Evaluating Chest Pain

What tests to order

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Disclosures

- I have nothing to disclose
Chest pain is EASY!

- Most chest pain can be sorted out into cardiac/non-cardiac by history alone
- Stress testing is not always necessary
  - If it’s clearly angina, just treat it and refer (if appropriate)
  - High risk patients should often (not always) go directly to cardiac cath
When do I need to order a stress test?

• The goal of stress testing should be to identify high risk patients

• These are patients who have a bad prognosis without treatment and whose prognosis will improve with treatment.

• Plain exercise treadmill testing is under-utilized, safe, cheap, and provides valuable information.

• Sometimes stress testing with imaging is useful.
Definition of ANGINA

• Occurring with exercise (or emotional stress) and relieved with rest (or nitroglycerin)

• Lasting about 5-10 minutes

• Of a certain typical quality
  • Vague (not pinpoint), often radiating
  • May be associated with diaphoresis, nausea, dyspnea
Clinical Classification of Chest Pain

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td><strong>Typical</strong></td>
<td>1) Substernal chest discomfort with a characteristic quality and duration that is 2) provoked by exertion or emotional stress and 3) relieved by rest or nitroglycerin</td>
</tr>
<tr>
<td>angina (definite)</td>
<td></td>
</tr>
<tr>
<td><strong>Atypical</strong></td>
<td>Meets 2 of the above characteristics</td>
</tr>
<tr>
<td>angina (probable)</td>
<td></td>
</tr>
<tr>
<td><strong>Noncardiac</strong></td>
<td>Meets 1 or none of the typical anginal characteristics</td>
</tr>
<tr>
<td>chest pain</td>
<td></td>
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</table>
Stable Angina

- Stable angina
  - Fixed restriction in myocardial oxygen supply, causing variable supply/demand mismatch with changes in demand

- *Unstable angina is different*
  - Change in myocardial oxygen supply, causing a change in symptoms or symptoms at rest
Unstable angina … Acute coronary syndrome … NSTEMI

- These imply an *active, dynamic situation*, usually caused by plaque erosion and impending (or actual) MI.

- These are managed in the ED or hospital, where a defibrillator is nearby, IV access is obtained, etc. A totally different situation.

- Not covered here, except to say:

  - **NEVER, EVER, EVER** send a troponin lab from the office
Why not send a troponin from the office?

• Doing so implies that you have decided to treat a life-threatening medical emergency without any of the necessary supports which are standard of care in this situation.

• You are therefore assuming responsibility for whatever happens next.

• Good luck with that.
Unstable angina spans a spectrum of disease

• Changing pattern of angina in an otherwise stable patient can be evaluated as an outpatient

• Oregon Cardiology’s new **Rapid Access Clinic** can see non-emergent but urgent chest pain within 24-48 hours
I just want to know if my patient’s chest pain is cardiac

- Pre-test probability of having CAD will change the likelihood of disease.
- Not all patients should have the same test for chest pain
What about women?

- A recent large review study in JAMA Internal Medicine showed that men and women with **stable angina** largely present with **the same symptoms**

- **Women did tend to use different words than men. Women more often used terms like “pressure”, “discomfort” and “ache”**

- **Women do more frequently have atypical symptoms with **acute MI**, compared to men**
What does this mean?

- A negative result on a stress test for a high-risk patient hasn’t helped very much.
- A positive result on a stress test for a low-risk patient hasn’t helped very much.
- Diagnostic tests with average sensitivity/specificity are most useful in intermediate risk patients
Diagnostic Accuracy of ETT, SPECT, and Echo

<table>
<thead>
<tr>
<th>Method</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETT</td>
<td>68</td>
<td>77</td>
</tr>
<tr>
<td>SPECT</td>
<td>87</td>
<td>73</td>
</tr>
<tr>
<td>Echo</td>
<td>86</td>
<td>81</td>
</tr>
</tbody>
</table>
So, which test should I order?

- How badly do you need to know?
- Should everyone just get an angiogram?
- Let’s shift gears for a moment and discuss the clinical impact of CAD *in your individual patient*
What is the annual mortality for single-vessel CAD?

- 1%?
- 2%?
- 10%?
- 20%?
CAD mortality

- About 1% per vessel per year!
- Except for Left Main and 3 vessel disease, which are 4-8%/year
The main point of stress testing is to identify patients with severe CAD

- Multi-vessel and Left Main CAD will realize a \textit{mortality} benefit from CABG or PCI

- These are the patients who have potential for \textit{mortality reduction} from the CAD diagnosis

- And these are the patients we \textit{most want to find} with stress testing
The prognostic result of stress testing is (maybe) more important than the diagnostic

- This is why not every positive stress test needs a cath

- Need to cath only if it will affect prognosis and if revascularization will affect prognosis

- Medical therapy without cath for a patient with single vessel CAD is OK
Duke Treadmill Score

Score =
Duration (min Bruce protocol) –
(5x ST-seg deviation)(mm) –
(4x angina index)(0, 1, 2)

<table>
<thead>
<tr>
<th>Annual CV Mortality (%)</th>
<th>Low (≥5)</th>
<th>Intermediate (-10 to +4)</th>
<th>High (&lt;-10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.3</td>
<td>1.3</td>
<td>5.0</td>
</tr>
</tbody>
</table>
Which patients are best for plain treadmill?

• Low-intermediate likelihood of CAD

• “Normal” EKG at rest
  • RBBB OK, but no LBBB and no ST depression at rest

• Able to exercise

• This is actually probably the majority of patients
## Standard ETT Versus Imaging, Initial Test Selection

<table>
<thead>
<tr>
<th></th>
<th>ETT</th>
<th>Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to exercise</td>
<td>Able</td>
<td>Unable</td>
</tr>
<tr>
<td>Prior PCI/CABG</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Resting ECG</td>
<td>Normal</td>
<td>Abnormal*</td>
</tr>
</tbody>
</table>
Which patients are best for nuclear MPI?

- Prior history of CAD, especially history of CABG or PCI
- MPI will localize the ischemia
- Can’t exercise or
- Might not be able to exercise but can try
  - Bail-out Lexiscan
  - LBBB
  - Pacemaker
Which patients are best for stress echo?

• Intermediate likelihood of CAD
• Can exercise
• Likely to have good imaging
• Not very obese, COPD
Direct Comparison of Stress MPI and Stress Echo in 1,405 Patients

![Bar Graph: Sensitivity and Specificity Comparison]

- Sensitivity:
  - MPI: 84%
  - ECHO: 80%

- Specificity:
  - MPI: 77%
  - ECHO: 88%
What about women?

• Exercise stress testing is somewhat less specific in women.

• Specificity in men 77% versus 70% in women.

• This means that women will have more false positive results.

• This also means that the Negative predictive value of an exercise treadmill test is just as good in women.
Stress testing in women

• Because sensitivity is just as good in women as men, guidelines still recommend exercise stress testing in women as the best initial test.

• Prognostic data regarding exercise duration is just as valid for women as for men.

• The Duke Treadmill Score is just as valid for women.