AF In Athletes

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EXERCISE IS GOOD FOR YOU

BENEFITS OF EXERCISE

- DISEASE PREVENTION
  - Cardiovascular
  - Diabetes
  - Osteoporosis, joint health
- FITNESS
- WEIGHT CONTROL
- ENJOYMENT
  - Personal Goals
  - Competition

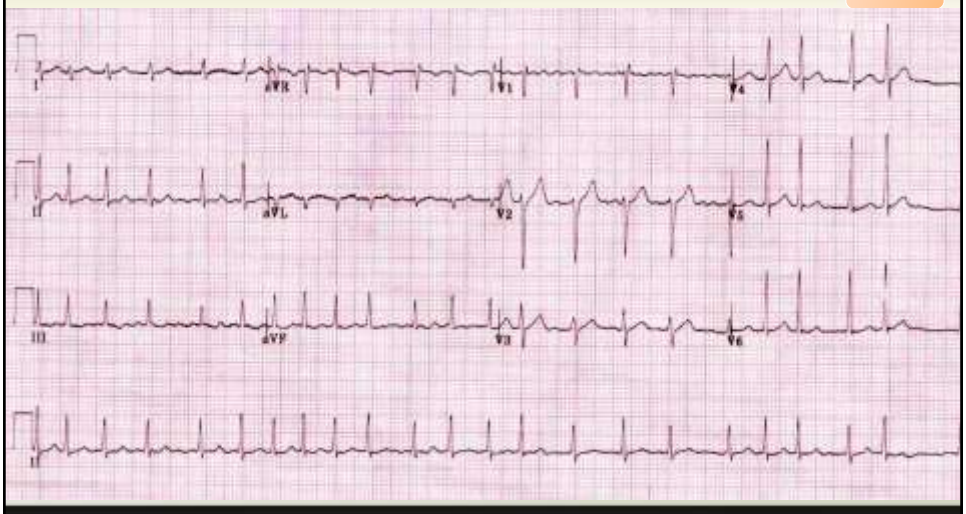
COULD YOUR "WORKOUT" CAUSE YOU CARDIOVASCULAR HARM?

- ANSWER: YES
- THE RISK IS SMALL
- THE CONSEQUENCES ARE SIGNIFICANT
- WHAT THE RISK IS AND WHAT CONDITIONS ARE RESPONSIBLE FOR THE RISK VARY BY AGE

Who are we talking about, what are the numbers and what are we talking about

Endurance Sport Practice and Atrial Fibrillation

AF



Studies demonstrating increased risk of AF in indurance sports

Studies	Type of study	% Men	Age	Type of sports	Cases/controls
Kaarjalainen et al	Longitudinal case/ control	100%	47±5 runners 49±5 controls	Orienteering	262/373
Mont et al	Retrospective/compared to general population	100%	44 ±13 sports 49 ±11 non-sports	Endurance sports >3h/week	70 lone AF
Elosua et al	Retrospective case/ control	100%	41±13 AF patients 44±11 controls	Endurance sports Current practice and >1500 cumulated hours of practice	51/109
Heidbuchel et at	Case/control in patients undergoing flutter ablation	83%	53±9 sports 60±10 controls	Cycling, running or swimming >3hours/ week	31/106
Molina et al	Longitudinal case/ control	100%	39±9 runners 50±13 sedentary	Marathon running	252/305
Baldesberger et al	Longitudinal case/ control	100%	67±7 cyclist 66±6 golfers	Cycling	134/62
Mont et al GI-RAFA study	Prospective case/ control	69%	48±11	Endurance sports	107/107

- The results showed that the moderate and heavy physical activity, whether sport- or job-related, increased the risk of suffering AF.
- In multivariable analysis, physical activity and atrial size were independent predictors for the development of AF, even after normalizing by body surface area (BSA) and height.
- It is interesting to note the GIRAFA study's association of height and atrial size (absolute and normalized) with AF. In understanding the male predominance observed in AF, sex may indeed be secondary to that association.

