Technology in the Palm of your Hand

MS3 August 2017

Goals:

1. Pull together MS 1 & 2 data and bring it to the bedside
2. Appreciate the Power of the History and Physical
3. Learn the concept of correlating clinically
4. Become familiar with the multitude of ancillary cardiac testing that are available

Suggestions before our session

- Review lectures in Year 1 and 2 from Drs.' Robia, Samarel, McKiernan and Kristopaitis while enjoying your favorite beverage or my choice Ice Cream
- Spend 20 minutes starring at a Wigger's Diagram
- Go to your learning resource center and listen to the heart sounds tutorial or visit the Harvey manikin in the Med School
- Bring to class a patients history or exam that is memorable or was challenging
- Bring to class any weird ECG's you have run across

References:

Your personal choice for Internal Medicine textbook: Cecil's, Harrison's or other

Chapter on the Cardiac history and physical

www.blaufuss.org

Go thru their free heart sounds tutorial
Low frequency, late diastolic sound heard at apex with bell. Best heard in left lateral decubitus position.

Deceleration of flow into the LV after the atrial contraction due to rise in the LV diastolic pressure

• Never normal
• Associated conditions:
  
  LV hypertrophy

Systemic Hypertension, Aortic stenosis, Intrinsic issue like Hypertrophic CM

Ischemia, Infarcted/Scar non-compliance

If your patient has symptoms (dyspnea most commonly) and their EF is normal they have:

Heart Failure with Preserved Ejection Fraction (HFP EF)

(I think a more friendly name would be "Unhappy Heart During Diastole") (maybe UPURS)

This would more likely be less stressful and treat their human spirit

Imaging Correlation: Echo
Scenarios

A. 66 yr old female with exertional dyspnea on > 4 MET activities

Dx: hypertension x 8 years

BP 168/102, BMI 38.5

+S4, non-displaced, mildly sustained PMI

Predict: Echo, EF, BNP

B. 72 yr old with remote MI 6 yr ago presents for routine follow up

Dx: CAD, Dyslipidemia

BP 138/80, BMI 25.2

+S4, PMI in mid-clavicular line

ECG: shown

Predict Echo
S3

Low frequency, early diastolic sound heard at apex with bell, best in the LL decubitus position

Deceleration of flow early in diastole due to finding the LV still full most commonly due to impaired ejection.

Can be normal in youth/health due to the extremely high volume, rapid early filling phase

"Physiologic S3"

Associated with LV and reduced ejection fraction

If your patient has symptoms then it is called:

**Heart Failure with Reduced Ejection Fraction (HFrEF)**

Associated with either ischemic or non-ischemic dilated cardiomyopathy

Assessment of EF:

- PMI, precordial activity
- Echo, CT, MRI, LV angiogram, Nuclear Medicine (SPECT, MUGA)

Stage and functional class:
### New York Heart Association (NYHA) Classification of Heart Failure

<table>
<thead>
<tr>
<th>Class</th>
<th>Patient Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I (Mild)</td>
<td>No limitation of physical activity. Ordinary physical activity does not cause undue fatigue, rapid/irregular heartbeat (palpitation) or shortness of breath (dyspnea).</td>
</tr>
<tr>
<td>Class II (Mild)</td>
<td>Slight limitation of physical activity. Comfortable at rest, but ordinary physical activity results in fatigue, rapid/irregular heartbeat (palpitation) or shortness of breath (dyspnea).</td>
</tr>
<tr>
<td>Class III (Moderate)</td>
<td>Marked limitation of physical activity. Comfortable at rest, but less than ordinary activity causes fatigue, rapid/irregular heartbeat (palpitation) or shortness of breath (dyspnea).</td>
</tr>
<tr>
<td>Class IV (Severe)</td>
<td>Unable to carry out any physical activity without discomfort. Symptoms of fatigue, rapid/irregular heartbeat (palpitation) or shortness of breath (dyspnea) are present at rest. If any physical activity is undertaken, discomfort increases.</td>
</tr>
</tbody>
</table>

