ROLE OF CARDIAC STRESS TEST IN PATIENTS OVER 65 YEARS OLD WITH ISCHEMIC CARDIAC INSUFFICIENCY

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Abstract: *Elderly's cardiac insufficiency (CI) represents a public health issue. Within this context, the aim of the study is to assess cardiac stress test capacity of the patients with ischemic CI with a view to include them in cardiovascular rehabilitation programmes. Two groups of patients were studied: group 1-below 65 years old and group 2 - below 65 years old. All patients were submitted to the cardiac stress testing and echocardiography. IC forms with preserved ejection fraction were predominant. We noticed that the patients in group 1 have a cardiac stress test capacity greater than those in group 2 ($WATT_s$: 86.11 ± 24.35 vs. 70.83 ± 21.7, p = 0.0051; METs: 4.6 ± 1.4 vs. 3.8 ± 1.1, p = 0.05). Most cardiac stress tests were stopped in both groups due to dyspnea. In conclusion, cardiac stress testing in its classical form can be useful for assessing exercise capacity in patients with CI who are to be included in cardiac rehabilitation programmes.*

Cuvinte cheie: *vârstnici, insuficenţă cardiacă, testare de efort*

Rezumat: *Insuficienţa cardiacă (IC) a vârstnicului reprezintă o problemă de sănătate publică. În acest context, scopul studiului este de a evalua capacitatea de efort a bolnavilor vâstnici cu IC ischemică, în vederea includerii lor în programe de recuperare cardiovasculară. Au fost luaţi în studiu două grupuri de pacienţi: grupul 1-sub 65 de ani şi grupul 2-peste 65 de ani. Tuturor pacienţilor li s-a efectuat tesare de efort şi ecocardiografie. Au predominat formele de IC cu fracţie de ejecţie păstrată. S-a constatat că bonavii din grupul 1 au o capacitate mai mare de efort decâ cei din grupul 2 ($WATT_s$: 86.11±24.35 vs 70.83±21.7, p=0.0051; MET_s: 4.6±1.4 vs 3.8±1.1, p=0.05). Majoritatea testelor de efort au fost oprite în ambele grupuri pentru dispnee. În concluzie, testarea de efort în forma ei clasică poate fi utilă pentru evaluarea capacităţii de efort la bolnavii cu IC care urmează să fie supuşi unui program de recuperare cardiacă.*

INTRODUCTION

At the same time with the existing growing trend in age at European level, there also is an increased incidence of chronic diseases. Over 60% of adults over 65 years old have functional deficits due to health problems that cause disability and even temporary or permanent handicaps.(1,2)

Cardiac insufficiency represents one of these disorders. Its prevalence increases with age (3), especially the forms with preserved ejection fraction.(3)

This form of CI is now a real epidemiological issue.(1) Recent studies show that mortality caused by this is similar to that of heart failure with reduced ejection fraction.(2,3)

PURPOSE

Within this context, this study aims at analysing to what extend assessing cardiac stress capacity through its classical method may contribute to evaluating cardiac stress test of the patients with CI who are to be included in cardiac rehabilitation programmes.

METHODS

There were studied 49 patients admitted to the Cardiology Department of the Rehabilitation Clinical Hospital of Cluj with CI, functional class, NYHA II-III of ischemic etiology without congestive syndrome, who were divided into two groups: group 1 - below 65 years old and group 2 - over 65 years old. CI was defined according to the European Society of Cardiology (ESC) criteria 2012.(3)

All patients had undergone echocardiography. Blood pressure was measured according to the standard protocol as the average of two measurements at 5 minutes from the time the patient began to rest in the sitting position.

All patients were tested in terms of cardiac stress on symptom-limited maximal treadmill (ETT) using Bruce protocol. Cardiac stress test capacity has been measured in METs (metabolic equivalents of the oxygen consumption 1.4 watt/kg).

1 MET is one unit of oxygen supply in resting/seating position (≈3.5 mL of O_2 per kilogram body weight per minute [mL • kg-1 • min-1]). Heart rate, blood pressure and 12-lead ECGs were recorded before exercise, at the end of each stage of exercise, and after the first minute of the recovery phase. Statistical analysis was performed using SPSS software for Windows (v 16.0, IBM Corporation, Armonk, NY, USA) and MedCalc (v 10.3.0.0, MedCalc Software, Ostend, Belgium).

A value of $p < 0.05$ was considered statistically significant. The eligible patients were informed about the study protocol and they gave their informed consent.

The study was conducted in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans.

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RESULTS

The main patients' characteristics are summarized in table no. 1. The following values of patients' echocardiographic parameters were registered between the two groups: left ventricular end diastolic volume, 57 ± 9 vs. 56 ± 8 mm, p = 0.27; left ventricular end systolic volume, 42 ± 11vs. 40 ± 11, p = 0.21; volume ejection fraction 42 ± 10 vs. 51, ± 16, p = 0.045%. Diastolic dysfunction was present in 32, respectively 25% of the patients.

Tables no. 2 and 3 show the way the patients in the two groups respond to the cardiac stress testing.