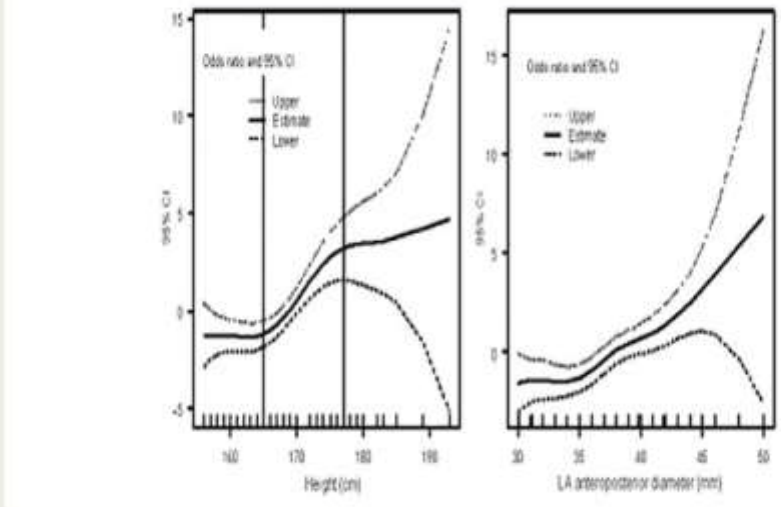


Figure 2 Thin-plate smoothing spline regression results assessing the non-linear relation between height and occurrence of lone atrial fibrillation (left panel), and the linear relation between left atrial (LA) diameter and occurrence of lone atrial fibrillation (right panel) (reproduced from reference 9, with permission).

Pathophysiology of AF in Endurance Athletes

1) Influence of the autonomic nervous system

2) Exercise and structural changes in the atria (fbrosis, inflammation and dilatation)

Influence of the autonomic nervous system

- Initiation of paroxysmal AF requires the activation of both the sympathetic and parasympathetic components of the cardiac ANS

Vagal AF

[1] males between 30 and 50 years of age

[2] at night and rarely occurs between breakfast and lunch when the sympathetic tone is high

[3] rarely occurs during exercise or emotional stress

[4] frequently triggered during relaxation after stress

[5] often preceded by bradycardia lasting from seconds to hours. However, there was no relationship between these episodes of AF and sport practice.

- Experimental animal models have demonstrated that atrial fbrillation can be induced by acetylcholine and that increasing vagal tone shortens the atrial refractory period, which, combined with atrial stimulation, inducesAF.
- In the GIRAFA study, 70% of consecutive patients with lone AF had vagal AF. Therefore, the increased vagal tone induced by endurance sport practice could facilitate the appearance of AF.

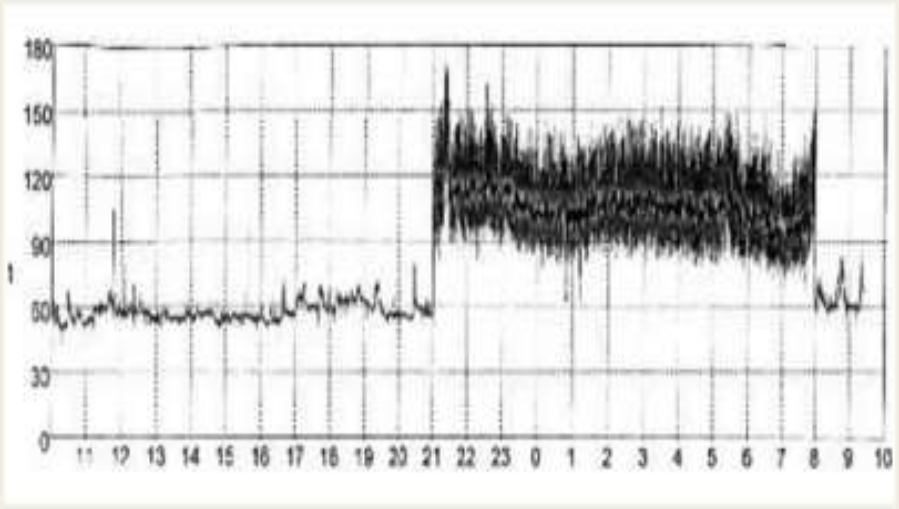


Figure 4 Twenty-four hours recording of heart rate showing a nocturnal episode of atrial fibrillation.

