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RESEARCH LETTER

Occult atrial fibrillation in endurance athletes

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Although low-to-moderate intensity exercise has been shown to result in decreased cardiovascular morbidity and mortality, limited data suggest that there may be an association between atrial fibrillation (AF) and trained endurance athletes.[1] The aim of our study was to prospectively evaluate moderately trained athletes for the occurrence of occult AF.

From March 2016 to March 2017, 20 moderately trained endurance athletes from local competitive biking and running clubs with no past medical history, including palpitations, were implanted with a Medtronic Reveal LINQ insertable cardiac monitor (ICM) device with standard programming and AF recognition ≥2 minutes. The study was approved by the University of Illinois College of Medicine institutional/ethics review board and written informed consent was obtained from all participants. Detailed questionnaires were administered to all participants in order to obtain information regarding routine exercise regimens. All volunteers underwent implantation of an ICM in order to assess occult AF along with baseline evaluation including electrocardiogram, transthoracic echocardiogram, and an objective assessment of exercise capacity using treadmill cardiopulmonary exercise (CPX) testing. Data were downloaded remotely by the participants from the ICM on a monthly basis which were analyzed for occult AF by two independent electrophysiologists (TSB; HO).

One of the 20 participants voluntarily withdrew from the study after the first week of implantation due to minor local discomfort while weight training. The participants had a mean age of 43±10 years (range 29–61 years) and 13 (68%) were males. All participants were long distance runners and/or cyclists who trained 5–7 days per week with a mean of 33±16 miles per week of running and/or 60±21 miles per week of biking. Average exercise capacity on CPX was 19±4 metabolic equivalents with a mean VO2 max (age and gender predicted) of 71±6% (Table 1).

AF was noted in one of the 20 participants (5.0%). The subject was a 43-year-old male who had a total of ten episodes of paroxysmal AF with the shortest episode lasting 2 minutes and the longest episode lasting 6 hours with no relation to time of day or physical exertion. There were no clinical predictors of AF in this cohort.

A meta-analysis by Kwok et al[2] examined 19 relevant studies with over half a million participants to determine if there was an association between AF and physical exercise. Although the authors concluded there was no significant increase in AF with

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Table 1 Clinical characteristics of the studied population

Subject	Age (years)	Gender	BMI (kg/m²)	Miles biked weekly	Miles run weekly	Posterior wall thickness (cm)	Septal wall thickness (cm)	Left atrial volume index (mL/m²)	METS	VO2 max (mL/kg/min)	% VO2 Max
1	36	Female	31.0	55	30	0.90	0.90	31	18.8	49.4	73
2	29	Male	24.3	60	60	0.90	1.04	21	17.5	56.6	72
3	61	Male	23.3	0	30	0.98	0.85	27	16.0	37.2	71
4	30	Male	25.1	0	30	0.78	0.68	28	17.2	44.1	70
5	38	Female	22.0	30	15	0.80	0.70	18	16.2	43.8	71
6	44	Male	25.9	30	20	0.95	1.02	27	19.0	41.3	71
7	44	Male	26.4	28	19	0.94	0.92	16	23.8	49.1	78
8	40	Male	21.7	0	75	0.95	0.97	30	20.3	57.1	78
9	56	Female	19.7	75	25	0.86	0.82	24	18.5	41.3	60
10	51	Female	23.1	60	18	0.69	0.72	20	15.7	36.9	62
11	57	Male	24.8	80	25	0.72	0.74	27	19.5	45.9	61
12	38	Male	23.0	80	32	0.96	0.94	42	30.0	57.1	89
13	31	Male	24.2	100	4	0.90	0.82	22	21.1	49.0	71
14	57	Male	30.6	0	40	0.96	1.15	29	16.6	32.5	72
15	55	Female	21.3	70	35	0.93	0.95	21	20.3	41.8	72
16	39	Male	28.1	0	30	0.92	0.83	30	16.5	40.6	73
17*	43	Male	25.9	0	40	0.98	0.99	29	17.2	42.8	63
18	42	Male	27.5	60	26	0.96	0.83	26	24.1	46.7	71
19	42	Female	23.2	150	24	0.88	0.90	40	24.1	53.0	80
20	30	Female	24.4	50	60	0.92	0.90	15	18.7	46.3	67

Note: *Subject 17 was noted to have evidence of occult atrial fibrillation in our study.
Abbreviations: BMI, body mass index; METS, metabolic equivalents.

a higher level of exercise, the study displayed a high level of heterogeneity as well as inability to accurately quantify the extent of physical activity. However, when examining individual studies limited to high endurance athletes such as marathon runners and high endurance cyclists, the prevalence of AF was 6%–10%, considerably higher than the control population yet similar to our study.[3,4]

Several different mechanisms may be responsible for occult AF in endurance athletes – atrial structural remodeling, autonomic influences, and atrial ectopic triggers.[5] A very elegant study by Sanz-de la Garza et al[6] clearly demonstrated acute, exercise-dose dependent impairment of bilateral atrial function which is likely due to compromise of the right ventricle.

Enhanced vagal tone in high endurance athletes has been shown to be a potential etiology for the development of AF in our study population as well. Potential mechanisms include a reduction in effective refractory periods within the atria[7] in addition to an increase in premature atrial contractions when compared to normal subjects.[8] The end result may be the perfect storm of structural remodeling as well as highly vulnerable refractory periods, all in the setting of increased atrial ectopic triggers.[5]

In conclusion, our study is the first prospective trial to assess asymptomatic occult AF in moderately trained endurance athletes. We found that 5% of athletes in our cohort displayed evidence of asymptomatic AF during a 12-month surveillance period. Further basic science as well as larger clinical trials are needed to understand the multifaceted relationship between moderate-to-high intensity exercise and arrhythmia.

Our study has several limitations. First, we are limited by our small sample size thus we may not represent the true prevalence of occult AF in the endurance athlete population. Second, although all patients underwent VO2 testing in order to objectively assess exercise capacity, our study may be subject to heterogeneity with regards to physical activity quantification.

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Disclosure

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