


## Association between Coronary Artery Disease and Erectile Dysfunction in Patients of a University Hospital

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**Abstract: Background:** Over the last decade, male sexual dysfunction has become a topic of great interest to clinicians, researchers and to public health managers. Many chronic coronary artery disease patients in Brazil suffer from erectile dysfunction (ED) and most do not feel comfortable about reporting their complaints. One of the main protection mechanisms against the onset and progression of cardiovascular diseases is physical activity. The objective of this study was to investigate the association between coronary artery disease and the degree of ED in a university hospital, as well as its relationship with age and modifiable risk factors such as low levels of physical activity and smoking. **Methods:** Sixty-seven patients with coronary artery disease were evaluated at a university hospital in a cross-sectional observational study using the International Index of Erectile Function (IIEF) questionnaire. **Results:** No association was found for the degree of ED with coronary artery disease, physical exercise or smoking. However, the results of this questionnaire showed that 79% these patients had some degree of ED. **Conclusions:** In this study, no association was found between patients with coronary artery disease and the degree of ED but, at a cut-off point of 21, the IIEF was very sensitive to indicate the presence of concomitant coronary artery disease.

**Keywords:** Coronary Artery Disease, Erectile Dysfunction, Physical Activity, Smoking

### Introduction

Over the last decade, male sexual dysfunction has become a topic of great interest to clinicians, researchers and to public health managers. This condition involves many aspects that often raise doubts and difficulties for both health professionals and patients <sup>1</sup>.

Erectile dysfunction (ED) is the inability of a man to obtain or maintain penile erection sufficient to perform sexual intercourse satisfactorily <sup>2</sup>. Several physical and psychological components are involved in erectile function, including hormonal, neurological, vascular and cavernous body diseases <sup>2,3</sup>. Studies have demonstrated a high prevalence of ED in men with cardiovascular diseases, since both diseases have several risk factors in common <sup>4,5</sup>.

Penile erection is regulated by the relaxation of the cavernous arteries and the smooth muscle of the corpora cavernosa, which is coordinated by a neuro-myovascular-endocrine complex mechanism mediated by the sympathetic and parasympathetic nervous systems, and the pituitary-gonadal axis <sup>6-8</sup>. It is believed that the problem of ED is an imbalance between contraction and relaxation of the smooth muscle of the corpora cavernosa <sup>9,10</sup>.

A general medical history is important to identify specific risk factors that may be responsible for or contribute to ED. These factors include age, diabetes mellitus, vascular diseases, coronary artery disease (CAD), pelvic or penile trauma, high total cholesterol levels, low high-density lipoprotein levels (HDL), drug use, neurological diseases, radiotherapy,

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depression, alcohol intake, and inappropriate interpersonal relationships<sup>9-13</sup>. Hypertension increases the risk of ED, however, in patients with CAD, it exerts a protective effect, even though CAD is an important risk factor for atherosclerosis. This is because higher pressures allow a greater blood flow and consequent increase in perfusion, essential for erectile function. In the long term, however, arterial hypertension is an aggravating factor for both ED and CAD<sup>14</sup>.

A sedentary lifestyle may also be considered a risk factor for ED. The rate of ED in sedentary individuals is between 43 and 70%, and thus regular physical activity can reduce the risk of ED by one third. However, some studies did not find any relationship between the practice of physical exercises and ED, possibly due to the negative influence of physiological aging and psychogenic factors, both of which were not considered in the studies<sup>15</sup>.

Smoking causes an adverse effect on erectile function, accentuating the risk due to vascular disease or hypertension<sup>16</sup>. Several epidemiological studies have shown that smoking not only increases the risk of ED, but also increases the severity of ED associated with other cardiovascular risks (hypertension, diabetes mellitus and dyslipidemia) and aging. Clinical and epidemiological studies have demonstrated that ED caused by smoking is associated with penile perfusion deficiency and acute vasospasm of the penile arteries. Moreover, long-term smoking and heavy smoking have deleterious effects on the vascular endothelium and peripheral nerves<sup>13</sup>.

It is important to note that although several studies on the prevalence, etiology, pathophysiology, diagnosis and treatment of ED have been carried out, little is known about the behavior of CAD patients to accept treatment<sup>11</sup>. The objective of this study was to investigate the association between CAD and the degree of ED in a university hospital, as well as its relationship with age and modifiable risk factors such as low level of physical activity and smoking.

### Patients and Methods

A cross-sectional observational study was performed using primary data collected throughout the research. All over 18-year-old male patients with CAD, submitted to a hemodynamic study were invited to participate in a follow-up program of the cardiology department of a university hospital concerning signs and symptoms of coronary insufficiency. This study was submitted and approved by the Ethics Committee on Human Research of the Medical School in São José do Rio Preto, SP. Patients were informed

regarding the nature and objectives of the study. All participants signed a consent form before participating in the research, in agreement and within the laws and regulations regarding clinical research in Brazil.

Patients submitted to prostate or pelvic surgeries, or pelvic radiotherapy and those unable to communicate or who did not agree to participate in the study were excluded from the study.