Exercise and structural changes in the atria (fibrosis, inflammation and dilatation)

Studies have found that excessive training may lead to tissue injury, which activates circulating monocytes, in turn producing large quantities of IL-1β and/or IL-6 and/or TNF-α and systemic inflammation.

Their fndings show a relationship between these inflamatory biomarkers and AF.

- Although the underlying mechanism for structural changes is not clear, recent echocardiographic data suggest that structural remodeling is often present in the atrium of elite athletes without AF.

- Pelliccia et al. described the remodeling induced by exercise in elite sport athletes. Their study shows that those involved in regular endurance practice have a larger atrium than the sedentary controls.
- Furthermore, a significant proportion (20%) showed enlarged atria according to established normal values.

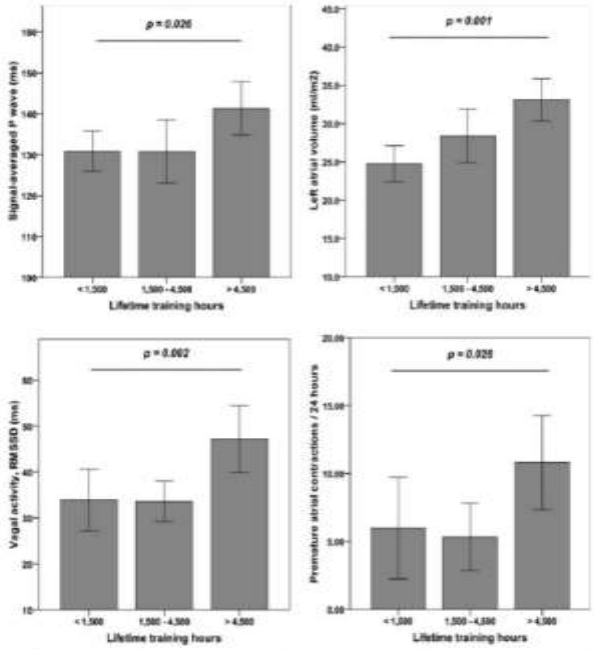


Figure 1 Signal-averaged P-wave duration, left atrial volume, vagal activity (expressed as root of mean squared differences of successive normal-to-normal intervals) and number of premature atrial contractions in 24 h stratified according to lifetime training hours (p values for analysis of variance). Reproduced with permission from Wilhelm *et al*.[20]

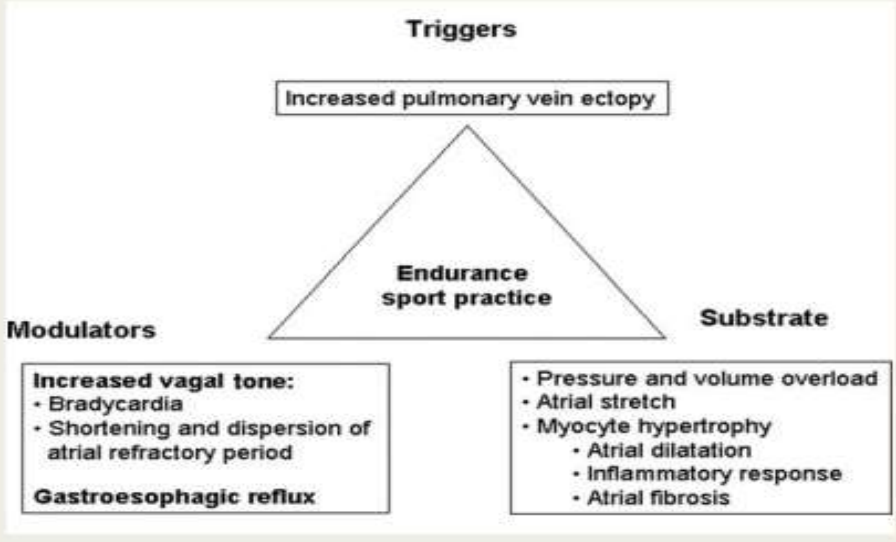


Figure 3 Classical triangle of Coumel suggesting possible etiopathogenic factors influencing the development of atrial fibrillation in athletes.

