Relation of Physical Activity and Incident Atrial Fibrillation (from the Multi-Ethnic Study of Atherosclerosis)

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Previous studies have raised the question of whether an association exists between physical activity and atrial fibrillation (AF). We used the Multi-Ethnic Study of Atherosclerosis (MESA) database to examine the association between physical activity and AF in a diverse population without clinically recognized cardiovascular disease (CVD). MESA participants (n = 5,793) with complete baseline physical activity and covariate data were included. Cox proportional hazards models were used to calculate hazard ratios (HRs) for incident AF by levels of total intentional exercise and vigorous physical activity, independently and in combination. Multivariate models were adjusted for demographics and CVD risk factors. During a mean follow-up of 7.7 ± 1.9 years, 199 AF cases occurred. In the overall MESA population, neither vigorous physical activity nor total intentional exercise was independently associated with incident AF after adjusting for covariates. However, within the group that reported any vigorous physical activity, there was a statistically significant inverse association between total intentional exercise (modeled as a continuous variable) and incident AF. In those who reported any vigorous physical activity, the top tertile of total intentional exercise was associated with a significantly lower risk of incident AF compared with the group with no total intentional exercise in the fully adjusted model (HR 0.46, 95% confidence interval 0.22 to 0.98). In conclusion, neither total intentional exercise nor vigorous physical activity alone was associated with incident AF, but greater total intentional exercise was associated with a lower risk of incident AF in those who participated in any vigorous physical activity. As importantly, no subgroup of participants demonstrated an increased risk of incident AF with greater physical activity. The results re-emphasize the beneficial role of physical activity for cardiovascular health. © 2015 Elsevier Inc. All rights reserved. **(Am J Cardiol 2015;■:■−■)**

A number of studies have examined and presented data both for and against an association between physical activity and AF. There seems to be an increased propensity for AF in elite athletes such as marathon runners.[1–4] There is also a suggestion that the intensity of exercise may play a role in risk of incident AF,[5] and a number of studies have specifically implicated vigorous exercise as a risk factor for incident AF.[6,7] The physiologic basis for an association exists, and physical activity is potentially implicated in providing the trigger, modulators, and substrate for AF onset.[4] In contrast, other studies have suggested a decreased risk of AF in walkers and runners[8] and in those who participate in low-to-moderate intensity activity.[9] A recent meta-analysis of 4 prospective cohort studies demonstrated no association between regular physical activity and AF[10] in nonathletes. The conflicting data suggest that there is still much to be uncovered regarding the association of physical activity and AF, especially in the general population. In this study, we sought to examine the association between physical activity and AF in the Multi-Ethnic Study of Atherosclerosis (MESA) cohort.

Methods

Inclusion criteria and methods of the MESA study have been described previously.[11] In brief, from July 2000 to August 2002, a total of 6,814 men and women aged 45 to 84 year and free of clinically apparent cardiovascular disease were recruited from 6 US communities: Baltimore City and Baltimore County, Maryland; Chicago, Illinois; Forsyth County, North Carolina; Los Angeles County, California; Northern Manhattan and the Bronx, New York; and St. Paul, Minnesota. Participants filled out a survey

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The study was funded by Grants K23HL089333 and R01HL116280 from National Institutes of Health (Dr. Nazarian). The MESA study was funded by grants N01-HC-95159 through N01-HC95169 from the National Heart, Lung, and Blood Institute.

See page 6 for disclosure information.