Table no. 1. Main characteristics of the patients (whole group vs. group I vs. group II)

Variables	Group 1<65 years (25 p)	Group 2-≥65 years (24 p)
Males No (%)	18 (72)	18 (75)
Age (mean ± SD)	56.6±4.47	68.79±6.26
Hypertension No (%)	12 (48)	10 (41.6)
Atrial fibrillation (%)	4 (16%)	5 (20.83)
Teledistolic diameter left ventricle(mm)	57± 9	56±8
Telesystolic diameter ventricle (mm)	42±11	40±11
Left ejection fraction (%)	47±14	51±16
Diastolic dysfunction (%)	8 (32)	6 (25)

Table no. 2. Main characteristics of the effort stress testing (group 1 vs. group 2)

Variables	Group 1<65 years	Group 2-≥65 years	p
$WATT_s$	86.11±24.35	70.83±21.7	0.0051
MET_s *	4.6±1.4	4±1.3	0.09
Maximal heart rate in effort (beats/minutes)	75±16	73±18	0.25
Effort dyspneea (%)	14 (56)	18 (75)	NS
Effort typical chest pain (%)	6(24)	4 (17)	NS
Asthenia (%)	5 (20)	2 (9)	NS

* metabolic equivalents of oxygen consumption =1.4 watt/kg body weight. 1 MET-1metabolic equivalent (MET) is a unit of sitting/resting oxygen uptake (≈3.5 mL of O_2 per kilogram of body weight per minute [$mL \cdot kg^{-1} \cdot min^{-1}$]; Maximal heart rate for men= 220-age (years); Maximal heart rate for women=210-age (years)

Table no. 3. Exercise data

Exercise stress testing	Group 1<65 years	Group 2 ≥65 years
True- positive *	4(16%)	4 (10%)
Nondiagnostic test **	15 (60%)	18 (75%)
True- negative ***	6(24%)	2 (9%)

* ST segment depression induced during effort or in recovery of 1 mm or more

** a negative test, but without achieving 85% of maximum predicted heart rate

*** no ischaemic ST changes during the exercise test or immediately after effort, reaching or exceeding 85% of maximum predicted heart rate

We can see that there were no significant differences between the two groups in terms of cardiac stress test parameters, except for the Watts number performed, which was much lower in the group of the elderly patients. One important thing is that cardiac stress testing was interrupted in most patients with IC, regardless of age because of dyspnea. At the same time, more than 50% of patients had inconclusive cardiac stress tests as a result of not reaching the maximum frequency.

DISCUSSIONS

Cardiac insufficiency is accompanied by an increased rate in the number of hospitalization days and significant mortality, which increases with age.(2) The incidence of CI is doubled from 0.2% for the age group of 45-55 years old, for each decade of age.(3) In the elderly, CI with preserved ejection fraction, which can be met more commonly in the female patients and in patients with obesity.(2) In our study as well, in accordance with the results of other recent studies, the elderly patients had an ejection fraction significantly lower than those aged below 65 years old.(4,5,6) Currently, a particular focus is paced both on recovery through physical exercises, motivated due to the decrease of stress capacity and cardiac performance associated to the poor adaptation of the skeletal muscle.(3) The programme objectives include the removal or mitigation of inactivity effects, of the education and the action on the risk factors, resuming the normal occupational and recreational activities.(3) In the cardiac rehabilitation programme, the most important objective is the physical exercise achieved by prescribing certain individual levels of physical activity, safe for the patient, resulting from prior testing effort.(3) In general, especially in elderly patients, but not only, there has been used an initial assessment using the 6-minute walk test, which through simplicity and justified compliance, has the advantage of rigor in the selection of patients and following up their behaviour within the recovery programmes.(3) The methodology of cardiac stress testing can be the classical one, on treadmill or cycle ergometer. In these cases, increased effort on every level, is not usually of 25-30 Wats as in the classical methodology, but lower (10-20 Wats), with possible benefits in the patients with CI who will adapt more easily to the low Wattage growth.(3,7,8,9)

The study used the classical stress testing, but only after the improvement of the congestive phenomena, that is after cardiac compensation. In the vast majority of patients, the cardiac stress test was stopped due to dyspnea, which is followed by precordial anginal pain and fatigue.

It is well known that the predominating symptom in heart failure is dyspnea.

Within this context, in more than half of the patients, cardiac stress tests were inconclusive due to not accomplishing the maximum frequency, as a result of low exercise capacity of the patients. A small number of patients had positive tests (given the CI etiology in our study-ischemia) and negative.

In fact, the main objectives of stress testing in the patients with CI is to determine the level of effort at which dyspnea and fatigue occur.(3,10)

Elderly patients have completed a significant lower number of Wats than those aged under 65. At the same time, the number of METs and maximal cardiac frequency were decreased in group 2. Obviously, having in view of all these results, different training physical programmed will be set up for the two groups of patients.(2,11,12,13) Given their cardiac pathology, these programmes will be applied under medical supervision and only in centres specialized for this purpose, at least for a certain period of time (14,15), an example being the Cardiovascular Diseases Hospital of Covasna.

The limits of the study are the small number of patients, but in this sense, mention must be made of the fact that only patients with CI of ischemic etiology were included in the study, who were compensated and stable from the clinical point of view.

In conclusion, cardiac stress testing in its classical form can be useful for assessing exercise capacity in the patients with CI who are to be included in cardiac rehabilitation programmes.

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