- **Clinical Characteristics of Sport-related Atrial Fibrillation**

- A man in his forties or fifties who has been involved in regular endurance sport practice since his youth and is still active in middle age.
- The AF is usually paroxysmal with crisis, initially very occasional and self limited, then progressively increasing in duration.

- Characteristically, AF episodes occur at night or after meals. As many as 70% of patients may suffer predominantly from vagal AF.

- Since the AF crisis rarely occurs during exercise, the patient is reluctant to accept a relationship between the arrhythmia and sport practice. The crises typically become more frequent and prolonged over the years and AF becomes persistent.

- Progression to permanent AF has been described by Hoogsteen et al.in 17% of individuals in an observational series.
- In the GIRAFA study, 43% presented persistent AF. The AF crisis frequently coexists with common atrial fluter in many patients

- **Treatment for AF in Athletes**

36th Bethesda Conference Eligibility Recommendations
1. Athletes with asymptomatic AF in the absence of structural heart disease who maintain a ventricular rate that increases and slows appropriately and is comparable with that of a normal sinus response in relation to the level of activity, while receiving no therapy or therapy with AV nodal-blocking drugs, can participate in all competitive sports. Note that the use of β-blockers is prohibited in some competitive sports (namely, rifle).
2. Athletes who have AF in the presence of structural heart disease who maintain a ventricular rate comparable with that of an appropriate sinus tachycardia during physical activity while receiving no therapy or therapy with AV nodal-blocking drugs can participate in sports consistent with the limitations of the structural heart disease.
3. Athletes who require anticoagulation should not participate in sports with danger of bodily collision.
4. Athletes without structural heart disease who have elimination of AF by an ablation technique, including surgery, may participate in all competitive sports after 4 to 6 wk without a recurrence or after an electrophysiologic study has confirmed noninducibility (20).

ESC Recommendations

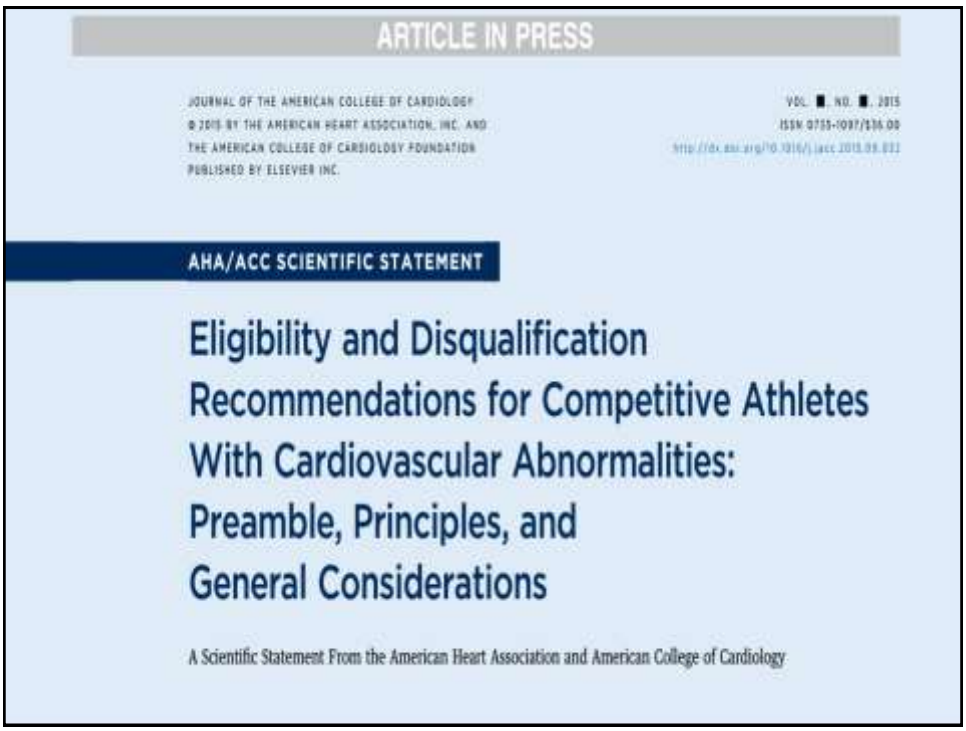
1. When a "pill-in-the-pocket" approach with sodium channel blockers is used, sport cessation should be considered for as long as the arrhythmia persists and until 1 to 2 half-lives of the antiarrhythmic drug used have elapsed. Class IIa level C evidence.
2. Isthmus ablation should be considered in competitive or leisure-time athletes with documented atrial flutter, especially when therapy with flecainide or propafenone is intended. Class IIa level C evidence.
3. Where appropriate, AF ablation should be considered to prevent recurrent AF in athletes. Class IIa level C evidence.
4. When a specific cause for AF is identified in an athlete (such as hyperthyroidism), it is not recommended to continue participation in competitive or leisure-time sports until correction of the cause. Class III level C evidence.
5. It is not recommended to allow physical sports activity when symptoms due to hemodynamic impairment (such as dizziness) are present. Class III level C evidence (5).

