Investigating senior athletes for cardiovascular disease

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Half a Century of Running — Clinical, Physiologic and Autopsy Findings in the Case of Clarence DeMar (Mr. Marathon)

James H. Currens, M.D. 7, and Paul D. White, M.D. 8

MARATHON RUNNING AND IMMUNITY TO ATEROSCLEROSIS

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Middle-aged, male marathon runner

Non-obstructive fibrous plaque complicated by luminal thrombosis triggered by endothelial erosion

(Courtesy of D. Corrado)
Incidence of sudden cardiac death in adult and senior athletes

- 1: 15,260 athletes/year (i.e., 7.6 times than sedentary) \(^1\)

- 1. 18,000 men/year (i.e., 25 times than during rest) \(^2\)

1. Thompson PD JAMA 1982
2. Siscovick DS NEJM 1984
Causes of SCD in athletes of >35-year age

- Ischemic Heart Disease: 80
- Cardiomyopathies: 5
- Valvular Diseases: 7
- Others: 3

Exercise-related triggers for plaque instability

- Increased coronary artery wall stress
- Spasm of the diseased segment of coronary artery
- Increased flexing of coronary artery and deepening of existing fissures
- Increased platelet aggregation

Ischemia-induced malignant arrhythmias

Plaque disruption
Thrombotic occlusion
Vigorous exertion increases the risk of AMI and SCD, particularly in less-trained and sedentary subjects with underlying CAD.

THE PARADOX” OF SPORT

How combine the benefits of regular exercise training and sport participation with the increased risk of CV events?
Cardiovascular evaluation of middle-aged/senior individuals engaged in leisure-time sport activities: position stand from the sections of exercise physiology and sports cardiology of the European Association of Cardiovascular Prevention and Rehabilitation

Mats Borjesson¹, Alex Urhausen², Evangelia Kouidi³, Dorian Dugmore⁴, Sanjay Sharma⁵, Martin Halle⁶, Hein Heidbüchel⁷, Hans Halvor Björnstad⁸, Stephan Gielen⁹, Alessandro Mezzani¹⁰, Domenico Corrado¹¹, Antonio Pelliccia¹² and Luc Vanhees¹³
Work-out for active, adult/senior individuals participating in sport activities, according to the Sport Cardiology of ESC (ECPRJ 2011)
Moderate-intensity activities

Self-assessment of the risk (PARQ)

Low-intensity activities

No risk

Start Activity

Yes, risk

Yes, risk

Sedentary senior subjects

Screening by physician by Hx, Score, PE, ECG

Exercise ECG

Work-out for sedentary, adult/senior individuals prior sport activities, according to the Sport Cardiology of ESC (ECPRJ 2011)
## Limitations of ECG exercise testing in asymptomatic adults

Froelicher VF et al. 2005

Meta-analysis of 12 large screening studies

<table>
<thead>
<tr>
<th>End-Points</th>
<th># Patients</th>
<th>Sensitivity</th>
<th>Specificity</th>
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</thead>
<tbody>
<tr>
<td>Major CV events (SD, MI)</td>
<td>12,212</td>
<td>25%</td>
<td>90%</td>
</tr>
<tr>
<td>All CV events</td>
<td>5,526</td>
<td>50%</td>
<td>90%</td>
</tr>
</tbody>
</table>
PP Fausto. 56-year, male, amateur runner

- No CV symptoms
- BP 130/90 mmHg (on treatment)
- Cholesterol 280 mg%; HDL 46 mg%; triglycerides 388 mg%
- FH negative for CAD
LAD: extensive calcium apposition on proximal tract; Cx: severe calcium apposition, with 40% lesion on distal tract; Dx: diffuse calcium apposition and irregular vessel shape.

PP Fausto
56-year, male, amateur runner
F. A. Male rower, 66 year-old
8-10 h/week training
No CV symptoms
BP 140/90 mmHg
Cholesterol 210 mg%  
FH negative for CAD

S.M. Male rower, 62 year-old
8-10 h/week training
No CV symptoms
BP 135/85 mmHg
Cholesterol 270 mg%  
FH positive for CAD
F. A. 66 year-old
S.M. 62 year-old
Coronary Artery Calcification in Athletes

(Mohlenkamp S. et al. Eur Heart J 2008)

Aged-matched controls
Marathon runners
FRS-matched controls

Risk Score 11
Risk Score 7
Risk Score 7

P =0.96
P =0.02
Clinical significance of coronary artery calcification in senior athletes?

- Coronary artery calcification (CAC) is present in a disproportionate large population of adult/senior athletes despite a low Risk Score, unrelated to their physical fitness.
- High calcium score in athletes is associated with increased risk for CV events within the next 5 years, as in untrained individuals (mechanical strain ? Micro-embolization ?)
Indication for coronary artery TC scan in adult/senior athletes?

1. Definite positive exercise testing in asymptomatic competitive athletes;
2. Equivocal symptoms or exercise ECG changes in athletes with high risk profile for CAD;
3. Suspected CAD with other concomitant pathologic conditions (CMPs, valve diseases...)
The current scientific evidence shows that …

✓ **atherosclerotic coronary artery disease is the most common cause for CV events in adult/senior athletes;**

✓ **strenuous exercise increases the risk of AMI and SCD, especially in sedentary individuals:**

✓ **identification of asymptomatic athletes at risk is recommended by risk assessment and ECG-screening, although sensitivity of exercise testing is low; TC scan substantially increases the diagnostic power of the screening;**

✓ **Indication for coronary CT scan in athletes is needed;**
Thank you for your attention

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