Exercise and Atrial Fibrillation: Benefits, Risks & the Unknowns

Iowa Cardio-Pulmonary Rehab Network Conference

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Objectives
At the conclusion of this activity, participants will be able to:

1. Recognize the relationship between exercise & incident Atrial Fibrillation (AF)
2. Review the benefits of exercise training in AF management
3. Identify strategies for monitoring & managing AF in cardiac rehabilitation patients

Atrial Fibrillation: Facts

- Atrial fibrillation (AF) is the most common arrhythmia in clinical practice
- Estimated prevalence: 0.4%-1% in general population, 8% > 80 yrs.
- Risk factors: age, structural heart disease, hypertension, thyroid disease, Alcohol, Obesity.
- Lone AF: AF in patients younger than 60 yrs and without any identifiable etiologic factor

AHA / IOM Recommendations

- 30 minutes of moderate-intensity aerobic activity at least 5 days/week (150 mins/week)
- OR
- 25 minutes of vigorous aerobic activity at least 3 days per week (75 mins/week)
- AND
- Moderate- to high-intensity muscle-strengthening activity at least 2 days per week

Benefits

Lower rates of:
1. all-cause mortality
2. coronary heart disease
3. hypertension
4. stroke
5. type 2 diabetes
6. metabolic syndrome

Exercise remains the cornerstone for therapeutic lifestyle interventions for primary and secondary prevention of cardiovascular and numerous non-cardiac conditions
**Exercise and AF**

- Do the beneficial effects of exercise extend to AF?

**WHI-OS**

- Women’s Health Initiative-Observational Study (WHI-OS)
- Prospective cohort study, postmenopausal women 50–79 years (N=94,000)
- Enrollment: 1994-98
- Average follow up: 11.5 years
- Assessed risk of AF with obesity and physical activity

Compared to sedentary women, participants in the highest stratum of physical activity (>9 MET-h/wk) had a significantly lower adjusted risk of incident AF (HR, 0.90; 95% CI, 0.85 to 0.96)

Women engaging in 3-9 and >9 MET-h/week of physical activity had 6% and 10% lower risk of AF respectively.

**WHI-OS**

- Of the 81,317 women, 8904 (11%) engaged in >15 MET-h/wk of strenuous physical activity
- Compared to those engaging in 0 MET-h/wk of strenuous activity, women engaging in >15 MET-h/wk of strenuous activity had a significant 9% reduction in AF risk
- HR of 0.91; 95% CI, 0.85 to 0.97

**Henry Ford Exercise Testing (FIT) Project**

- 64,561 adults; mean age of 54.5 years
- Retrospective cohort study
- Follow up: 5.5 years (median)
Henry Ford Exercise Testing (FIT) Project

1 greater MET achieved during treadmill testing was associated with a 7% lower risk of incident AF.

Cardiovascular Health Study

- 5446 adults ≥ 65 years
- Enrolled: 1989 to 2001
- 12 year follow up (47,280 person-years)
- Impact of leisure time activity and exercise on AF

Cardiovascular Health Study

Pace walked: 2, 2-3, ≥3 mph
Distance walked: 0-4, 5-11, 12-23, 24-59, ≥ 60 blocks/wk

Cardiovascular Health Study

<table>
<thead>
<tr>
<th>Leisure time activity</th>
<th>Adjusted HR for AF</th>
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<tr>
<td>Quintile 2</td>
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<tr>
<td>Quintile 3</td>
<td>0.75</td>
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<tr>
<td>Quintile 4</td>
<td>0.78</td>
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<tr>
<td>Quintile 5</td>
<td>0.64</td>
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</table>

Cardiovascular Health Study

<table>
<thead>
<tr>
<th>Exercise Intensity</th>
<th>Adjusted HR for AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>0.85</td>
</tr>
<tr>
<td>Moderate</td>
<td>0.72</td>
</tr>
<tr>
<td>Intense</td>
<td>0.87</td>
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</tbody>
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Leisure time activity, regular physical exercise and better functional capacity decrease the risk for AF.

Within the limits assessed there appears to be a clear dose response relationship.
Endurance Training

Vigorous Exercise

Relation of Vigorous Exercise to Risk of Atrial Fibrillation (Physicians Health Study)

- 16,921 subjects, mean age: 52.12 years of follow up
- Exercise habits assessed at 3 and 9 years
- Frequency of vigorous exercise was associated with increased risk of AF

Risk limited to those exercising >5-7 days/wk, young men (<50 yrs) and joggers (>4 miles/day)
Association was significant at 3 yrs but not at 9 yrs

Prospective study of 20,484 adults
- 12-67 years of age; 50% male
- Surveyed 1986-87; follow up through 2010
- Leisure time activities were assessed (low/moderate/high/vigorous)
- Assessed the risk of AF with respect to leisure time/work related activities and baseline resting heart rate

Physical activity, resting heart rate, and atrial fibrillation: the Tromsø Study

Endurance Training

Prolonged training aimed at enhancement of cardiorespiratory function, together with aerobic capacity of the exercised muscles so as to withstand prolonged physical exertion.

Lone atrial fibrillation in vigorously exercising middle aged men: case-control study

- 300 top ranked orienteers vs 495 controls
- Ages: 32-59; 11 year follow up
- Lower mortality, CAD
- Higher risk for AF and atrial flutter despite lower prevalence of risk factors

Incidence of AF (5.2% vs 0.9%); OR of 5.5
First episode occurred about 30 years from onset of training
Sport practice and the risk lone atrial fibrillation: A case-control study

- A retrospective case control study of Lone AF (51 cases/109 controls)
- Assessed relationship between sports practice and AF

In men, the combination of current and prolonged lifetime sport practice is associated with higher risk of LAF
A threshold of 1500 lifetime practice hours was identified as a risk factor for AF.