- Particular caution should be exercised with the monotherapeutic use of class I antiarrhythmic drugs in AF patients. These drugs may prevent AF recurrences, but also can convert AF into slow atrial fluter, which may conduct one-to-one to the ventricles during situations of high sympathetic tone.

Sport Reduction

- The ESC recommends that:
  Athletes in an early stage of paroxysmal AF should discontinue training for 2 months to stabilize sinus rhythm. The degree of improvement during this resting period will determine whether athletes are allowed to resume their training.

- Task Force of the 36th Bethesda Conference recommends that
- Athletes with asymptomatic AF in the absence of structural heart disease can be permitted to participate in any competitive sport, provided they maintain a ventricular rate that increases and slows appropriately and is comparable to that of a normal sinus response in relation to the level of activity, while receiving no therapy or therapy with AV nodal-blocking drugs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AHA/ACC SCIENTIFIC STATEMENT

Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Preamble, Principles, and General Considerations

A Scientific Statement From the American Heart Association and American College of Cardiology

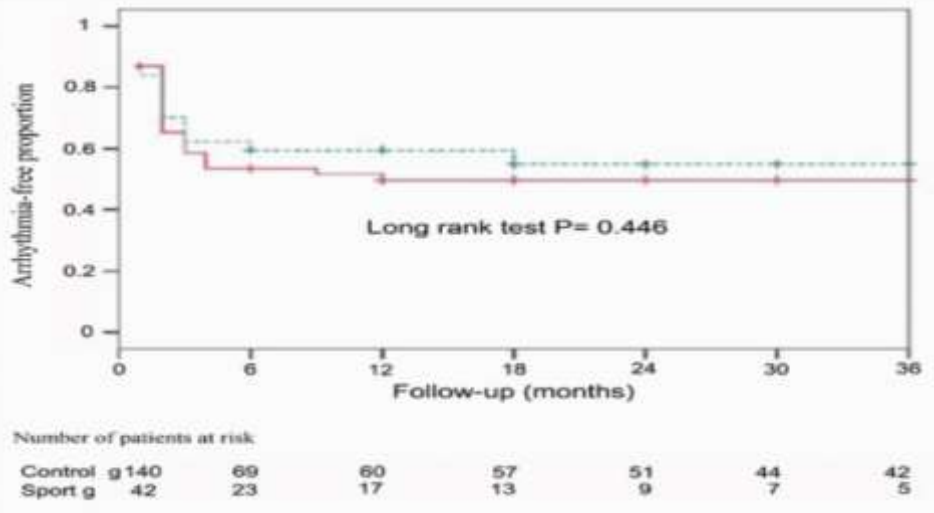
Recommendations

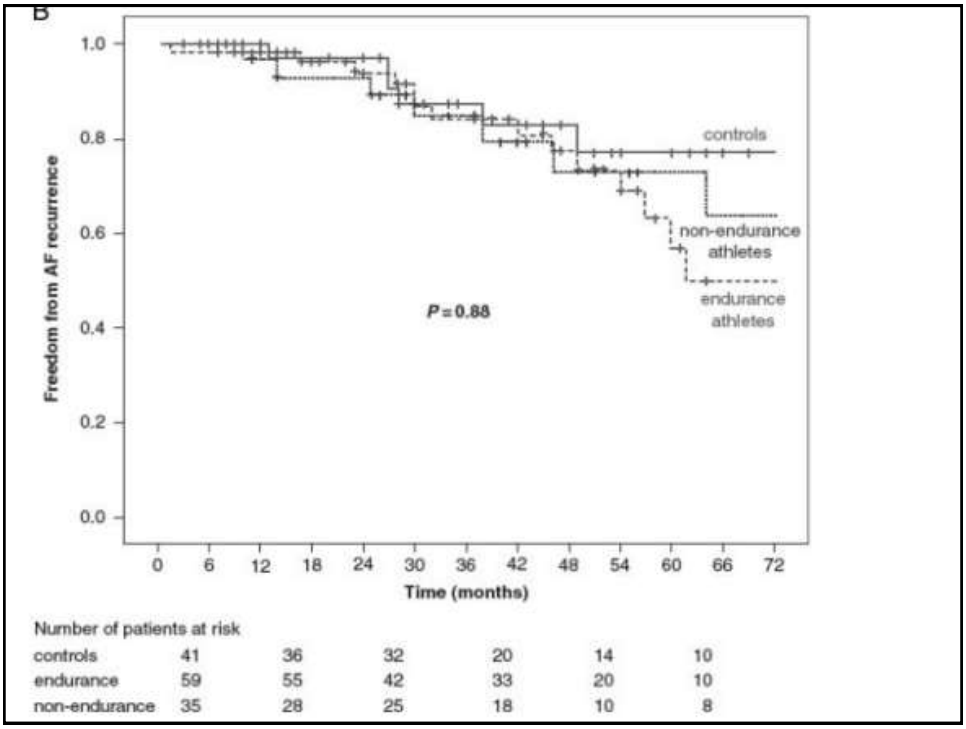
1. **Athletes with AF should undergo a workup that includes thyroid function tests, queries for drug use, ECG, and echocardiogram *(Class I; Level of Evidence B)*.**
2. **Athletes with low-risk AF that is well tolerated and self-terminating may participate in all competitive sports without therapy *(Class I; Level of Evidence C)*.**
3. **In athletes with AF, when antithrombotic therapy, other than aspirin, is indicated, it is reasonable to consider the bleeding risk in the context of the specific sport before clearance *(Class IIa; Level of Evidence C)*.**
