ORIGINAL ARTICLE

Effect of myocardial infarction on the occurrence of erectile dysfunction

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ABSTRACT

Aim To investigate etiological link between acute myocardial infarction (AMI) and the accompanying impotence/erectile dysfunction (ED).

Methods Study included 99 male patients (48 who had AMI - patient group, and 51 healthy examinees without previous cardiovascular disease - control group). All patients completed a standardized questionnaire, the International Index of Erectile Function (IIEF-5).

Results Older patients had significantly lower IIEF-5 score (negative correlation) (p <0.05), but higher ED degree (significant positive correlation) (rho=0.522; p=0.0001). In the patient group, 37 (77.1%) patients had ED, while in the control group it was found in 26 (51%) examinees (p<0.05). A clear correlation was found between incidence of ED and diabetes, dyslipidaemia, hypertension and positive family history (they were more common in patients with ED, with no statistically significant difference). There was no statistically significant difference between patients with ED and patients without ED according to the beta-blocker usage (p=0.824): ED was reported in 11 (68%) patients in the group who used carvedilol, 14 (82.3%) in the group who used metoprolol, and nine (81.8%) who used nebivolol.

Conclusion Myocardial infarction as well as age are directly related to the occurrence of ED. Cardiovascular risk factors are in direct correlation for the occurrence of erectile dysfunction after myocardial infarction.

Key words: cardiovascular disease, impotence, risk factors

INTRODUCTION

Development of erectile dysfunction (ED) after acute myocardial infarction (AMI) occurs in one-half to three-quarters of patients (1). Erectile dysfunction essentially has organic cause in the background (only 5-15% of cases have a purely psychogenic cause) (2). Complications following myocardial infarction are well documented, and it is clearly demonstrated that myocardial infarction further increases the risk of an additional cardiovascular incident, but also directly affects the quality of life of the patient (life satisfaction, sleep quality, and activity limitations) (3). The ED and AMI can be taken as different manifestations of the same underlying vascular pathology (atherosclerosis and endothelial dysfunction) (4). Different risk factors such as aging, obesity, sedentary lifestyle, smoking, hypertension, dyslipidaemia, diabetes, and medication (beta-blockers, diuretics and statins) are associated with psychological disorders, cardiovascular disease and sexual dysfunction (5). Integrative and holistic approach, with full consideration of the properties of these conditions, is an adequate way of diagnosis and management of these diseases (6).

Erectile dysfunction is a common clinical problem that is clearly associated with a variety of diseases (cardiac insufficiency, diabetes mellitus, peripheral vascular disease and hypertension) (2). The relationship between ED and coronary vascular disease is endothelial dysfunction, which occurs in penile as well as in coronary arteries, and ED and AMI are considered to be different manifestations of the same pathology (2, 7-11). It is considered that every patient with ED has a cardiovascular risk, until the opposite is proven. The prevalence and significance of ED in patients behind acute myocardial infarction are not sufficiently explored and defined (10). Unfortunately, it is a common condition (10). Variable ED prevalence was reported in cardiac patients (38-78%), mainly after acute myocardial infarction (10). In Bosnia and Herzegovina no studies have been performed in this field.

Aim of this study was to investigate etiological link between AMI and accompanying ED to point out the importance of this connection (especially with regard to the treatment of ED in the period of cardiac rehabilitation), ED frequency after myocardial infarction, the presence of ED in dependence on age incidence of risk factors and state of atherosclerotic nature, and the influence of drugs in the therapy of infarction on the development of ED.

PATIENTS AND METHODS

Patients and study design

Observational, prospective, analytical and controlled comparative study was performed. The study included 99 male patients divided into two groups. The first group consisted of 48 patients (patient group) aged between 41 and 70 years who had AMI, and had been treated at the Clinic for Heart, Blood Vessel and Rheumatic Diseases at the Clinical Centre of the University of Sarajevo during the period between June 2017 and December 2017. The control group included 51 healthy patients without previous cardiovascular incident who underwent regular general examination.

The inclusion criteria in the study was previous acute myocardial infarction, which occurred at least a month before the study. Exclusion criteria were: an unconfirmed diagnosis of AMI, the existence of endocrine disease and hormonal disorders (as a possible cause of ED), e.g. tumours of the hypothalamic pituitary region and hypogonadism, and possible traumatic lesions of the penile region and spinal cord. Patients with myocardial infarction were further divided into groups: according to age (aged between 40 and 50, 51 and 60 and 61 and 70 years), according to the time of occurrence of ED symptoms in relation to recent AMI (1 to 2 months, 2 to 6 months, 6 months to one year, more than a year after discharge). Anamnestic data was obtained from the history of the disease.

