Exercise guidelines in adolescents and young adults with congenital heart disease

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• Dua JS et al. Exercise training in adult congenital heart disease: feasibility and benefits. Int J Cardiol 2010;138:196-205
  • n = 61 (36 males, age 31.7±10.9)
  • 20% overweight, 11% obese
  • 10% > 30 min of moderate intensity activity 5/7 per week

  • n = 434 (age 12-18)
  • Significantly less physical active than healthy peers
Exercise and congenital heart disease

Key questions

- **Is it beneficial?**
  - Morbidity/mortality
  - Physical performance
  - QOL

- **Is it safe?**
  - Sudden cardiac death
  - Risk stratification

- **Is it feasible?**
Is it beneficial?

- Morbidity/mortality
  - HF-ACTION trial (JAMA 2009;301:1439-50)
    - 2300 patients
    - no difference
  - Congenital heart disease
    - do not know
Is it beneficial?

- **Physical performance/QOL**
  


  Fredriksen PM et al. Effect of physical training in children and adolescents with CHD. Cardiol Young 2000


  Dua JS et al. Exercise training in adult congenital heart disease: feasibility and benefits. Int J Cardiol 2010

  Hager A. QOL and exercise in adult CHD. Heart 2005
Is it safe?

- Sudden cardiac death
  - Toronto data (Harrison, Can J Cardiol 1996)
    - 5.3 scd per 1'000 pt-yrs, mean age 34
    - 2 cases during ex. (AS/hockey; Cor.Fist./Tennis)
  - Minneapolis data (Moller, Am J Cardiol 1992)
    - no exercise death in 30'000 patient-yrs
  - Brompton data (Somerville, 1998)
    - 7/94 cases of scd occurred during exercise
    - 10/70 attacks of AF during stress, often same patient
Guidelines and recommendations


<p>| Table 2 Recommendations for sport participation in congenital heart diseases |</p>
<table>
<thead>
<tr>
<th>Lesion</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASD (closed or non-significant or PFO)</td>
<td>No restrictions</td>
</tr>
<tr>
<td>VSD (closed or non-significant)</td>
<td>No restrictions</td>
</tr>
<tr>
<td>PDA (closed or non-significant)</td>
<td>No restrictions</td>
</tr>
<tr>
<td>AVSD (successfully repaired)</td>
<td>Low to moderate dynamic and static sports</td>
</tr>
<tr>
<td>Moderate MVR</td>
<td>No restrictions</td>
</tr>
<tr>
<td>PAPVC/TAPVC (successfully repaired)</td>
<td>No restrictions</td>
</tr>
<tr>
<td>Pulmonary stenosis (mild)</td>
<td>Low to moderate dynamic and static sports</td>
</tr>
<tr>
<td>Moderate</td>
<td>Low to moderate dynamic and static sports</td>
</tr>
<tr>
<td>Aortic stenosis (mild)</td>
<td>Low to moderate dynamic and static sports</td>
</tr>
<tr>
<td>Moderate</td>
<td>Low dynamic and static sports</td>
</tr>
<tr>
<td>CoA (successfully repaired)</td>
<td>No competitive sport if left ventricular dysfunction or symptoms</td>
</tr>
<tr>
<td>TOF (successfully repaired)</td>
<td>No restrictions</td>
</tr>
<tr>
<td>Residual disease</td>
<td>Low to moderate dynamic and static sports</td>
</tr>
<tr>
<td>TGA</td>
<td>No restrictions</td>
</tr>
<tr>
<td>aosTGA (successfully repaired)</td>
<td>Low to moderate dynamic and low static sports</td>
</tr>
<tr>
<td>iatTGA, cTGA</td>
<td>Low to moderate dynamic and low static sports</td>
</tr>
<tr>
<td>Ebstein anomaly</td>
<td>Low to moderate dynamic and low static sports</td>
</tr>
<tr>
<td>Univentriicular hearts/Fontan circulation</td>
<td>Low dynamic sports</td>
</tr>
<tr>
<td>Eisenmenger’s syndrome</td>
<td>No restrictions</td>
</tr>
<tr>
<td>Congenital coronary artery anomalies</td>
<td>Successfully repaired</td>
</tr>
</tbody>
</table>
High risk groups

- LVOTO
- Poor ventricular function/systemic RV
- Arrhythmia
- Pulmonary hypertension (Eisenmenger syndrome)
- Congenital coronary artery anomalies
Individual assessment
Cardiac function

- Echocardiography
  - Significant rest-lesion, LV and RV function, Mean/Peak transvalvular gradients, TR/RVP (Pulmonary Hypertension), Significant hypertrophy
  - Doppler myocardial imaging…? 
  - Exercise echo…..?
  - 3D/4D echo……?
- MRI
Individual assessment

Arrhythmia

- Extensive surgery, transventricular repair, repair late in life
- Exercise induced dizziness or syncope
- Depolarization disturbances or hypertrophy
- 24-h ECG
Individual assessment
Cardiopulmonary exercise testing

Measurements
- Lung function (spirometry)
- Maximal test – treadmill or bicycle
- Standardised protocol (Bruce)
- BP, ECG

Report
- BP response
- Chronotrope response
- Peak VO2
- Oxygen pulse
- VO2/CO2 slope
- Exercise recommendations
Exercise kinetics
Oxygen pulse

Chronotrope incompetence

Stroke volume limitation

[Images of graphs and diagrams related to exercise kinetics and oxygen pulse]
## Classification of sports

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Low dynamic</td>
<td>Moderate dynamic</td>
<td>High dynamic</td>
</tr>
<tr>
<td>Low static</td>
<td>Archery, Bowling, Golf</td>
<td>Table tennis, Volleyball, Baseball</td>
<td>Badminton, walking, running (marathon)</td>
</tr>
<tr>
<td>II</td>
<td>Moderate static</td>
<td>Fencing, Field events (jumping), Running (sprint)</td>
<td>Basketball, Ice hockey *, Football *, Cross Country, Tennis, Swimming, Running (mid/long)</td>
</tr>
<tr>
<td></td>
<td>Auto racing*, Diving, Motorcycling*, Karate/Judo*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>High static</td>
<td>Body building, Downhill skiing *, Wrestling</td>
<td>Boxing *, Cycling *, Rowing</td>
</tr>
<tr>
<td></td>
<td>Field events (throwing), Weight lifting</td>
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</tbody>
</table>

Symbols: *Danger of bodily collision. ✓ Increased risk if syncope occurs. Adapted and modified after Mitchell et al.
Counselling

  - “Adequate consultation on the importance of fitness and patient-centred exercise prescription are rare”
  - “Physicians and nurses with adequate communication skills should assist patients in achieving a positive attitude towards physical activity”
Advices

• Put it on your agenda – early!
• Dynamic rather than static
• Long warm-up, low intensity (Fontan, Eisenmenger)
• Avoid fluid depletion (Fontan)
• Bodily collision (Marfan, PM, anticoagulation)
• Motivators
  • Follow-up exercise testing
  • Self reports
  • Accelerometers
Exercise in congenital heart disease

Summary

- It is safe and feasible
- It improves physical capacity and QOL
- Children < 10(-12) yrs need no restrictions
- A restrictive attitude seems wise in CHD and competitive sport
- Guidelines and recommendations are useful but can not replace a thorough individual assessment (high risk groups)
Conclusion

All children, adolescents and adults with CHD can and should do some kind of regular physical activity

Only patients likely to deteriorate during exercise and/or those in whom exercise may trigger serious arrhythmias should be restricted (after individual assessment)
“Those who do not make time for exercise will eventually have to make time for illness”

The Earl of Derby (1863)
Thank you for your attention