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DO PATIENTS WITH CORONARY HEART DISEASE OLDER THAN SEVENTY BENEFIT FROM CARDIAC REHABILITATION?*

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SUMMARY – Elderly patients with coronary heart disease (CHD) are frequently not referred to cardiac rehabilitation programs. The aim of the study was to assess the effect of 3-week inpatient cardiac rehabilitation in CHD patients older than seventy. The study included 103 consecutive CHD patients older than 70 who underwent 3-week inpatient rehabilitation. A history of myocardial infarction was recorded in 77% of patients, whereas 23% had previously undergone coronary artery bypass surgery. The patients who could not perform exercise test or those with congestive heart failure were not included in the study. Functional capacity, lipid profile, blood glucose, body weight and body mass index were determined before and at the end of rehabilitation. After 3-week inpatient cardiac rehabilitation, functional capacity markedly improved ($p<0.0001$). The levels of cholesterol ($p<0.0001$), triglycerides ($p=0.01$), LDL-cholesterol ($p<0.0001$) and blood glucose ($p=0.004$) were significantly lower in comparison with initial values. There were no significant differences in HDL-cholesterol, body weight and body mass index between initial values and those measured at the end of rehabilitation. Results of the study suggest that elderly patients with CHD benefit from cardiac rehabilitation and should be routinely referred to cardiac rehabilitation and encouraged to attend these programs.

Key words: *Myocardial infarction, rehabilitation; Aged; Aged, 70 and over; Exercise therapy; Exercise, tolerance*

Introduction

Comprehensive cardiac rehabilitation and exercise programs have proven to be extremely effective in patients after major coronary events[1-3]. Cardiac rehabilitation is associated with reduction in subsequent medical costs[4], and pooled data from several randomized studies have shown an up to 25% reduction in coronary heart disease (CHD) mortality in patients randomized to cardiac rehabilitation[5]. However, elderly patients frequently are not encouraged to participate in such programs after a major coronary event or cardiac surgery[6,7].

The aim of this study was to assess the effect of 3-week inpatient cardiac rehabilitation in CHD patients older than 70.

Patients and Methods

The study included 103 consecutive CHD patients older than 70 (mean age 73±3, range 71-80 years), who underwent 3-week inpatient cardiac rehabilitation, phase

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II (mean duration 20±2 days) at the Hospital for Medical Rehabilitation in Krapinske Toplice from November 1999 till December 2000. There were 62% of men and 38% of women (mean age 74±3 *vs.* 72±2 years; non-significant). A history of myocardial infarction (MI) was recorded in 77% of patients, whereas 23% had undergone aortocoronary bypass surgery two weeks to three months before admission for cardiac rehabilitation (mean 49±22 days). Inferior, anterior and non-Q MI was recorded in 52%, 35% and 13% of patients, respectively. Diabetes mellitus was present in 30% of study patients. Medication administered during rehabilitation is presented in Table 1. Patients who could not perform exercise test or those with acute congestive heart failure were not included in the study.

Table 1. Medication during cardiac rehabilitation

Drug group	n	%
Angiotensin-converting enzyme inhibitors	67	65
Beta-adrenergic blockers	25	24
Long-acting nitrates	79	77
Digitalis	18	17
Diuretics	44	43
Calcium channel blockers	32	31
Statins	59	57
Antiarrhythmics (class Ic and III)	15	15
Acetylsalicylic acid	91	88
Oral anticoagulants	8	8

Exercise test was done on admission and before discharge from the hospital on a cycle ergometer with 25 W starting workload and 25 W increments every 2 minutes. Rehabilitation program included conditioning on cycle ergometer, supervised group exercise, and distance limited exercise walking. Rehabilitation was practised six days a week, with rest on Sundays.

Exercise level on cycle ergometer was determined according to the results of exercise test on admission. The cycle ergometer conditioning started on the day after the initial exercise test, twice daily. On the first day, the patients started conditioning with 6 one-minute rounds and one-minute rest between two rounds. If there were no contraindications, every 3 days the number of one-minute rounds progressively increased to up to a maximum of 14 rounds. Besides conditioning on cycle ergometer, group exercise included breathing, stretching, relaxation, muscle strengthening, and distance limited exercise walking, under supervision of a physiotherapist.