Methods

All patients completed a standardized questionnaire for the ED assessment, the International Index of Erectile Function (IIEF-5), which consisted of 5 questions (How do you assess your safety that you will be able to achieve and maintain an erection?; When you had erection with sexual stimulation, how often it was hard enough for penetration?; During your sexual intercourse, how often were you able to maintain erection after penetrating?; During sexual intercourse, how difficult was it to maintain your erection to successfully complete the intercourse?; When you had sexual intercourse, how often was it satisfactory for you?) (7).

The answers were scored from 1 to 5. The overall score ranged from 5 to 25: 22-25 points indicate normal erectile function, 17-21 points mild erectile dysfunction, 12 -16 mild to moderate erectile dysfunction, 8-11 moderate erectile dysfunction, 1-7 points indicate severe erectile dysfunction. Patients were additionally asked three Yes / No questions (Do you avoid sexual intercourse because of fear that it can cause cardiac problems?; Are you generally in bad mood after the infarction?; Do you know the adverse effects of drugs that could affect sexual function?).

Statistical analysis

Descriptive statistics, χ^2 test, student t -test were performed, and the significance of differences for independent continuous variables that did not follow normal distribution was tested with the Mann-Whitney test for independent samples, or the Kruskal-Wallis test, depending on the number of investigated groups (for the analysis of anamnestic data and patient therapy). Spearman's rank correlation coefficient was also used (for assessing the relationship between ED and age of the patient). Values of $p<0.05$ were considered statistically significant.

RESULTS

The average age of the patient group was 57.1±7.5 years (range 40-70). The average age in the control group was 55.2±6.9 years (39-68) (p=0.10).

Based on the data obtained from the IIEF-5 questionnaire, 11 (22.92%) out of 48 patients had no erectile dysfunction, and 16 (33.33%) were positive for erectile dysfunction (mild form). In the control group, 25 (out of 51; 49.01%) patients did not have erectile dysfunction, and in 13 patients (25.49%) erectile dysfunction was found (mild form) (Table 1).

Table 1. Erectile dysfunction (ED) degree in patients after acute myocardial infarction and control group

Patient group	Stage	No (%) of patients	Average age (range) (years)	p
Patients (n=48)	Without ED	11 (22.92)	50.1±5.3 (41-56)	
	Mild ED	16 (33.33)	55.4±7.8 (40-70)	
	Mild to moderate ED	10 (20.83)	60.6±3.9 (53-66)	**0.001**
	Moderate ED	6 (12.5)	62.3±4.8 (54-67)	
	Severe ED	5 (10.42)	64.4±3.4 (60-68)	
	Total	**48 (48)**	**57.1±7.5 (40-70)**	
Controls (n=51)	Without ED	25 (49.01)	52.8±6.4 (39-65)	
	Mild ED	13 (25.49)	52.8± (44-62)	
	Mild to moderate ED	8 (15.68)	61±3.5 (57-66)	**0.001**
	Moderate ED	3 (5.55)	62.7±3.2 (59-65)	
	Severe ED	2 (3.92)	67.5±0.7 (67-68)	
	Total	**51 (52)**	**55.2±6.9 (39-68)**	

Older patients had lower IIEF-5 score (negative correlation) (p<0.05).

Patients with ED in the patients group were significantly older in comparison to patients without ED (59.2±6.8 (40-70) vs. 50.1±5.3 (41-56); p=0.001). Older patients have a higher degree of ED compared to the younger ones (significant positive correlation) (rho = 0.691; p = 0.0001) (Table 1). In the control group, patients with higher degree of ED (severe) were older than the patients with mild ED (p=0.001), with significant positive correlation (rho=0.522; p=0.0001).

If we compare the number of patients with and without ED in the control and patients group, it can be noted that 37 (77.1%) patients and 26 (51%) controls had ED.

Statistical analysis by Fisher's exact test and control of results by phi (φ) coefficient test showed that there was no statistically significant difference in the appearance of ED between the observed groups (p>0.05) (although all ED degrees were more represented in the patient group). Erectile dysfunction in 10 (27.02%) patients occurred in the period 3- 6 months after AMI, in eight patients 1-2 months, in seven patients after more than 12 months, in six patients each immediately and 7-12 months after AMI.

The mean IIEF-5 score in the total sample (control and patient group, n = 99) was 18.01±5.4 (range 5-25). The IIEF-5 score was statistically significantly lower (p = 0.007) in the patient group, with an average of 16.5±5.6 (range 5-25) compared to the control group, with the average of 19.4 ± 4.9 (range 6-25). The IIEF-5 score is obtained through five questions, and represents the degree of erectile dysfunction (the lowest score equals severe ED degree). Out of 48 patients, 40 (83.33%) responded negatively to the question "Do you avoid sexual intercourse because of the fear that it can cause cardiac problems?" (p=0.069). The next questions were related to the presence of reasons for mood swings, or no reasons for mood swings ("Are you generally in bad mood after the infarction?" and "Do you know the adverse effects of drugs that could affect sexual function?") (p=0.2 and p=0.34, respectively).

