SportsCardiologyBC

Young and Masters Athlete Screening Project Updates

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The first reported SCD
The death of an athlete

• Regardless of age, is a tragic event
• The death of an athlete is often difficult to comprehend
• How can some of the ‘healthiest’ and most physically fit members of society succumb to sudden cardiac death?
• Are there ways to identify these athletes who may be at an increased risk of SCD?
Pre-participation Screening

• The primary objective is the detection of intrinsic underlying cardiovascular abnormalities that predispose an athlete to sudden cardiac death

• To find the: ‘fatally flawed among the fabulously fit’
Young vs. Old (Masters)
Young vs. Old (Masters)
Young vs. Old (Masters)
Causes of SCD by age

Age (Years)

Channelopathies
- Long QT Syndrome
- Brugada Syndrome
- Catecholaminergic VT

Cardiomyopathies
- Hypertrophic Cardiomyopathy
- Arrhythmogenic RV Cardiomyopathy
- Dilated Cardiomyopathy

Coronary Artery Pathology
- Atherosclerotic
- Anomalous Coronary Ostia

35 years-old
Causes of SCD by age

Young Athlete < 35 years
- >80% of SCD due to:
  - Cardiomyopathies
    - Hypertrophic Cardiomyopathy
    - ARVC
    - Dilated Cardiomyopathy
  - Electrical abnormalities
    - Long QT Syndrome
    - WPW
    - Brugada
- Coronary Anomalies
- Myocarditis / Drugs / Aortopathy

Masters Athlete > 35 years
- >80% of SCD due to:
  - Coronary Artery Disease
Tools used in screening

**Young Athlete**
- History
- Physical
  - Symptoms
  - Family History
- 12-lead ECG

**Masters Athlete**
- History
- Physical
- 12-lead ECG
- Framingham Risk Score
- Exercise Stress Test
SCBC Young Athlete Study

• **Purpose(s):**
  
  – Ascertain the prevalence of subclinical potentially lethal CVD amongst a sample of young competitive athletes in the province of British Columbia
  
  – Assess the effectiveness of the ECG in screening
  
  – Development of a novel SCBC protocol
SCBC Young Athlete Study

Phase 1

681 Young Competitive Athletes

- AHA 12-item questionnaire
- Physical Examination
- 12-lead ECG

Phase 2

681 Young Competitive Athletes

- Novel SCBC questionnaire*
- 12-lead ECG**

Athletes aged 12 to 35

ECG interpreted as per Seattle Criteria
SCBC Young Athlete Study

Phase 1

- 681 Young Competitive Athletes
  - AHA 12-item questionnaire
  - Physical Examination
  - 12-lead ECG

Phase 2

- 681 Young Competitive Athletes
  - Novel SCBC questionnaire *
  - 12-lead ECG**

NO
Phase 1 (AHA + Physical + ECG)

Negative Findings
N = 622 (91.4%)

No Further Testing

Positive Findings
N = 59 (8.6%)

Further Investigations
(echo, stress test, 24-h Holter, CMRI)

- Hypertrophic cardiomyopathy
- Mitral valve prolapse with mild MR
- Ventricular septal defect (restrictive)
- AV nodal re-entry tachycardia
  N = 4

No Cardiovascular Disease
N = 55
Phase 2 (SCBC questionnaire + ECG)

- **Negative Findings**
  - N = 650 (95.4%)
  - No Further Testing

- **Positive Findings**
  - N = 31 (4.6%)
  - Further Investigations (echo, stress test, 24-h Holter, CMRI)
    - Long QT Syndrome
    - Wolf-Parkinson-White Syndrome (4)
    - AV nodal re-entry tachycardia
      - N = 6
    - No Cardiovascular Disease
      - N = 17
    - Investigations pending
      - N = 8
Young Athlete Study

CONCLUSIONS

• We found significant subclinical CV disease amongst BC’s young competitive athletes

• The 12-lead ECG is an effective tool at identifying significant disease

• Our novel SCBC questionnaire increased the positive predictive value 8.9% to 19.4% and reduced false positives
SCBC Masters Athlete Screening Study

• **Primary Objective:**
  – Prevent adverse cardiac events and sudden cardiac death in Masters athletes

• **Outcomes:**
  – Prevalence of cardiovascular disease (i.e. CAD)
  – Prevalence of risk factors (i.e. hypertension, dyslipidemia)
  – Prevalence of atrial fibrillation in the masters athlete and its association with intensity of sport and volume of physical activity
N = 800+ Recreationally Competitive and High Performance Masters Athletes

Initial Screen:
History and Personal Symptoms Questionnaire, Physical Exam, Framingham Risk Score, Resting 12-lead ECG

- Negative
  - No Further Testing → Follow-up (5 Years): ECG, FRS, Questionnaire

- Positive
  - Exercise Treadmill Test
    - Negative: Follow-Up (5 years): ECG, FRS, Questionnaire
      - No Cardiovascular Disease
        - Follow-up (5 years): ECG, FRS, Questionnaire
          - CVD → q1yr Follow-up
        - Other → Clinical Care
    - Positive
      - Further Examinations (i.e. echo, 24 h holter, CMR, CCT/CACS)
Masters Study – Interim Results

Framingham Risk Score

- Low risk: 60%
- Intermediate risk: 29%
- High risk: 11%

185 Patients
Masters Study – Interim Results

- 112 Low Risk (<10% FRS)
  - ETT (35)
  - No Further Testing (77)

112 Low Risk

- Existing symptoms (17)
  - Positive family history (8)
  - Positive physical examination (6)
  - Abnormal ECG (9)
  - Age ≥65 years (3)

