Erectile dysfunction as a coronary artery disease risk equivalent

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Background. **The conditions that predispose patients to erectile dysfunction are substantially similar to the coronary artery disease risk factors, including diabetes mellitus, hypertension, hyperlipidemia, obesity, sedentary lifestyle, depression, age, and smoking. Because of these shared risks and overlapping pathophysiologic mechanisms, we designed this pilot study to address the hypothesis that the presence of coronary artery calcium, a known indicator of increased cardiac risk, is associated with erectile dysfunction.**

Methods and Results. **A prospective registry enrolled 9150 men who underwent multidetector computed tomography. Subjects supplied baseline data regarding demographic variables, coronary risk factors, and erectile dysfunction symptoms or lack thereof. The 2 groups then underwent computed tomography to screen for the presence or absence of coronary artery calcium. Subjects with erectile dysfunction were older, had higher triglyceride levels, had higher blood pressures, and were more likely to have measurable coronary artery calcification than men without erectile dysfunction (79% vs 58%, $P < .001$).**

Conclusion. **Erectile dysfunction is significantly associated with abnormal coronary artery calcification and, like peripheral arterial disease, might warrant consideration as a coronary artery disease risk equivalent. (J Nucl Cardiol 2008;15:800-3.)**

Key Words: Erectile dysfunction • cardiovascular disease • coronary artery calcium score • multidetector computed tomography

Erectile dysfunction (ED), defined as the inability to produce or maintain an erection for sexual intercourse, is an extremely prevalent problem worldwide, affecting over 150 million men.[1,2] Recently, ED has been associated with the standard cardiovascular (CV) risk factors and has been proposed to be considered an early manifestation of atherosclerotic arterial insufficiency.[3,4] Furthermore, ED has been proposed to be a coronary artery disease (CAD) risk equivalent, similar to the case with peripheral artery disease or diabetes. ED shares many risk factors with CAD such as hypertension, diabetes mellitus,[5,6] hyperlipidemia, obesity, depression, sedentary lifestyle, and smoking.[7] Recent studies have shown that diabetic patients with ED are at higher risk of CAD than diabetic patients without ED.[5,8]

Montorsi et al[9] suggested that ED starts as a derangement of nitric oxide–mediated endothelial vasodilatation, which often eventually leads to the development of atherosclerotic plaque. Both ED and CAD are manifestations of a systemic inflammatory process culminating in atherosclerosis and arterial insufficiency. Yaman et al[10] showed that the severity of ED was positively correlated with increased coronary artery calcium deposits in 83 subjects. Inci et al[11] showed similar results in 35 renal failure patients undergoing hemodialysis. Chiurlia et al[12] were also able to illustrate a correlation between coronary artery calcification and ED (odds ratio, 2.91; 95% confidence interval, 1.30-6.52; $P = .01$) in a small group of 70 patients.

This cross-sectional pilot study investigated the hypothesis that ED may be associated with the presence of coronary artery calcification in a large population (n = 9150) of men who underwent screening to detect CAD with multidetector computed tomography (MDCT).

METHODS

A total of 9150 men who underwent MDCT at the Mid America Heart Institute (Kansas City, Mo) between July 11, 2005, and February 7, 2008, were consecutively enrolled in a prospectively collected database. This population of men was either self-referred or physician-referred to undergo screening for the presence of coro-

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Table 1. Patient characteristics

Characteristics	ED		*P* value
	Yes (n = 513)	No (n = 8637)	
Age	62.2 ± 9.0	53.6 ± 10.3	<.001
Body mass index	28.2 ± 5.8	27.5 ± 7.1	.033
Calcium score	273.1 ± 446.4	146.5 ± 417.2	<.001
Calcium score of 0	103 (20.1%)	3658 (42.4%)	<.001
Family history	199 (38.8%)	3612 (41.8%)	.176
Hypertension	263 (51.3%)	2968 (34.4%)	<.001
High triglyceride levels	211 (41.1%)	2293 (26.5%)	<.001
Diabetes	63 (12.3%)	420 (4.9%)	<.001
Smoking	32 (6.2%)	608 (7.0%)	.489

Continuous variables were compared by use of the Student *t* test, and categorical variables were compared by use of the χ^2 or Fisher exact test.

nary artery calcification. Before undergoing MDCT, patients were asked to fill out a questionnaire detailing general demographic data such as age and gender, as well as the existence of CV risk factors including smoking, diabetes, hypercholesterolemia, hypertriglyceridemia, hypertension, obesity, age, and family history of CAD. In addition, patients were asked whether they had ED or used a medication for ED. The 513 ED-positive patients included 489 who answered "yes" to the ED question and 24 who answered "no" but were current users of ED medications. The 8637 patients considered to be free from ED answered "no" to the ED question and were not taking a medication for ED.

All patients underwent MDCT according to our standard imaging protocol,[13] and a calcium score was determined by the Agatston method.[14] For statistical analysis, the calcium score was interpreted as a dichotomous variable, 0 or greater than 0, and was compared with the presence or absence of ED by use of a χ^2 analysis. In addition, the severity of coronary calcification was compared between men with ED and men without ED by stratifying both groups into quintiles based on coronary calcium scores. The calcification was graded as follows: none, 0; mild, greater than 0 to less than 100; moderate, 100 to less than 400; high, 400 to less than 1000; and very high, 1000 or greater.

RESULTS

Compared with the group of men without ED, the ED group was on average older, had higher triglyceride levels, and was more likely to have elevated blood pressure and diabetes (Table 1). Among the 513 patients with reported ED, 403 (79%) had a calcium score reported to be greater than 0, whereas among the 8637 patients without ED, 4979 (58%) had a calcium score greater than 0 (Figure 1). The mean calcium score was approximately twice as high in the ED group compared with the group without ED ($P < .001$), and the median was greater than 20 times higher (Agatston score of 76.8 in ED patients vs 3.1 in patients without ED, $P < .001$). The χ^2 analysis showed a highly significant relationship between the presence of ED and the presence of coronary artery calcium ($P < .0001$). The distribution of MDCT results showed a significant skewing toward higher calcium scores in the ED group compared with the group without ED (Figure 2).

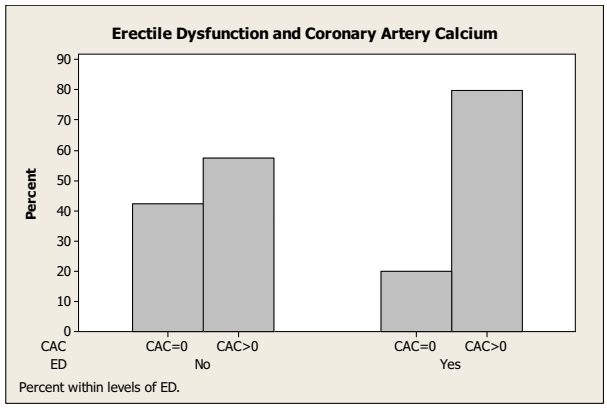

Figure 1. ED and coronary artery calcium (*CAC*): 403 (79%) of the patients with ED had a calcium score reported to be greater than 0, whereas 4979 (58%) of the patients without ED had a calcium score greater than 0.

When other significant univariate predictors of coronary calcium were entered into a multivariate analysis, the presence of ED showed only a trend ($P = .0923$) toward correlation with the presence of coronary calcium