The effect of cardiac rehabilitation was assessed by peak exercise capacity (estimated by metabolic equivalents, METs) and maximal oxygen consumption on symptom-limited exercise tests on admission and after rehabilitation. Furthermore, the levels of cholesterol, triglycerides, low density lipoprotein cholesterol (LDL-cholesterol), high density lipoprotein cholesterol (HDL-cholesterol), and blood glucose, then body mass index (BMI) and body weight (BW) obtained at the end of rehabilitation program were compared with those measured on admission.

Blood samples were obtained on the day after admission and on the last day of rehabilitation. Plasma cholesterol and triglyceride levels were determined by the enzymatic colorimetric method (PAP). The level of LDL-cholesterol was determined by use of Friedewald formula, and that of HDL-cholesterol by the selective precipitation method with magnesium chloride. Blood glucose was determined by the glucose oxidase method.

Statistical analysis was done by the commercial software package, SPSS for Windows, Version 7.5. Results were expressed as mean ± standard deviation (SD), and as percentage of change in the value of each parameter after rehabilitation as compared with the values measured on admission. The baseline and postcardiac rehabilitation data were compared by paired t-test. A value of $p<0.05$ was considered statistically significant.

Results

After 3-week cardiac rehabilitation, functional capacity of the patients markedly improved. The patients' exercise capacity (3.1±0.9 *vs.* 4.3±1 METs; $p<0.0001$) and maximal oxygen consumption (10.9±3.2 *vs.* 15.1±3.4 ml/kg/min; $p<0.0001$), estimated by symptom-limited exercise test, were significantly higher compared with the values measured before rehabilitation.

Before rehabilitation, only 26% of the patients were classified as the New York Heart Asssociation (NYHA) functional class I, 46% as NYHA II, and 28% as NYHA III. After rehabilitation, 41% of the patients were classified as NYHA I, 42% as NYHA II, and 17% as NYHA III (Fig. 1).

Furthermore, the levels of cholesterol (6.44±1.41 *vs.* 5.42±1.00 mmol/L, $p<0.0001$), triglycerides (2.07±1.07 *vs.* 1.74±0.77 mmol/L, $p=0.01$), LDL-cholesterol (4.48±1.12 *vs*. 3.71±0.83 mmol/L, $p<0.0001$) and blood glucose (7.2±2.6 *vs.* 6.3±1.9 mmol/L, $p=0.004$) were significantly lower as compared with the values measured before reha-

bilitation. There were no significant differences between the initial and post-rehabilitation values of HDL-cholesterol (1.05±0.37 *vs.* 1.11±0.34 mmol/L), BMI (27.1±3.5 *vs.* 26.6±3.3) and BW (74.9±12.9 *vs.* 73.5±12.5 kg) (Table 2).

Table 2. Effect of cardiac rehabilitation on functional capacity, blood lipids and blood glucose, body mass index and body weight in elderly patients with coronary heart disease

Variable	Difference (%)	p
Functional capacity	+28	<0.0001
Cholesterol	-16	<0.0001
Triglycerides	-16	0.01
LDL-cholesterol	-17	<0.0001
HDL-cholesterol	+5	NS
Blood glucose	-12	0.004
Body mass index	-2	NS
Body weight	-2	NS

NS=non-significant

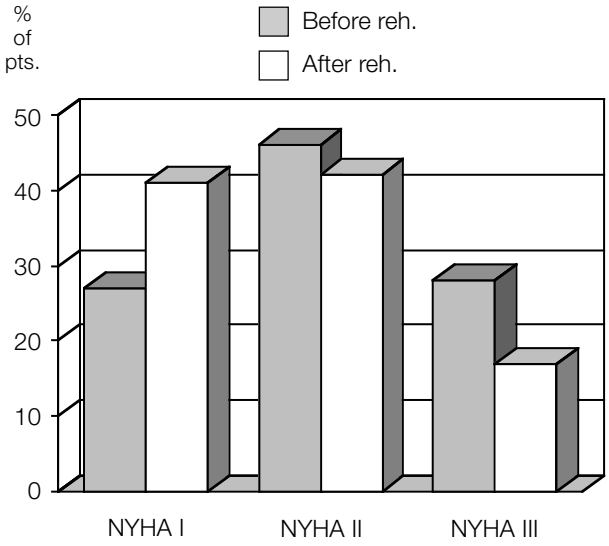

Fig. 1. NYHA functional class before and after cardiac rehabilitation.