ETT (35)

- Pending ETT (7)
  - No CVD (2)
- Positive (11)
  - Query HCM (1)
  - Mild MR (1)
  - Long QT (1)
  - ST Depression - High DTS, no further testing (1)
- Negative (17)
  - Investigations pending (5)
Masters Study – Interim Results

53 Intermediate Risk (10-19% FRS)

- ETT
  - Pending ETT (11)
  - Further Tests (19)
  - Negative (23)

Further Tests (19):
- Investigations pending (4)
- No CVD (3)

Pending ETT (11):
- High PVC burden + Athlete’s heart (1)
- High PVC burden + Mild systolic dysfunction (1)
- MVP (1)
- Paroxysmal AFib, mild MR (1)
- Permanent AFib (1)
- Mild diastolic dysfunction, mild-moderate MR and TR (1)
- Mild-mod MR (1)
- Ao sclerosis, mild MR, mild TR (1)
- Non-obstructive CAD (2)
- Severe CAD (1)
- Probable old MI (1)
Masters Study – Interim Results

20 High Risk (>20%)

ETT

Test pending (4)  Further tests (16)

Bicuspid aortic valve with severe aortic insufficiency (1)
  High CACS (94th percentile) (1)
  Mild Ao sclerosis, Mild-mod TR, high PVC burden (1)
  Single vessel disease (2)
  Double vessel disease (1)
  Severe 3 vessel disease, moderate systolic dysfunction (1)
  Mild-moderate aortic insufficiency (1)
  Coronary anomaly (low risk)(1)

Investigations pending (7)
Masters Study – Interim Conclusions

• Masters athletes are not immune to elevated cardiovascular risk

• Significant CV disease exists amongst asymptomatic physically fit Masters athletes

• Systematic screening amongst Masters athletes may worthwhile in select cases
Stay active, stay fit, stay safe

http://www.sportscardiologybc.org/

Clinical Assessment
With the overwhelming existing evidence of the beneficial and preventive effects of exercise, our society is becoming more and more physically active. Our goal is to assess and evaluate athletes to ensure safe participation in athletics.

Research
With an aging population and an overall increase in the participation of regular athletics and exercise in the general population, research in risk factors and warning signs for cardiovascular events must be investigated.

Advocacy
In order to educate the public on the importance of cardiovascular health and help prevent tragic cardiovascular events, Sports Cardiology B.C. will collaborate with local, national and international organizations.

Education
Through the dissemination of results from research investigation and the interpretation of clinical case studies, public education on safe participation in athletics needs to be provided.
SportsCardiology BC Team

• Please feel free to contact us:
  – Collaboration in research
    • Current and NEW projects
  – Participation in advocacy events
  – Clinical assessment of an athlete
  – Create partnerships
SCBC Team

- Dr. Saul Isserow
- Dr. Brett Heilbron
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- Dr. Janet McKeown
- Dr. Shu Sanatani
- Dr. Rich Vandegriend
- Dr. Michael Luong
- Dr. Christopher Fordyce
- Faisal Aziz
Questions?

www.sportscardiologybc.org
SportsCardiologyBC

• Multidisciplinary medical team approach
• Goals of the program are outlined by the 4 pillars:
  – Research, Clinical Assessment, Education and Advocacy

• Clinical focus: Risk assessment and guidance in athletes with cardiac abnormalities, with a focus on Master’s athletes with CHD

• Resource for medical community to educate and provide local perspective on controversial topics

• Research: Detection, prevention and treatment of cardiovascular disease, registry formation, risk factor and disease prevalence
SCD in General Population

Marijon, Circulation, 2011
Disclosures

• We will only be discussing our screening study results
Exercise can be a trigger for a heart attack?

<table>
<thead>
<tr>
<th>Study</th>
<th>Effect Period</th>
<th>End Point</th>
<th>RR (95% CI)</th>
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<tbody>
<tr>
<td>Seattle study&lt;sup&gt;5&lt;/sup&gt; (1984)</td>
<td>&lt;1 h</td>
<td>Primary cardiac arrest</td>
<td>56 (23–131)&lt;sup&gt;†&lt;/sup&gt;</td>
</tr>
<tr>
<td>Onset study&lt;sup&gt;32&lt;/sup&gt; (1993)</td>
<td>1 h</td>
<td>Nonfatal MI</td>
<td>5.9 (4.6–7.7)</td>
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<tr>
<td>TRIMM study&lt;sup&gt;31&lt;/sup&gt; (1993)</td>
<td>1 h</td>
<td>Nonfatal MI</td>
<td>2.1 (1.1–3.6)</td>
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<tr>
<td>Hartford Hospital AMI study&lt;sup&gt;6&lt;/sup&gt; (1999)</td>
<td>1 h</td>
<td>Nonfatal MI</td>
<td>10.1 (1.6–55.6)</td>
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<tr>
<td>SHEEP study&lt;sup&gt;40&lt;/sup&gt; (2000)</td>
<td>&lt;15 min</td>
<td>Nonfatal MI</td>
<td>6.1 (4.2–9.0)</td>
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<tr>
<td>Physician's Health Study&lt;sup&gt;7&lt;/sup&gt; (2000)</td>
<td>30 min</td>
<td>SCD</td>
<td>16.9 (10.5–27)</td>
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The paradox of exercise

• **Undisputed** health benefits of physical activity
• Vigorous exertion may *transiently* increase the risk of acute cardiac events
• The risk of sudden cardiac death (SCD) approximately doubles during physical activity
Physiological alterations accompanying acute exercise and recovery