Data on CAD patients were collected from medical records and through an interview using the self-administered International Index of Erectile Function (IIEF) questionnaire. According to the IIEF, ED is classified into several degrees of severity depending on the patient's score: above 21 points: normal erectile function; 17-21: mild ED; 12-16: mild to moderate ED; 8-11: moderate ED; and 1-7: severe ED<sup>16</sup>.

Hemodynamic examinations were performed by experienced physicians and reassessed by a single hemodynamicist for consistency. Patients were also questioned about physical activity, whether they accepted treatment for ED and the degree of nicotine dependence. The Fagerström nicotine dependence test (FNNT) was used, which classifies patients by several degrees of severity: Non-smoker - 0; 1-4 - very low/low dependence; 5 - average dependence; 6-10 - high/very high dependence<sup>17</sup>.

Presence of CAD was attributed by means of a review of the patient's records, based on the percentage of obstruction of arteries (>50%): right coronary, anterior descending, circumflex and trunk or the presence of stents.

### Statistical analysis

The Mann-Whitney test was used to compare the IIEF scores between the sedentary and non-sedentary groups, as the data was nonparametric. Sensitivity and specificity calculations were made for the IIEF scores using a cut-off point of 21 for the diagnosis of ED. Fisher's exact test was used to identify any possible correlation between the degree of CAD and acceptance or not of treatment for ED. P-values <0.05 were considered significant.

### Results

Sixty-seven patients were evaluated; 14 (21%) had normal erectile function and 53 (79%) had some degree of ED according to the IIEF questionnaire.

Thirty-nine patients had CAD (58%) according to the hemodynamic examination. The median age was 61

years (range: 33-84 years). The relationship of the IIEF scores with CAD is presented in Table 1.

Table 1 - Relationship between International Index of Erectile Function (IIEF) scores and coronary artery disease

IIEF	With obstructive coronary lesion	Without obstructive coronary lesion
Normal erectile function	6	8
17-21: mild ED	17	8
12-16: mild to moderate ED	12	6
8-11: moderate ED	2	2
1-7: severe ED	2	4

ED: Erectile dysfunction

Of the 39 patients with CAD, 33 (84%) had some degree of ED. Thus, the sensitivity of the IIEF to indicate the coexistence of CAD with ED was 84% when considering the cut-off point of 21.

As for physical activity, only 34.3% of the patients identified themselves as active, with 65.7% stating that they did not practice any type of regular physical

activity. The median IIEF score among active individuals was 19, while the median score of sedentary subjects was 17; both scores of 17 and 19 are classified as mild ED. A p-value = 0.9846 was calculated using the Mann-Whitney test, so there was no statistically significant difference between the groups (Figure 1).

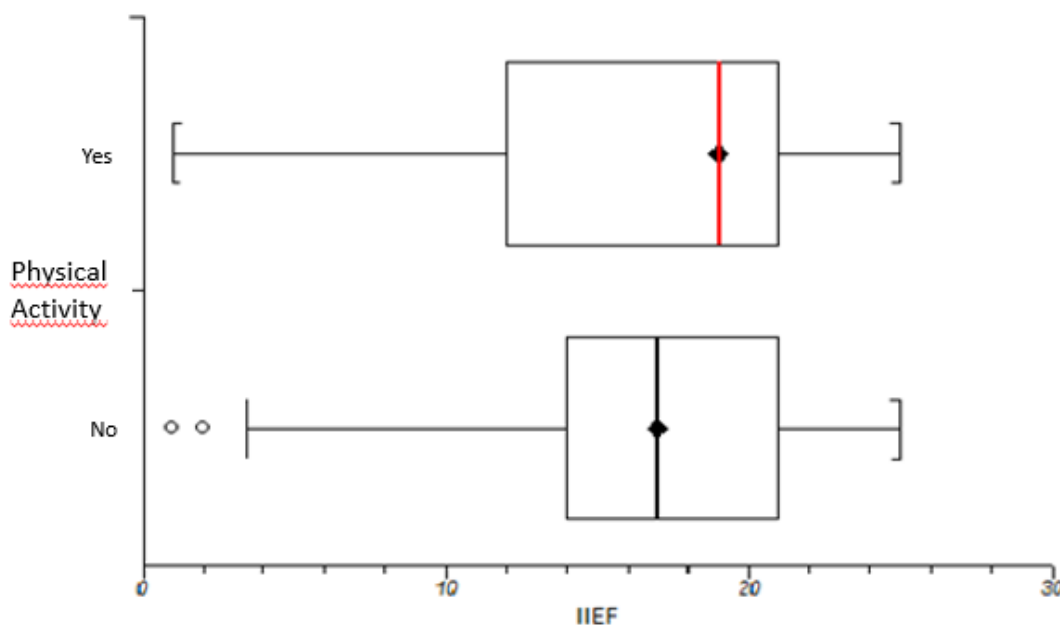


Figure 1 - Box plot of the values obtained with the IIEF questionnaires according to physical activity.

