Exercise Guidelines in Hypertrophic Cardiomyopathy

Professor Sanjay Sharma MD, FRCP, FESC
St George’s University of London
St George’s Healthcare NHS Trust
Conflict of Interest Declared
None
Hypertrophic Cardiomyopathy
Causes of Sudden Cardiac Death in Athletes in Relation to Age

- **HCM**: 48%
- **CAD**: 14%
- **Unexplained**: 18%
- **Ruptured Aorta**: 7%
- **CAA**: 3%
- **Idiopathic LVH**: 10%
Small Vessel Disease

Myocardial disarray

LVH with non-dilated LV cavity

Myocardial disarray

Small Vessel Disease
Abstinence from strenuous exertion is recommended to minimise the risk of sudden cardiac death
Pertinent Issues

Heterogeneous Disorder

Incomplete Penetration

Mild morphology can be difficult to differentiate from physiological LVH of ‘athlete’s heart’.

Risk stratification is possible

Treatment available to reduce the risk of SCD

Gene testing has identified individuals with mutations who do not express the clinical phenotype.
Natural History of HCM

**Age 0-12**
- Development of LVH
- Sudden death

**Age 12-35**
- Severe symptoms

**Age 35-60**
- Development of LVH and symptoms
- Progressive symptoms
- AF, CVA or Heart Failure

**Age 60-85**
- Death due to natural causes
Risk Pyramid in HCM

- **High Risk**
  - Aborted sudden death
  - Sustained VT
  - Multiple risk factors

- **Intermediate Risk**
  - 1 risk factor

- **Low Risk**
  - No risk factors

ICD

Individualised therapy
Potential triggers for Sudden Death

Supraventricular arrhythmias
Myocardial ischaemia
LVOT obstruction
Abnormal Vascular Responses

Dehydration

Electrolyte imbalance

Unstable Electrophysiological Substrate

Adrenergic surges

Acid/base disturbance
Therapeutic Strategies in HCM

**Symptomatic Non obstructive HCM**
- Beta-blockers/Calcium channel blockers
- Anti-arrhythmic agents (amiodarone)

**Symptomatic Obstructive HCM**
- Beta-blockers/Calcium channel blockers/Disopyramide
- Transcoronary septal ablation
- Surgical myomectomy

**High Risk HCM**
- ICD
PERMANENT SUBSTRATE

Pharmacological agents

Invasive therapy for obstruction

ICD

Life style modification
Exercise Guidelines in HCM

THE EVIDENCE IS CIRCUMSTANTIAL

Conservative

Homogeneous

Encompass all preventable deaths
Guidelines

Bethesda (AHA)

European Society of Cardiology
Individuals with Unequivocal HCM or High Probability of HCM

Bethesda Guidelines (American)

Participation in class 1A sport (low intensity and low dynamic)

ESC Guidelines

No competitive sports if symptoms or any risk factors for sudden death

Class IA sport (low intensity and low dynamic) in those with no symptoms or risk factors
<table>
<thead>
<tr>
<th>LEISURE ACTIVITY</th>
<th>COMPETITIVE ACTIVITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stationary bicycle</td>
<td>Golf</td>
</tr>
<tr>
<td>Bowling</td>
<td>Archery</td>
</tr>
<tr>
<td>Brisk walking</td>
<td>Bowling</td>
</tr>
<tr>
<td>Golfing</td>
<td>Cricket</td>
</tr>
<tr>
<td>Moderate hiking</td>
<td></td>
</tr>
<tr>
<td>Skating</td>
<td></td>
</tr>
<tr>
<td>Tennis (doubles)</td>
<td></td>
</tr>
<tr>
<td>Treadmill</td>
<td></td>
</tr>
<tr>
<td>Low-intensity weights</td>
<td></td>
</tr>
</tbody>
</table>
Implications of the Guidelines in Athletic Individuals

1. Diagnosis of HCM in athletes
2. Isolated ECG abnormalities outside the context of a family history of HCM
3. Gene positive/phenotype negative individuals participating in regular sports
4. Individuals with ICD and individuals with therapeutic abolition of LV outflow gradient
5. Leisure/recreational sporting activities
Diagnosis of HCM is Based on Echocardiography

