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Prevalence of Asymptomatic Coronary Artery Disease in Men with Vasculogenic Erectile Dysfunction: A Prospective Angiographic Study

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Abstract

Objectives: Erectile dysfunction (ED) shares common risk factors with coronary artery disease (CAD). It has been suggested that ED may be considered a clinical manifestation of a generalized vascular disease affecting also the penile arteries. The aim of this prospective study was to evaluate angiographically the incidence of asymptomatic CAD in men with ED of vascular origin.

Methods: Fifty consecutive asymptomatic men, aged 41–74 years, with non-psychogenic and non-hormonal ED were comprehensively evaluated using medical history and examination, exercise treadmill test and stress echocardiography. Patients who had positive one or both of the two non-invasive procedures were referred for coronary arteriography in order to document CAD and evaluate the severity of the disease.

Results: The mean time interval between the onset of ED and cardiological assessment was 25 months (range 1–66). Smoking (32 patients/64%), hypertension (31 patients/62%) and hyperlipidemia (26 patients/52%) were the most common risk factors. Moreover, 35 men (70%) had two or more risk factors. Twelve patients (24%) with ED had positive one or both of the two non-invasive procedures and one patient presented with acute myocardial infarction before he completed the non-invasive investigation. Coronary arteriography performed in ten patients (in nine with positive one or both of the two non-invasive procedures [while the other three refused], and in the patient with acute myocardial infarction) demonstrated that one patient had three-vessel disease, two patients had two-vessel disease and six patients had single-vessel disease.

Conclusions: A considerable proportion (9/47 or 19%) of patients with ED of vascular origin has angiographically documented silent CAD. These findings support the strategy that patients with ED should undergo further cardiovascular evaluation.

Keywords: Coronary arteriography; Coronary artery disease; Erectile dysfunction; Exercise stress testing

1. Introduction

It has been suggested that erectile dysfunction (ED) may be considered a clinical manifestation of a generalized vascular disease affecting also the penile arteries. Indeed, ED shares many common risk factors with coronary artery disease (CAD) including aging, hypertension, diabetes mellitus, hypercholesterolaemia and smoking [1–4]. Endothelial dysfunction is a common underlying abnormality in ED and vascular disease [5–8].

ED is common in patients with CAD. Studies have shown that a significant proportion (42–75%) of patients

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with CAD have ED [9–15]. Furthermore, it has been shown that the degree of ED is related to the extent of CAD [11,16] and ED is more frequent in diabetic patients with silent CAD than in those without CAD [17].

Interestingly enough, retrospective analysis has suggested that ED becomes evident prior to coronary artery disease in almost 70% of cases [9]. The aim of the present study was to assess prospectively the incidence of asymptomatic coronary artery disease determined angiographically in patients who present with ED of vascular origin.

2. Methods

2.1. Patients

Fifty consecutive patients who were evaluated at the Cardiovascular and Sexual Health Clinic of the 1st Department of Cardiology of Athens Medical School for symptoms of erectile dysfunction and did not have a history or a clinical presentation of current cardiovascular disease comprised the study population. Patients were aged 41–74 (59 ± 11) years and were screened for sociodemographic data and risk factors for CAD, including smoking, diabetes, hypertension and hyperlipidemia. Diagnosis of hypertension was set if resting blood pressure was ≥140 (systolic) and/or ≥90 (diastolic) mmHg, of hypercholesterolaemia if total cholesterol level was ≥190 mg/dl (5 mmol/l) and LDL cholesterol level was ≥115 mg/dl (3 mmol/l), and of diabetes if plasma glucose level was ≥125 mg/dl (7.0 mmol/l; fasting) and ≥200 mg/dl (11.1 mmol/l; 2 hours after a 75 mg oral glucose load). Informed consent was obtained from each patient after explaining the nature of the tests, risks and benefits and alternative choices.

