Exercise ECG diagnosis and event rates in patients with a low pre-test probability of coronary artery disease


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Presenter Disclosure Information

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FINANCIAL DISCLOSURE:
None
Background

- Rapid Access Chest Pain Clinics (RACPC) were established in the UK to fast track the diagnosis of patients with suspected cardiac chest pain
- Patients are seen by a cardiologist within 2 weeks of primary care physician referral
- Full clinical assessment and same visit treadmill exercise ECG if appropriate.
NICE guidelines for chest pain

- Published in March 2010
- Do not use exercise ECG to diagnose or exclude CAD
- In people without confirmed CAD, estimate pre-test probability based on modified Diamond-Forrester score.
  - <10% no investigations required
  - 10-29% CT calcium score as first line investigation
  - 30-60% functional imaging
  - 61-90% invasive coronary angiography
  - >90% manage as angina
Pre test probability of CAD

Table 1 Percentage of people estimated to have coronary artery disease according to typicality of symptoms, age, sex and risk factors

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Non-anginal chest pain</th>
<th>Atypical angina</th>
<th>Typical angina</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men Lo</td>
<td>Hi</td>
<td>Women Lo</td>
</tr>
<tr>
<td>35</td>
<td>3</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>45</td>
<td>9</td>
<td>47</td>
<td>2</td>
</tr>
<tr>
<td>55</td>
<td>23</td>
<td>59</td>
<td>4</td>
</tr>
<tr>
<td>65</td>
<td>49</td>
<td>69</td>
<td>9</td>
</tr>
</tbody>
</table>

For men older than 70 with atypical or typical symptoms, assume an estimate > 90%.
For women older than 70, assume an estimate of 61–90% EXCEPT women at high risk AND with typical symptoms where a risk of > 90% should be assumed.

Values are per cent of people at each mid-decade age with significant coronary artery disease (CAD).
Hi = High risk = diabetes, smoking and hyperlipidaemia (total cholesterol > 6.47 mmol/litre).
Lo = Low risk = none of these three.
The shaded area represents people with symptoms of non-anginal chest pain, who would not be investigated for stable angina routinely.

Note: These results are likely to overestimate CAD in primary care populations.
If there are resting ECG ST-T changes or Q waves, the likelihood of CAD is higher in each cell of the table.
Aims of the study

This study aimed to assess the diagnostic findings and event rates in patients with a low pre-test probability of CAD undergoing treadmill exercise ECG.
Methods

- Retrospective observational study
- Data registry of 2,199 consecutive patients attending RACPC from 2004 to 2006
- Follow up data collected from medical records
- Events defined as all-cause mortality and ACS admissions.
RACPC Database

- Established in 2000
- 3 RACP clinics per week
- 8 patient slots per clinic
- Conducted by cardiologist and cardiac physiologist
Clinical Information

- Age, gender, ethnicity
- Past medical history including previous cardiac history (MI, CABG, PCI)
- Risk factors (HTN, DM, smoking, hypercholesterolemia, family history)
- Chest pain characteristics and physical examination findings
- Pre-test probability scores
Exercise ECG protocol

- Treadmill exercise ECG
- Bruce/Modified Bruce protocol
- 85% target heart rate or symptom limited test
- Test positivity based on ST segment changes, symptoms and haemodynamic response.
Patient groups

N = 2199

- Inappropriate referral: 316
- Known CAD: 114
- Low (<30%): 558
- Intermediate (30-60%): 404
- High (>60%): 775
Demographic characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of patients</td>
<td>558</td>
</tr>
<tr>
<td>Age</td>
<td>48.0 ± 10.1 years</td>
</tr>
<tr>
<td>Gender (male, %)</td>
<td>31</td>
</tr>
<tr>
<td>Diabetes (%)</td>
<td>3</td>
</tr>
<tr>
<td>Hypertension (%)</td>
<td>22</td>
</tr>
<tr>
<td>Hypercholesterolaemia (%)</td>
<td>5</td>
</tr>
<tr>
<td>Smoking (%)</td>
<td>3</td>
</tr>
</tbody>
</table>
Exercise ECG findings

- Negative: 78%
- Positive: 3%
- Inconclusive: 8%
- Unable: 11%
Follow-up data

- Follow-up period over 4 years
- 17 events noted during the study period.
- Annual event rate for the study population was 0.76% per year
Exercise ECG diagnosis and Event Rates

- Negative: 0.4%
- Positive: 4.2%
- Non diagnostic: 1.7%
Multivariate Analysis for Events

Factors included in the model:

Age, gender, ethnicity, hypertension, diabetes, hyperlipidemia, smoking, exercise ECG diagnosis

Independent predictors of events

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR (95% CI)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive ex test</td>
<td>7.32 (1.89-28.42)</td>
<td>0.004</td>
</tr>
<tr>
<td>Non diagnostic ex test</td>
<td>3.98 (1.33-11.83)</td>
<td>0.01</td>
</tr>
</tbody>
</table>
Conclusions

- Vast majority of low pre-test probability patients had negative exercise test followed by very low event rates.

- Positive exercise test patients with higher event rates were appropriately identified.

- Non exercise cardiac imaging tests in this patient population may be best reserved in patients without a diagnostic exercise test.
Thank You