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0002-9149/15/$ - see front matter © 2015 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.amjcard.2015.06.013

Table 1
Baseline characteristics of entire population and subgroups

Variable	Overall (N=5793)	Vigorous Physical Activity		
		= 0 (N=3927)	> 0 (N=1866)	p value
Total Intentional Exercise (MET-min/wk)	1566 ± 2345	1168 ± 1674	2406 ± 3184	< 0.010
Age (years)	62 ± 10	63 ± 10	59 ± 10	< 0.010
Resting Heart Rate (bpm)	63 ± 9	64 ± 10	61 ± 9	< 0.010
Systolic Blood Pressure (mm Hg)	126 ± 21	128 ± 22	123 ± 20	< 0.010
Low density lipoprotein (mg/dl)	117 ± 31	117 ± 32	119 ± 31	= 0.012
High density lipoprotein (mg/dl)	51 ± 15	52 ± 15	50 ± 14	< 0.010
Body mass index (kg/m^2)	28 ± 5	29 ± 6	28 ± 5	< 0.010
Female	53%	62%	36%	< 0.010
White	38%	33%	48%	<0.010
Chinese-American	12%	13%	9%	
Black	27%	29%	25%	
Hispanic	22%	24%	17%	
Education				< 0.010
Less than HS grade	19%	22%	11%	
HS Grade	18%	20%	14%	
Post-HS degree	29%	27%	34%	
Grad degree	18%	15%	23%	
Smoker				< 0.010
Never	51%	52%	47%	
Former	36%	35%	40%	
Current	13%	13%	13%	
HTN Meds	36%	39%	29%	< 0.010
Diabetes mellitus	12%	14%	9%	< 0.010

documenting their baseline level of physical activity and the specific type and duration of physical activity. Patients with self-reported AF were excluded from enrollment in MESA. All participants were contacted every 9 months to inquire about interval hospitalizations, obtain medical records, and abstract *International Classification of Diseases, Ninth Revision,* codes from the records. Incident AF events were ascertained on the basis of hospital discharge *International Classification of Diseases, Ninth Revision,* codes (427.3x) and Medicare claims data for those who were enrolled in fee-for-service Medicare at any time during follow-up. The institutional review boards at all participating centers approved the study, and all participants gave informed consent. In this study, we included all participants with completed physical activity questionnaires and complete covariate data (n = 5,793).

During the baseline examination (2000 to 2002), standardized questionnaires and calibrated devices were used to obtain demographic data, tobacco use data, co-morbidities, current prescription medication usage, weight, and height. Resting, seated blood pressure was measured 3 times using a Dinamap automated oscillometric sphygmomanometer (model Pro 100; Critikon, Tampa, Florida); the last 2 measurements were averaged for analysis. Hypertension was defined on the basis of use of an antihypertensive medication, systolic blood pressure (SBP) ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg. Fasting blood samples were drawn and were sent to a central laboratory for measurement of glucose and lipids.[12] Participants were considered to have diabetes if they used hypoglycemic drugs or if their fasting blood glucose was >7.0 mmol/l (126 mg/dl). Participants were considered to have impaired fasting glucose if they did not have diabetes according to the preceding criteria but their fasting blood glucose level was 5.6 to 7.0 mmol/l (100 to 126 mg/dl) in accordance with the 2004 American Diabetes Association definition.[13] Incident coronary heart disease (CHD) during follow-up was defined as myocardial infarction, angina, resuscitated cardiac arrest, or death attributed to coronary heart disease.

The MESA Typical Week Physical Activity Survey (TWPAS), completed during the baseline examination, identifies the amount of time spent in and the frequency of various physical activities during a typical week in the previous month. The survey has 28 items in 9 categories of activities (1, household chores; 2, lawn/yard/garden/farm; 3, care of children/adults; 4, transportation; 5, nonoccupational walking; 6, dancing and sport activities; 7, conditioning activities; 8, leisure activities; 9, work). Respondents were asked whether they participated in these activities, and if applicable, they answered questions regarding the average number of days per week and time per day engaged in each activity. Where appropriate, the physical activity survey accounted for exercise intensity at 3 levels (heavy, moderate, or light), which was determined by the type of activity in any given category (i.e., sitting or standing vs pushing or lifting). Minutes of activity were summed for each discrete activity type and multiplied by metabolic equivalent (MET) level.[14]

In our study, we used 2 summary variables derived from the MESA TWPAS data: total intentional exercise and vigorous physical activity. Total intentional exercise focused on the areas of physical activity recommended by US Department of Health and Human Services guidelines