### Physical Activity MET Values

<table>
<thead>
<tr>
<th>Physical Activity</th>
<th>MET Values</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Light intensity activities</strong></td>
<td>&lt; 3</td>
</tr>
<tr>
<td>sleeping</td>
<td>0.9</td>
</tr>
<tr>
<td>watching television</td>
<td>1.0</td>
</tr>
<tr>
<td>writing, desk work, typing</td>
<td>1.5</td>
</tr>
<tr>
<td>walking, 1.7 mph (2.7 km/h), level ground, strolling, very slow</td>
<td>2.3</td>
</tr>
<tr>
<td>walking, 2.5 mph (4 km/h)</td>
<td>2.9</td>
</tr>
<tr>
<td><strong>Moderate intensity activities</strong></td>
<td>3 to 6</td>
</tr>
<tr>
<td>bicycling, stationary, 50 watts, very light effort</td>
<td>3.0</td>
</tr>
<tr>
<td>walking 3.0 mph (4.8 km/h)</td>
<td>3.3</td>
</tr>
<tr>
<td>calisthenics, home exercise, light or moderate effort, general</td>
<td>3.5</td>
</tr>
<tr>
<td>walking 3.4 mph (5.5 km/h)</td>
<td>3.6</td>
</tr>
<tr>
<td>bicycling, &lt;10 mph (16 km/h), leisure, to work or for pleasure</td>
<td>4.0</td>
</tr>
<tr>
<td>bicycling, stationary, 100 watts, light effort</td>
<td>5.5</td>
</tr>
<tr>
<td>sexual activity</td>
<td>5.8[^10]</td>
</tr>
<tr>
<td><strong>Vigorous intensity activities</strong></td>
<td>&gt; 6</td>
</tr>
<tr>
<td>jogging, general</td>
<td>7.0</td>
</tr>
<tr>
<td>calisthenics (e.g. pushups, situps, pullups, jumping jacks), heavy, vigorous effort</td>
<td>8.0</td>
</tr>
<tr>
<td>running jogging, in place</td>
<td>8.0</td>
</tr>
<tr>
<td>rope jumping</td>
<td>10.0</td>
</tr>
</tbody>
</table>
Scenario:

48 yr old with 4 months of progressive SOB now having symptoms with ADL's and waking up with a "smothering" sensation.

Denies chest pain

Exam: 108/88, 106, 22

JVP 8 cm at 45 degrees, Bibasilar rales, PMI in Anterior Axillary Line with "Gallop"

16 cm liver and 3 + edema

Diagnosis

Prognosis

Treatment
"I want to rule out CAD"

What is your goal?

**To detect "any"** then do an autopsy (A bit aggressive, but very accurate)

Or consider a coronary artery CT scan

![Image of CT scan](image1.png)

*Fig. 1 - Calcification of the anterior descending artery detected on ultrafast tomography in an asymptomatic man (arrow).*

**To detect "significant":**

Exercise treadmill stress test using ECG as marker for ischemia

![Image of ECG](image2.png)
IF ECG stinks (LVH with strain, LBBB, Pacemaker) then use imaging

Nuclear Medicine myocardial perfusion ("Thallium")

Echocardiography (Looks at contractility when myocardium become ischemic)

**What if can't exercise**

**Pharmacologic options:**

- Simulate the HR and BP response to exercise with Dobutamine and attempt to create ischemia
- Provide one of the material responsible for dilating the coronary arteries (_________) and take a look at the coronary blood flow using a traceable substance (Radioactive pharmaceutical: "Myoview", "Cardiolite")
Coronary Arteriography
# Systolic Murmur: AS versus MR

<table>
<thead>
<tr>
<th></th>
<th><strong>Aortic Stenosis</strong></th>
<th><strong>Mitral Regurgitation</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overload</strong></td>
<td>Pressure</td>
<td>Volume</td>
</tr>
<tr>
<td><strong>PMI</strong></td>
<td>Sustained, not displaced</td>
<td>Enlarged, displaced laterally</td>
</tr>
<tr>
<td><strong>Pulse</strong></td>
<td>Potentially tardus and brevis</td>
<td>Normal</td>
</tr>
<tr>
<td><strong>Extra Heart</strong></td>
<td>S4</td>
<td>S3, diastolic rumble</td>
</tr>
<tr>
<td><strong>Sounds</strong></td>
<td>Potentially Ejection Click</td>
<td></td>
</tr>
</tbody>
</table>
During ventricular ejection, LVP exceeds AP (gray area, pressure gradient generated by stenosis).

*Abbreviations:* LAP, left atrial pressure; LVP, left ventricular pressure; AP, aortic pressure.
Aortic Insufficiency

Blowing quality, heard with diaphragm along sternal border. Heard better when vertical and leaning forward

Never normal

Associated with lots of variable conditions

- Aortic dissection
- Aortic root dilation
- Endocarditis
- Bicuspid aortic valve
Your History & Physical Exam in setting of chest pain

History and Vote:

Diamond and Forrester & CASS

<table>
<thead>
<tr>
<th>AGE</th>
<th>Nonanginal</th>
<th>Atypical</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
</tr>
<tr>
<td>30-39</td>
<td>4</td>
<td>2</td>
<td>34</td>
</tr>
<tr>
<td>40-49</td>
<td>13</td>
<td>3</td>
<td>51</td>
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<tr>
<td>50-59</td>
<td>20</td>
<td>7</td>
<td>65</td>
</tr>
<tr>
<td>60-69</td>
<td>27</td>
<td>14</td>
<td>72</td>
</tr>
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</table>