Screening Young Competitive Athletes for Underlying Cardiovascular Disease in British Columbia, Canada – A SportsCardiologyBC Study

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Introduction:

• Following the publication of a 25-year study out of Italy that showed a 90% risk reduction for SCD after the implementation of a systematic screening program, international attention towards the concept of screening has increased

• Implementation of screening remains a controversial issue, with the primary disparity lying in whether a 12-lead electrocardiogram (ECG) should be included in addition to a cardiovascular focused medical history and physical examination

• The purpose of this study is to determine the prevalence of cardiovascular diseases that can lead to SCD in a sample of young (12-35) competitive athletes in British Columbia
Methods

- The first 681 participants were screened using the AHA 12-element recommendations for screening and resting 12-lead ECG.
- The latter 681 participants were screened using a revised SportsCardiologyBC protocol and resting 12-lead ECG with no physical exam.
- ECGs were interpreted by cardiologists using the “Seattle Criteria”.

**Flowchart**

- **N= 681 Young Competitive Athletes**
  - Family and personal history questionnaire, physical examination (AHA 12-item), 12 lead ECG
    - **Negative Findings**
      - No Further Testing
      - Cardiovascular disease
    - **Positive Findings**
      - Further Examinations (echo, stress test, 24 h holter, MRI, angio)
        - No Cardiovascular Disease
        - Other

- **N= 681 Young Competitive Athletes**
  - SportsCardiologyBC Questionnaire, 12 lead ECG
    - **Negative Findings**
      - No Further Testing
      - Cardiovascular disease
    - **Positive Findings**
      - Further Examinations (echo, stress test, 24 h holter, MRI, angio)
        - No Cardiovascular Disease
        - Other
Results

• Of the 1,362 athletes evaluated, 93 (6.8%) required follow-up investigation.
• 11 (0.8%) cardiovascular disorders were found
  • Probable hypertrophic cardiomyopathy (HCM)
  • Long QT syndrome
  • 4 cases of Wolff-Parkinson-White Syndrome
  • Myxomatous mitral valve prolapse with mild regurgitation
  • Mild-moderate tricuspid insufficiency with pectus excavatum
  • Paroxysmal supraventricular tachycardia
  • Supraventricular tachycardia
  • Restrictive ventricular septal defect

• 11 participants are still under investigation for the presence of disease.
  Notable queries include:
  • Atrial septal defect
  • HCM
  • Arrhythmogenic right ventricular dysplasia
  • Premature coronary artery disease
# ECG Findings

<table>
<thead>
<tr>
<th>Abnormal ECG Findings (suggestive of pathology)</th>
<th>Prevalence</th>
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</thead>
<tbody>
<tr>
<td>Right ventricular hypertrophy pattern</td>
<td>n=2 (0.15%)</td>
</tr>
<tr>
<td>T-wave inversion</td>
<td>n=4 (0.29%)</td>
</tr>
<tr>
<td>Premature ventricular contractions</td>
<td>n=3 (0.22%)</td>
</tr>
<tr>
<td>Left atrial enlargement</td>
<td>n=1 (0.07%)</td>
</tr>
<tr>
<td>Long QT interval</td>
<td>n=4 (0.29%)</td>
</tr>
<tr>
<td>Complete left bundle branch block</td>
<td>n=1 (0.07%)</td>
</tr>
<tr>
<td>Ventricular pre-excitation</td>
<td>n=4 (0.29%)</td>
</tr>
<tr>
<td>Intraventricular conduction delay</td>
<td>n=1 (0.07%)</td>
</tr>
<tr>
<td>Biaatrial abnormality</td>
<td>n=1 (0.07%)</td>
</tr>
<tr>
<td>Accelerated idioventricular rhythm</td>
<td>n=1 (0.07%)</td>
</tr>
</tbody>
</table>

Total abnormal ECG findings = 22 (1.7%)

ECG Positive predictive value = 7/19 = 36.8% (3 athletes still under investigation with initial abnormal ECG)
Conclusions

- With 11 positives cases of underlying CVD found, and the investigation into several more athletes pending, screening for CVD in this population is likely a worthy endeavor.

- The AHA 12-element preparticipation screening tool produced several false-positive results, prompting the research team to revise the protocol.

- Considering the low proportion of ECG false-positive findings, as well as the improvement in positive predictive value over physical exam and ECG alone (36.8% vs. 10.2%), the resting 12-lead ECG should be considered an effective tool for screening.

Questions? – dlithwick@sportscardiologybc.org