The prevalence of cardio metabolic risk factors and conditions of atherosclerotic nature in the patient group was: smoking, 37 (77.1%) (p=0.214), diabetes mellitus, 8 (16.7%) (p=0.443), abnor-

mal amount of lipids in the blood (dyslipidae-mia), 35 (72.9%) (p=0.430), alcohol consumption, 12 (25%) (p=0.843), obesity (BMI> 24.9), 30 (62.5%) (p=0.929), positive family history, 36 (75%) (p=0.074), hypertension, 35 (72%) (p=0.430). A clear correlation was found between the incidence of ED and diabetes, dyslipidae-mia, hypertension and positive family history, e.g. they were more common in patients with ED, with no statistically significant difference. Smoking, alcohol consumption, and obesity were more common in patients without ED.

There was no statistically significant difference between patients with ED and patients without ED according to the beta-blocker usage (p=0.824): ED was reported in 11 (68%) of patients in the group who used carvedilol, 14 (82.3%) in the group who used metoprolol, and nine (81.8%) who used ne-bivolol. Also, there was no statistically significant difference between patients with erectile dysfunction and patients without erectile dysfunction according to the usage of furosemide (p=0.610), spironolactone (p=0.461) and statins (p=0.171).

DISCUSSION

The presented study included 48 patients who had undergone cardiac rehabilitation after myocardial infarction, and compared with a group of 51 healthy patients of the appropriate age. The results showed that 77.1% of the patients after myocardial infarction reported signs of ED, in comparison with the control group, in 51% (p = 0.007). These results correspond to the results showed by Ruzic et al. (8) which found that 82% of patients after myocardial infarction showed a certain degree of ED, with note that patients included in that study had a greater range of years - from 30 to 75. Araujo et al. (9) an extensive Massachusetts Male Aging study showed that 52% of men between 40 and 70 years of age suffered from a certain degree of ED; Montorsi found it in 67% of patients (10). According to the IIEF-5 questionnaire (7), the study conducted by Maroto-Montero (12) showed that 52.6% of patients had a score below 20, what is lower than in our research probably because of the small patient group, but an occurrence of ED degrees is in accordance with our research (12).

Results of our study have shown that the prevalence of ED was related to the age of the patients. In addition, older patients had lower IIEF-5 score.

All patients in our study with ED had at least two risk factors correlating with the appearance of ED. These results partially correspond to the results obtained by Maroto-Montero (12). On the other hand, Dong et al. showed that ED alone significantly increases the risk of coronary heart disease, AMI and mortality itself regardless of the cause (13), probably independently of conventional cardiovascular risk factors (13). Our study has shown no correlation between used drugs in the therapy of infarction and erectile dysfunction. Based on the experience of many studies it is known that propranolol and metoprolol negatively interfere with sexual function (16). In some studies, carvedilol, because of the lower incidence of ED, defined as the drug of choice for patients with this complication (14,15). Nevertheless, other studies showed that nebivolol is the best choice, because of the properties of nebivolol, and the relationship with nitric oxide (16,17). Nebivolol has a particular mechanism of action, which involves release of nitric oxide, resulting in penile vasodilation, and that can be favourable in male subjects with the history of hypertension and ED (16). When it comes to the effects of statins and diuretics on the appearance of ED, different and most often contradictory literature data were found (19). The role of statins and diuretics in the occurrence of ED after myocardial infarction is still dubious, and requests bigger and more controlled trials to confirm their influence (18-20). Our research showed that psychological state of patient (fear, mood swings) could reduce the rate of intercourse, which is also confirmed by results obtained by Lunelli (20), suggesting that 44% of patients reduced the rate due to aforementioned reasons. Kazemi-Saleh (21) in his study of the incidence of depression and fear of sexual intercourse showed that these problems occur in 33.3% of patients, and a correlation between depression and fear of sexual intercourse in men was also noted. Depression, by definition, gives the answer why it can be the cause of ED and its first sign is that the activities that once gave the patient satisfaction and pleasure no longer do that (22).

In conclusion, myocardial infarction, as well as the age, are directly related to the occurrence of ED. It was found that diabetes mellitus, dyslipidaemia, positive family history of cardiac disease and hypertension are more represented in the

patients with erectile dysfunction, which is also the case for smoking, alcohol consumption, and obesity. Influence of therapy, which is prescribed as per a protocol after myocardial infarction, has to be confirmed by larger studies. Although knowing pharmacological properties of drugs, the fact is that therapy should have impact of ED

occurrence. Developing of psychological counselling may be of great importance.

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TRANSPARENCY DECLARATION

Competing interests: None to declare.

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