>
<td>LV EDV (mL)</td>
<td>76 ± 15</td>
</tr>
<tr>
<td>LV ESV (mL)</td>
<td>28 ± 7</td>
</tr>
<tr>
<td>LV volumes normalized by BSA</td>
<td></td>
</tr>
<tr>
<td>LV EDV (mL/m²)</td>
<td>45 ± 8</td>
</tr>
<tr>
<td>LV ESV (mL/m²)</td>
<td>16 ± 4</td>
</tr>
<tr>
<td>LV EF (biplane)</td>
<td>64 ± 5</td>
</tr>
</tbody>
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BSA, body surface area; EDV, end-diastolic LV, left ventricular; SD, standard deviation.
42 year old woman with a murmur

Diagnostic possibilities include all of the following except:

1. High output heart failure
2. PDA
3. Severe MR
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LVVd = 126 cc
LVVs = 55 cc
SV = 71 cc
LVVdi = 74 cc/M2
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Table 2. Normal values for 2D echocardiogram according to gender

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<tr>
<th>Parameter</th>
<th>Female</th>
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<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>2-SD range</td>
</tr>
<tr>
<td>LV internal dimension</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diastolic dimension (mm)</td>
<td>45.0 ± 3.6</td>
<td>37.8–52.2</td>
</tr>
<tr>
<td>Systolic dimension (mm)</td>
<td>28.2 ± 3.3</td>
<td>21.6–34.8</td>
</tr>
<tr>
<td>LV volumes (biplane)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LV EDV (mL)</td>
<td>76 ± 15</td>
<td>46–105</td>
</tr>
<tr>
<td>LV ESV (mL)</td>
<td>28 ± 7</td>
<td>14–42</td>
</tr>
<tr>
<td>LV volumes normalized by BSA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LV EDV (mL/m²)</td>
<td>45 ± 8</td>
<td>29–61</td>
</tr>
<tr>
<td>LV ESV (mL/m²)</td>
<td>16 ± 4</td>
<td>0–24</td>
</tr>
<tr>
<td>LV EF (biplane)</td>
<td>64 ± 5</td>
<td>54–74</td>
</tr>
</tbody>
</table>

BSA, body surface area; EDV, end-diastolic LV; left ventricular; SD, standard deviation.
A 65 year old with MVP and MR. What do you conclude from these spectral profiles:

1. He has normal diastolic function
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Doppler + Haemodynamics
A 65 year old with MVP and MR. What do you conclude from these spectral profiles?

1. He has normal diastolic function
2. The MR is probably not very significant
3. The MR is likely to be significant
4. Cannot tell with certainty
Tabata et al. J Am Coll Cardiol 1992;20:1345
Pulmonary Vein Flow Profiles in MR
Tabata et al. J Am Coll Cardiol 1992;20:1345
Table 3 Application of specific and supportive signs, and quantitative parameters in the grading of mitral regurgitation severity

<table>
<thead>
<tr>
<th>Specific signs of severity</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small central jet &lt; 4 cm² or &lt; 20% of LA area</td>
<td>Signs of MR &gt; mild present, but no criteria for severe MR</td>
<td>Vena contracta width ≥ 0.7 cm with large central MR jet (area &gt; 40% of LA) or with a wall-impinging jet of any size, swirling in LA</td>
<td></td>
</tr>
<tr>
<td>Vena contracta width &lt; 0.3 cm</td>
<td></td>
<td></td>
<td>Large flow convergence</td>
</tr>
<tr>
<td>No or minimal flow convergence</td>
<td></td>
<td></td>
<td>Systolic reversal in pulmonary veins</td>
</tr>
<tr>
<td>Systolic dominant flow in pulmonary veins</td>
<td>Intermediate signs/findings</td>
<td>Dense, triangular CW Doppler MR jet</td>
<td></td>
</tr>
<tr>
<td>A-wave dominant mitral inflow</td>
<td></td>
<td>E-wave dominant mitral inflow (E &gt; 1.2 m/s)</td>
<td></td>
</tr>
<tr>
<td>Soft density, parabolic CW Doppler MR signal</td>
<td></td>
<td>Enlarged LV and LA size **, (particularly when normal LV function is present).</td>
<td></td>
</tr>
<tr>
<td>Normal LV size</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Supportive signs

<table>
<thead>
<tr>
<th>Quantitative parameters</th>
<th>Mild (&lt; 30)</th>
<th>Moderate (30-44)</th>
<th>Severe (45-59)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R Vol (ml/beat)</td>
<td>&lt; 30</td>
<td>30-44</td>
<td>45-59</td>
</tr>
<tr>
<td>RF (%)</td>
<td>&lt; 30</td>
<td>30-39</td>
<td>40-49</td>
</tr>
<tr>
<td>EROA (cm²)</td>
<td>&lt; 0.20</td>
<td>0.20-0.29</td>
<td>0.30-0.39</td>
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Zoghi et al, JASE, 2003
85 year old with known AS, now is being referred for TAVR
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Technical Considerations

**Continuity Equation**

- Accuracy of LVOT diameter
  
  measure just apical to valve
  largest diameter
  avoid basal septal hypertrophy
  virtues of low parasternal window
Technical Considerations

Continuity Equation

- LVOT velocity must use laminar flow pre-use modal velocity
Technical Considerations

Continuity Equation

- CW signal

Apical  RPS
Doppler Imaging in Aortic Stenosis: The Importance of the Nonapical Imaging Windows to Determine Severity in a Contemporary Cohort

Jeremy J. Thaden, MD, Vuyisile T. Nkomo, MD, MPH, Kwang Je Lee, MD, PhD, and Jae K. Oh, MD, Rochester, Minnesota and Seoul, Korea
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