Cardiac Adaptation in Veteran Athletes

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Prof Jeremy Morris 06/05/1910 – 28/10/2009

1954 World Conference of Cardiology
Exercise and the Heart
Athlete’s Heart

Structure

Rhythm / ECG

Function
Exercise and the Heart Athlete’s Heart

Structure

Dynamic Exercise:  Largely increase in volume load
Increase in LV internal dimension
Proportionate increase LV wall thickness
“Eccentric “ LVH

Static Exercise:  Largely increase in pressure load
Increase in LV wall thickness
No change in LV internal dimension
“Concentric “ LVH
Exercise and the Heart
Athlete’s Heart

Structure

What about the Right Ventricle?

Increase in RV end diastolic volume

Increase in RV mass
Exercise and the Heart
Athlete’s Heart

Rhythm / ECG

Sinus bradycardia / arrest

Wandering pacemaker

Junctional bradycardia

First degree AV block

2nd Degree AV block (Wenckebach)

Repolarisation “abnormalities” (ST & T wave changes)
Exercise and the Heart
Athlete’s Heart

Function

LV systolic function – Normal at rest and on exertion

LV diastolic function – Normal at rest
Enhanced on exertion
Heart rate, peak oxygen uptake (\(\dot{V}o2\)), and left ventricular mass (LVM) in 127, 18–34 year old men according to weekly hours of sports activity.

Fagard R Heart 2003;89:1455-1461
What about veteran athletes?

- Coronary artery disease
- Conduction system disease
- Hypertension
Electrocardiographic findings in male veteran endurance athletes

20 male members of Scottish Veteran Harriers Club

20 age matched controls (golfers / bowlers)

Non smokers and no CVS disease

Resting, exercise & ambulatory ECG analysis

Echocardiography

This group of veteran endurance athletes developed concentric rather than eccentric LVH.
Athlete’s Heart or HCM or Myocardial Ischaemia
Left Ventricular Hypertrophy
HCM or Athlete’s Heart

Physiological
- Septal thickness <13mm
- Normal atria
- Normal or dilated LV
- VO₂ max >50ml/kg/min
- Regress with detraining
- Normal LV filling

Pathological
- Septal Thickness >13mm
- Enlarged atria
- Reduced LVID
- VO₂ max <50ml/kg/min
- No regression
- Abnormal LV filling
Electrocardiographic findings in male veteran endurance athletes

24 hour trend of heart rate in athletes and controls

## Bradycardia in Veteran Athletes

<table>
<thead>
<tr>
<th></th>
<th>Athletes</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean 24hr heart rate (bpm)</td>
<td>59</td>
<td>74</td>
</tr>
<tr>
<td>Asystole &gt;2s</td>
<td>7/20</td>
<td>2/20</td>
</tr>
<tr>
<td>2\textsuperscript{nd} Degree Heart Block</td>
<td>4/20</td>
<td>0/20</td>
</tr>
<tr>
<td>3\textsuperscript{rd} Degree Heart Block</td>
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Heart Rate Response over 24hrs & frequency of asystole >2s in one veteran athlete

Electrocardiographic findings in male veteran endurance athletes

12 Year Follow Up

19 male members of Scottish Veteran Harriers Club

20 age matched controls (golfers / bowlers)

Non smokers and no CVS disease

Resting, exercise & ambulatory ECG analysis

Echocardiography

### Echocardiogram Findings

<table>
<thead>
<tr>
<th></th>
<th>1985</th>
<th>1997</th>
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</thead>
<tbody>
<tr>
<td>Number with LV dilatation</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Number with LVH</td>
<td>9</td>
<td>10</td>
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</table>
EXERCISE ECG FINDINGS

Mean exercise time (s.d.) - 14.8 (3.8) mins

3 Subjects (17%) had >2 mm ST depression
Exercise Tolerance Test in a Veteran Athlete
EXERCISE ECG FINDINGS

Mean exercise time (s.d.) - 14.8 (3.8) mins

3 Subjects (17%) had >2 mm ST depression

1 - Normal thallium scan
1 - Fixed perfusion defect (Normal cor angio)
1 - Normal coronary angio 1991
# Bradycardia in Veteran Athletes
## 12 Year Follow Up

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<td>3/20 (2 paced)</td>
</tr>
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</table>

Veteran Athletes and Atrial Fibrillation
<table>
<thead>
<tr>
<th>Author</th>
<th>Type of study</th>
<th>% men</th>
<th>Age</th>
<th>Sport</th>
<th>Cases/controls</th>
<th>Odds Ratio (95% C.I)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kjaarlainen</td>
<td>Longitudinal Case control</td>
<td>100</td>
<td>47±5 runners 49±5 controls</td>
<td>Orienteering</td>
<td>262/373</td>
<td>5.5 (1.3 to 24.4)</td>
</tr>
<tr>
<td>Mont</td>
<td>Retro v gen pop</td>
<td>100</td>
<td>44±13 sports 49±11 non-sports</td>
<td>Endurance Sports &gt;3hrs/week</td>
<td>70 lone AF</td>
<td>61% of subjects with lone AF</td>
</tr>
<tr>
<td>Elusoa</td>
<td>Retrospective Case control</td>
<td>100</td>
<td>41±13 AF patients 44±11 controls</td>
<td>&gt;1500 hrs cumulated practice</td>
<td>51/109</td>
<td>2.87 (1.39 to 7.05) adjusted for age and hypertension</td>
</tr>
<tr>
<td>Heidbuchel</td>
<td>C/C in ablation pts</td>
<td>83</td>
<td>53±9 sports 60±10 controls</td>
<td>Cycling running or swimming &gt;3hrs /week</td>
<td>31/106</td>
<td>1.81 (1.10 to 2.98)</td>
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<tr>
<td>Molina</td>
<td>Longitudinal Case control</td>
<td>100</td>
<td>39±9 runners 50±13 controls</td>
<td>Marathon runners</td>
<td>252/305</td>
<td>8.80 (1.26 to 61.29) adjusted for age and blood pressure</td>
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<tr>
<td>Baldesberger</td>
<td>Longitudinal Case control</td>
<td>100</td>
<td>67±7 cyclists 66±6 golfers</td>
<td>Cycling</td>
<td>134/62</td>
<td>10% AF in cyclists 0% AF in controls</td>
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<tr>
<td>GIRAFA (Mont)</td>
<td>Prospective Case control</td>
<td>69</td>
<td>48±11</td>
<td>Endurance sports</td>
<td>107/107</td>
<td>7.31 (2.33 to 22.9)</td>
</tr>
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Ventricular Arrhythmias and Exercise

Jensen–Urstad et al Heart 1998

Northcote et al Br Heart J 1989
Ventricular Arrhythmias and Exercise

Number of patients with ventricular dysrhythmias

Exercise and the Heart
Veteran Athlete’s Heart

Structure
Rhythm / ECG
Function
Cardiac Adaptation in Veteran Athletes

Summary

Exercise is beneficial

Athlete’s Heart –

- Generally benign
- Usually reversible on detraining
- Occasionally harmful

Everything in moderation
Asanas with Props

The ancient yogis used logs of wood, stones, and ropes to help them practice asanas effectively. Extending this principle, Yogacharya Iyengar invented props which allow asanas to be held easily and for a longer duration, without strain.

Yogacharya Iyengar in Setubandha Sarvangasana

This version of the posture requires considerable strength in the neck, shoulders, and back, requiring years of practice to achieve. It should not be attempted without supervision.
Indian Yoga (Glasgow Style)