Left ventricular Hypertrophy ($\geq 13$ mm in adults and $> 11$ mm in adolescents) in association with a non-dilated LV cavity
Athlete’s Heart or HCM in Athlete with LVH ≥ 13 mm

HCM

Athlete

- Bizarre patterns of LVH
- LV cavity > 54 mm
- LA > 50 mm
- LV outflow obstruction
- Impaired diastolic function
- Isolated Sokolow-Lyon LVH
- ST depression/Deep T wave inversion
- Female gender
- Absence of HCM in first degree rels
- Peak VO2 > 50 ml/kg/min
Isolated ECG Abnormalities in the Absence of LVH
Role of ECG in Differentiating Physiological LVH from HCM

- Pathological Q waves
- Deep T wave inversions
- Isolated Sokolow-Lyon LVH
- Marked ST segment depression
- Left bundle branch block

Study group

No symptoms, no CV disease

70

6

81

5

1 cardiac arrest
1 sudden death
Athletes With Abnormal Repolarization Pattern and Structurally Normal Heart Can Participate in Competitive Sport A Lifelong Experience

ECG traces over 40 years of a soccer player (A and B whilst he was competing)

C and D after retirement
Investigation of Athletes with Isolated ECG Abnormalities

- **Holter**
  - Non sustained ventricular tachycardia

- **Exercise Test**
  - Flat blood pressure response
  - Low peak oxygen consumption
  - Cardiac arrhythmias
  - Inducible left ventricular outflow obstruction

- **Cardiac MRI**
  - Apical LVH
  - Myocardial fibrosis

- **Family Evaluation**
  - Affected first degree relatives
Exercise Guidelines for Athletes with Isolated ECG Abnormalities in the absence of other phenotypic features of HCM or Familial HCM

**Bethesda Guidelines**

Can participate in all sports

**ESC Guidelines**

Can participate in all sports
Gene Positive/Phenotype Negative Individuals

- No symptoms
- No risk factors for sudden death

**Bethesda Guidelines**
- Can participate in all sports
- Should have annual follow up to check for HCM phenotype

**ESC Guidelines**
- Recreational, non competitive sports only

Annual Evaluation
Diagnosis of HCM in young athletes

Abnormal findings:
- Genotype positive, phenotype negative
- Abnormal ECG
- LV Hypertrophy

Sudden death can occur at any time!
Treated Athletes

Symptomatic athlete ➔ Asymptomatic athlete

No competitive sport ➔ Class 1 A sport
HCM Individuals Treated with ICD

Implantation of an ICD does not change guidelines. Reliability of ICD during sport is unpredictable

Contact sport prohibited and most non contact sport (except class 1A) not recommended
Sports Allowed on an Individual Basis

Moderate intensity weights
Cross country skiing (flat)
Horse riding
Jogging
Running
Sailing
Stationary rowing
Swimming
Prudent Advice

AVOID

1. sudden explosive exertion (sprinting).

2. Exercise in extreme adverse environmental conditions e.g. hot, humid or very cold.

3. Exercise programmes that involve regular systematic training with increasing workloads focussed on achieving high levels of conditioning and excellence.

4. Intensive static isometric exertion (free weights)
<table>
<thead>
<tr>
<th>Description</th>
<th>36th Bethesda</th>
<th>ESC 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definite diagnosis of HCM plus risk factors</td>
<td>Low dynamic and low static sport (class 1A)</td>
<td>No competitive sport</td>
</tr>
<tr>
<td>Definite diagnosis of HCM, but with low risk profile or with probable diagnosis</td>
<td>Low dynamic and low static sport (class 1A)</td>
<td>Low dynamic and low static sport (class 1A)</td>
</tr>
<tr>
<td>Athlete with positive genotype and negative phenotype</td>
<td>Can participate in all competitive sport</td>
<td>Low dynamic and low static sport (class 1A)</td>
</tr>
</tbody>
</table>