Regarding smoking, 38.8% of the patients said they were smokers and 61.2% reported never having smoked. Among the smokers, 26.9% (10.44% of the patients) had very low or low degrees of dependency

according to the FNDDT, while 73.9% (28.35% of the patients) had high or very high degrees of dependency and none had a medium degree of dependency (Figure 2).

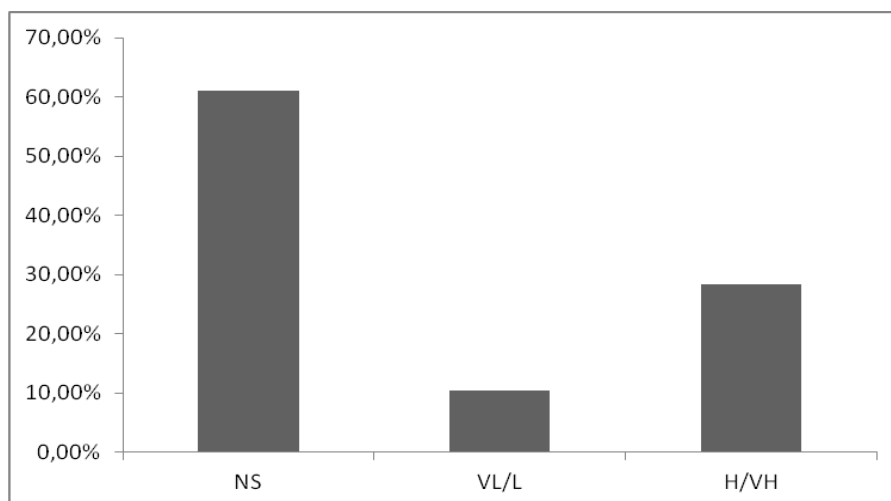


Figure 2 - Degree of dependency on smoking (NS = non smokers; VL/L = very low/low level; VH/H = very high/high level)

### Discussion

Although several studies have shown a high prevalence of ED in men with cardiovascular diseases, we have had some difficulties investigating this condition due to the patients' reluctance to collaborate with studies on sexuality. This high prevalence occurs because both diseases have several common risk factors<sup>4,5</sup>.

The most common organic causes of ED are vascular abnormalities, often associated with atherosclerosis and diabetes mellitus<sup>18-21</sup>. In the United States, atherosclerosis is a risk factor for ED in 70% of over 60-year-old men<sup>22</sup>. Several studies have shown that ED is a marker for cardiovascular diseases, and ED symptoms may appear two to three years before the symptoms of subclinical heart disease. ED has been associated with the severity of ischemic heart disease as the more severe the ED the greater the degree of coronary disease<sup>23</sup>.

Many chronic CAD patients in Brazil suffer from ED and most do not feel comfortable about reporting their complaints. It is important to remember that one of the main protection mechanisms against the onset and progression of cardiovascular diseases is physical activity.

The prevalence of ED in this study was 79%; higher than described in some other studies<sup>24,25</sup>. In studies investigating CAD and ED, the prevalence was reported at 84%<sup>26,27</sup>.

The current study demonstrated that IIEF has a sensitivity of 84% to identify CAD when the IIEF scores are  $\leq 21$  (the cutoff point for ED). Thus, the IIEF is a very sensitive noninvasive test to indicate the need for further investigation, since ED appears

as an early symptom of cardiovascular disease<sup>19,20</sup>. This result corroborates evidence of an association between ED and heart disease<sup>28</sup>.

According to the Framingham risk score, research shows that the relative risk of 30- to 39-year-old men developing CAD within 10 years of the diagnosis of moderate to severe ED is 1.1%; this risk rises to 4.9% in the 60- to 69-year age group<sup>26</sup>. Based on this, the diagnosis of ED may be very important to accompany and treat coronary diseases early.

In addition, stress tests with physical activity can only identify major lesions (50-70% of stenosis), whereas ED is sensitive for stenosis <50%.<sup>23</sup> Thus, the use of the IIEF questionnaire in the daily practice of hemodynamics units would be extremely useful.

This study had some limitations such as a small number of patients analyzed and some of the patients interviewed were illiterate and asked for help reading the IIEF questionnaire, which may have made them omit the true answer.

The prevalence of ED in cardiac patients in the current study was 84%, which demonstrates the high rate of ED in men with cardiovascular diseases. Since the symptoms of ED appear a few years before the symptoms of coronary disease, a tool that would assist in the diagnosis of this dysfunction may have important implications.

Although the sample size in this study was small, we stress the clinical relevance of the research, since the increase in the use of non-invasive methods, such as the IIEF, may help the early monitoring and diagnosis of heart diseases.

## Conclusions

In this study, there was no association between patients with CAD and the degree of ED, however, at the cut-off point of 21, the IIEF was very sensitive to indicate the presence of concomitant CAD. The study did not show an association between low levels of physical activity and the severity of ED. Forty percent of the patients submitted to a hemodynamic study in a university hospital are smokers, and of these approximately 74% have a high or very high degree of nicotine dependence.

**Conflicts of interest:** none

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