Risk of arrhythmias in 52755 long-distance cross-country skiers: a cohort study

- Participants who completed Vasaloppet (90 km skiing): 1989–98
- F/u through December, 2005
- No baseline cardiovascular disease
- Risk of arrhythmias assessed after adjusting for age, education, and occupational status.

AF in Endurance Athletes: Mechanisms

- Adverse cardiac remodeling (substrate)
- Increased vagal tone (triggers)

Adverse Cardiac Remodeling

- Chronic volume overload
- Atrial and RV stretch and dilation
- Repeated injury and Oxidative stress
- Inflammation
- Myocardial fibrosis
- Molecular remodeling

Cardiac Arrhythmogenic Remodeling in a Rat Model of Long-Term Intensive Exercise Training

- Male Wistar rats conditioned to run 16 weeks; time-matched sedentary rat controls
- Serial echocardiograms, in vivo EP studies and ventricular collagen deposition were assessed (after euthanasia)
Effects of Short-term Exercise Training on Symptoms and Quality of Life (QOL) in Patients with Chronic AF

- 30 patients (15 controls) with permanent AFib
- Randomized assessment of the impact of EBCR
- 24 training sessions, aerobic exercise and muscle strengthening
- Perceived exertion using cycle ergometer (Borg scale 6-20)
- QOL: Short-Form 36 (SF-36) and Symptom and Severity Checklist (SSCL) were assessed pre/post

Exercise capacity improved by 41%, perceived exertion during testing by 1.4 points.
Significant improvements in QOL: frequency and severity of symptoms on SF-36 and SSCL.
Impact of CARDIOrespiratory FITness on Arrhythmia Recurrence in Obese Individuals With Atrial Fibrillation - The CARDIO-FIT Study

- 308 patients with symptomatic paroxysmal or persistent AF
- Baseline and follow up assessment of cardiorespiratory fitness
- A structured motivational, individualized, goal-directed program using face-to-face counseling was used for initiating and reinforcing graded exercise therapy along with weight reduction and risk factor modification
- Primary outcome was AF burden as determined by symptom burden and freedom from AF

Exercise Prescription

- Low-intensity exercise was prescribed initially for 20 min, 3 times weekly, increasing to at least 200 min of moderate intensity exercise per week
- Combination of aerobic and resistance/strength exercises for progressive fitness gain to avoid weight plateaus
- For patients with decreased mobility because of weight / musculoskeletal problems, hydrotherapy, aqua aerobics, upper body training, and physiotherapy sessions were initially used

Impact of CARDIOrespiratory FITness on Arrhythmia Recurrence in Obese Individuals With Atrial Fibrillation - The CARDIO-FIT Study

- 51 patients with nonpermanent AF were randomized to exercise or standard care following AF ablation
- Exercise consisted of aerobic interval training

Exercise Interval Training Reduces the Burden of Atrial Fibrillation in the Short Term - A Randomized Trial

- 216 patients, s/p Radiofrequency ablation (RFA) for AF
- 12 weeks of EBCR & 3 psycho-educational consultations vs usual care
- VO2 peak at 4 months (24.3 ml/kg/min versus 20.7 ml/kg/min, p=0.0004
- Six minute walking test (591.5 meters versus 576.3 meters, p=0.02)
- SF-36 mental component score at six months: No difference
- Self-reported adverse events: 18 patients in the rehabilitation group and 7 in the control group (p=0.02)
- No difference in serious adverse events
A Systematic Review of the Health Benefits of Exercise Rehabilitation in Persons Living With Atrial Fibrillation

- Extensive review of literature, only 6 studies assessing role of exercise in AF management
- Significantly lowered resting and peak exercise heart rates after 8 weeks of exercise (rate control)
- Improved functional capacity (6MWT, bicycle ergometer)
- Improved Quality of Life (SF-36)
- Benefits similar to non-AF patients

Giacomantonio et al. Canadian J Cardiol 29 (2013) 483–491

A Systematic Review of the Health Benefits of Exercise Rehabilitation in Persons Living With Atrial Fibrillation

- Minimal reported adverse events
- Overall, a life-threatening adverse event rate of 1 per 4706 exercise sessions, or 209,752 minutes of exercise
- Non-life-threatening adverse events were found to occur at rates of 1 per 219 exercise sessions, or 9756 minutes of exercise

Giacomantonio et al. Canadian J Cardiol 29 (2013) 483–491

Issues in AF Patients Attending EBCR

- No large scale validated protocols
- Consider frailty and tailor EBCR
- Start at a low intensity
- Aerobic + strength training
- Avoid HR targets (load/RPE based)
- Do not forget to address stroke risk, anticoagulation

Summary

- Physical activity (leisure time), moderate exercise and good functional capacity (treadmill test): associated lower risk of AF in subjects >55 years of age
- Benefits proportional to activity (speed, distance); lower or no benefits at <3 METs and possibly no significant incremental benefits beyond 50-100 minutes/day
- Prolonged endurance training / intense exercise increases AF risk by 2-9 fold

Summary

- EBCR can improve rate control, functional capacity, QOL and rhythm control in AF
- Despite reports of a higher overall adverse event rate, major adverse events remain low
- Therapy should be tailored considering the unique characteristics of this population