Discussion

Treatment of an elderly cardiac patient poses a unique problem to the clinician. Although exercise, training and physical activity have been shown to have a favorable effect on health and function in primary and secondary prevention in both young and elderly cardiac patients, the use of cardiac rehabilitation in elderly cardiac patients is still controversial[8]. Many clinicians view the emphasis on cardiac rehabilitation for improvement of functional capacity, risk factor modification and quality of life as irrelevant in very old adults and consider mere exercise programs as an appropriate alternative[9].

In contrast, the results of the present study showed marked improvement (+28%, p<0.0001) of functional capacity in the elderly cardiac patients at the end of 3-week inpatient phase II cardiac rehabilitation.

Similar results have been reported by Lavie and Milani, i.e. a 32% functional capacity improvement in elderly cardiac patients (age >70) after one-month phase II cardiac rehabilitation[10]. Stahle *et al.* also observed a beneficial effect of cardiac rehabilitation on functional capacity and several quality of life parameters in elderly cardiac patients[11].

Heldal and Sire[12] found greater exercise capacity improvement after a 4-week cardiac rehabilitation program (+49%, p=0.0001) than that recorded in our study, probably because of the longer duration of training and younger cohort of cardiac patients included in their study. Furthermore, they also observed the beneficial effect of exercise on blood lipid levels, i.e. a significant decrease in the levels of cholesterol and triglycerides, whereas HDL-cholesterol showed no significant increase.

Although elderly patients frequently are not referred to cardiac rehabilitation, some studies have recently revealed an increase in the participation of cardiac patients of this age group in such programs in comparison with data from the last decade. There is a prominent trend of attending cardiac rehabilitation programs by the elderly, suggesting better awareness of both patients and their physicians than some ten years ago[13].

In conclusion, the results of this study suggest that elderly CHD patients benefit from cardiac rehabilitation and should be routinely referred to and encouraged to attend these programs. Besides the functional capacity improvement, the aims of cardiac rehabilitation programs include psychological support and education of patients about risk factors and lifestyle. Outpatient exercise and preventive programs have to continue to preserve the beneficial effects of phase II inpatient cardiac rehabilitation. Therefore, cardiac rehabilitation should be an integral part of the management after major cardiac events or surgery in elderly patients.

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Sažetak

JE LI KARDIOLOŠKA REHABILITACIJA KORISNA U BOLESNIKA S KORONARNOM BOLEŠĆU STARIJIH OD SEDAMDESET GODINA?

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Bolesnici s koronarnom bolešću starije životne dobi često se ne upućuju na kardiološku rehabilitaciju. Cilj ovoga rada bio je procijeniti učinak trotjedne stacionarne kardiološke rehabilitacije u bolesnika s koronarnom bolešću starijih od 70 godina. U studiju je bilo uključeno 103 uzastopnih bolesnika starijih od 70 godina tijekom trotjedne stacionarne kardiološke rehabilitacije. Infarkt miokarda bilo je preboljelo 77% bolesnika, dok ih je 23% bilo prethodno podvrgnuto kirurškoj revaskularizaciji miokarda. Bolesnici koji nisu mogli izvesti ergometrijsko testiranje ili oni s kongestivnim srčanim popuštanjem nisu bili uključeni u studiju. Funkcionalni kapacitet, lipidogram, razina glukoze u krvi, tjelesna težina i indeks tjelesne mase mjereni su prije te odmah nakon završetka rehabilitacije. Nakon trotjedne kardiološke rehabilitacije funkcionalni se kapacitet značajno poboljšao ($p<0,0001$). Razine kolesterola ($p<0,0001$), triglicerida ($p=0,01$), LDL-kolesterola ($p<0,0001$) i glukoze u krvi ($p=0,004$) bile su značajno niže u odnosu na početne vrijednosti. Nije bilo značajne razlike u razini HDL-kolesterola, tjelesnoj težini i indeksu tjelesne mase na kraju rehabilitacije u odnosu na početne vrijednosti. Rezultati ovoga rada pokazali su da kardiološka rehabilitacija koristi bolesnicima s koronarnom bolešću starijim od 70 godina, te da ih treba rutinski upućivati i poticati na provođenje ovih programa.

Ključne riječi: *Infarkt miokarda, rehabilitacija; Starije osobe; Starije osobe, dob 70 i više godina; Terapija tjelovježbom; Tjelovježba, podnošenje*