2.2. Evaluation of erectile dysfunction

All patients were invited to complete a 5-item brief form of the International Index of Erectile Function (IIEF) [18], the Sexual Health Inventory for Men (SHIM) [19]. Following, all patients were evaluated by comprehensive medical and sexual history and physical examination. Special emphasis was put upon the onset of ED and medications, including β-adrenergic antagonists and diuretics. Patients with SHIM score less than 21 were submitted to hormonal testing and to penile color duplex Doppler ultrasonography using 20 μg intracavernous prostaglandin E1 and audiovisual stimulation [20,21]. Men with hormonal, neurogenic, anatomic, or psychogenic ED were excluded from the study. ED was defined as mild (SHIM score 17–21), mild to moderare (11–16), moderate (8–10) and severe (7 or less). Arteriogenic ED was diagnosed when peak systolic velocity was less than 35 cm/s.

2.3. Assessment of the incidence and extent of asymptomatic coronary artery disease

All patients were referred for further assessment by exercise treadmill stress test and stress echocardiography. Exercise treadmill stress test was performed for detection of CAD and for assessment of cardiovascular efficacy during exercise and risk stratification of patients. Stress echocardiography, a feasible and accurate technique for the identification and localization of CAD [22], was added to the investigation to increase the sensitivity in the detection of CAD and to locate the responsible vessel(s). Stress echocardiography obtains optimal diagnostic accuracy in patients with a moderate risk of CAD such as those in our population [23]. Furthermore, it has been shown that patients with ED who have a negative stress echocardiography study are at low risk for cardiac death for 2 years following the stress study [24]. If at least one of these tests was positive, the patients were referred for coronary angiography for documentation and assessment of the severity of possible CAD. In two patients who were overweight dobutamine stress echocardiography was carried out alone. β-adrenergic antagonists and calcium channel blockers were discontinued for at least 48 h before the non-invasive tests.

2.3.1. Exercise treadmill test

Exercise testing was carried out according to the multistage Bruce protocol [25]. An exercise test result was considered *positive* if there was (a) a horizontal or down-sloping ST segment depression of at least 1 mm, 60 ms beyond the J point or (b) an up-sloping ST-segment depression of 1.5 mm or greater, 80 ms beyond the J point, or (c) an ST-segment elevation of at least 1mm. An exercise electrocardiogram (ECG) was considered *negative* (based on ST-segment changes) when the patient achieved at least 85% of the maximal predicted heart rate in the absence of ischemic ST-segment changes [26]. Two independent investigators who were unaware of the angiographic findings carried out the interpretation. Intra-observer and inter-observer variability for ST-segment changes were 0.08 ± 0.06 and 0.09 ± 0.05 mm respectively.

2.3.2. Echocardiographic studies

All echocardiograms were recorded by commercially available equipment Philips (Sonos 5500, Andover, Massachusetts) ultrasound system, with a second harmonic 1.8–3.6 MHz transducer to optimize endocardial border visualization. Dobutamine infusion was initiated at a dose of 10 μg/kg/min and increased up to 20–30–40–50 μg/kg/min every 3 minutes. Atropine (up to 2 mg) was administrated intravenously if the test end point was not reached. Continuous monitoring of ECG and blood pressure was performed throughout the infusion. Images were recorded on both videotape and digital format for later analysis. To match myocardial segments with coronary distribution, anterior wall, anterior septum, and apex were assigned to the left anterior descending coronary artery (LAD), the lateral wall to the circumflex artery (LCx), and the inferoposterior wall and inferior septum to the right coronary artery (RCA).

An independent investigator who had no knowledge of patient data interpreted wall motion using the 16-segments as normal, hypokinetic, akinetic, or dyskinetic. A positive test for wall motion was defined as new or worsening wall motion abnormality in two or more contiguous segments during stress.

2.3.3. Coronary angiography

Coronary angiography was performed using the standard Judkins technique. Significant coronary artery disease was defined as 50% reduction of the luminal diameter of any of the three coronary arteries or their major branches. All angiograms were reviewed by two independent observers who were unaware of the results of exercise stress test and stress echocardiography.

3. Results

3.1. Risk factors and ED characteristics

The clinical and demographic characteristics of the patients, as well as their drug therapy are shown in Table 1. Table 2 shows erectile function characteristics