4. **Catheter ablation for AF could obviate the need for rate control or antiarrhythmic drugs and should be considered *(Class IIa; Level of Evidence B)*.**

- Particular caution should be exercised with the monotherapeutic use of class I antiarrhythmic drugs in AF patients. These drugs may prevent AF recurrences, but also can convert AF into slow atrial fluter, which may conduct one-to-one to the ventricles during situations of high sympathetic tone.

- On the other hand, circumferential pulmonary vein ablation (CPVA) is established as an effective and safe treatment of AF, with success rates ranging from 30% to 85% in the general population.
- A study by Furlanello et al. described a highly successful ablation series, with 90% success after a mean of two ablation procedures in 20 athletes, without major complications.

CPVI





- **Anticoagulation**

- Anticoagulation in atrial fibrillation and atrial flutter is no different than in nonathletes.
- The CHA2DS2-VASc score can be utilized to ascertain individual risk of thromboembolism.
- Most athletes would have a CHA2DS2-VASc score of zero, therefore, by the current guidelines no need for anticoagulation.

CONCLUSIONS

- There is growing evidence that long-term endurance sports participation can result in cardiac structural changes and alterations in the autonomic system, which can result in the initiation and maintenance of AF and Afl., although the mechanisms explaining the relationship between these conditions remain to be elucidated.

- Reducing sports activities may need to be considered as part of the therapeutic advice to minimise the risk of AF development in endurance athletes.
- In addition, CPVA ablation has been shown to be as safe and effective as in general population and should be recommended in highly symptomatic and drug-refractory endurance athletes