

EFFECTS OF CARDIOVASCULAR REHABILITATION IN PATIENTS ADMITTED TO THE “DR BENEDEK GEZA” HOSPITAL OF REHABILITATION IN CARDIOVASCULAR DISEASES, COVASNA

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Abstract

Background. Cardiovascular rehabilitation is an important objective of the treatment of cardiovascular patients in general, and ischemic heart disease patients in particular.

The aim of the study is to monitor the effects of long-term cardiovascular rehabilitation in patients readmitted to the “Dr Benedek Geza” Hospital of Rehabilitation in Cardiovascular Diseases Covasna.

Material and methods. The study included 92 patients with a mean age of 66.31±9 years, of which 63% women, who had two successive admissions to the “Dr Benedek Geza” Hospital of Rehabilitation in Cardiovascular Diseases, Covasna. At both admissions, all patients were evaluated for the presence of the main cardiovascular risk factors. All patients attended cardiovascular rehabilitation programs, including physical training, climatotherapy, CO₂ baths, mofette therapy, aerotherapy, electrotherapy .. We mention that cardioprotective therapy (aspirin, angiotensin enzyme converting inhibitors, beta-blockers and statins) did not undergo major changes from one admission to the other.

Results. More than half of the patients had the following risk factors: hypertension - 79.35%, dyslipidemia - 64.13%, overweight and obesity - 76.4%. The complex rehabilitation programs attended by the patients consisted of physical training - 33.7%, CO₂ baths - 85.9%, mofette therapy - 53.3%, aerotherapy - 96.7%, electrotherapy - 88%. A comparison of the main cardiovascular risk factors during both admissions showed no significant differences between these, except for LDL-cholesterol (3.15±1.26 vs 2.58±1.65 mmol/dl, p=0.004) and HDL-cholesterol (1.06±0.61 vs 1.194±0.41 mmol/dl, p=0.075)

In conclusion, in cardiovascular patients, obtaining improvements of cardiovascular risk factors requires long-term cardiovascular rehabilitation programs, in parallel to the application of measures for lifestyle change and for secondary drug prevention.

Keywords: rehabilitation, cardiovascular diseases, gender

Introduction

Cardiovascular mortality ranks first in Europe, among both women and men [1]. This is why particular emphasis is currently placed on the early diagnosis and correct treatment of these categories of patients. At the same time, the importance of the long-term follow-up of patients by applying secondary prevention measures and cardiovascular rehabilitation programs is highlighted [2, 3, 4, 5]. Today, in the age of myocardial revascularization, the implementation of rehabilitation programs according to the old rehabilitation "phases" is no longer possible, because the revascularized patient can be discharged from hospital as early as after 3-4 days of hospitalization. This is why the presence of rehabilitation centers where patients might attend complex rehabilitation programs becomes extremely important and useful. Unfortunately, in Romania, there are currently few such centers. "Dr Benedek Geza" Hospital of Rehabilitation in Cardiovascular Diseases Covasna, which plays an important role in this sense, is unique in Romania, as well as in Europe. In this study, we aim to evaluate the effects of cardiovascular rehabilitation in patients with cardiovascular diseases who had two successive admissions to this hospital.

Material and method

The study included 92 patients with a mean age of 66.31 ± 9 years, of which 63% women, who had two successive admissions to the "Dr Benedek Geza" Hospital of Rehabilitation in Cardiovascular Diseases Covasna. At both admissions, all patients were evaluated for the presence of the main cardiovascular risk factors. Thus, lipid fractions and glycemia were determined in all patients. Blood samples (10 ml) were obtained by venipuncture, according to the standard Lipid Research Clinics protocol [6]. LDL-cholesterol was assessed using the Friedewald formula [7]. Serum glycemic levels were measured using the glucose oxidase method [8]. Blood pressure was

measured according to the standard protocol, as the mean of two measurements after the patient was in supine rest position for 5 minutes. Patients were evaluated for obesity, a body mass index higher than 30 kg/m² being defined as obesity.

All patients attended cardiovascular rehabilitation programs, including physical training, climatotherapy, CO₂ baths, mofette therapy, arotherapy, electrotherapy.

Patients with contraindications for cardiovascular rehabilitation were excluded from the study.

We mention that cardioprotective therapy (aspirin, angiotensin enzyme converting inhibitors, beta-blockers and statins) did not undergo major changes from one admission to the other.

Statistical analysis was performed using the SPSS for Windows package (v 16.0, IBM Corporation, Armonk, NY, USA) and the MedCalc software (v 10.3.0.0, MedCalc Software, Ostend, Belgium). The Kolmogorov-Smirnov test was used to assess the presence of the normal distribution of continuous numerical variables. The results were presented as numbers and percentages for qualitative variables, and as mean \pm standard deviation or as mean for quantitative variables. Qualitative data were compared using the χ^2 test. For the comparison of normal distribution data, the Student t test was used, and for non-normal distribution data, the Mann-Whitney test was applied. A p value less than 0.05 was considered statistically significant.

Patients were informed about the study protocol and signed an informed consent. The study was carried out according to the ethical code of the World Medical Association (Helsinki Declaration) regarding the participation of human subjects in medical experiments.

Results

The clinical characteristics of the patients are shown in Table I.

Table I. Main characteristics of the patients

<i>CHARACTERISTICS OF THE PATIENTS</i>	<i>GLOBAL</i>	<i>WOMEN</i>	<i>MEN</i>	<i>p</i>
Sex (%)	-	58%	34%	NS
Mean age (years)	66.31±9	67.12±9.02	64.94±8.93	NS
Total cholesterol (mmol/dl)	5.28±1.57	5.60±1.36	4.72±11.76	0.009
LDL-cholesterol (mmol/dl)	3.15±1.26	3.44±1.14	2.6735±1.33	0.2
HDL-cholesterol (mmol/dl)	1.06±0.61	1.20±0.59	0.81±.58	0.003
Triglycerides (mmol/dl)	1.83±1.21	1.69±0.71	2.07±0.71	NS
Glycemia (mmol/dl)	6 ±1.86	6.21±2.41	5.87±1.46	NS
Hypertension (%)	79.35	82.2	73.5	NS
Dyslipidemia (%)	64.13	62.1	67.6	NS
Diabetes mellitus (%)	30.44	31	29.4	NS
Overweight (%)	36.2	31	35.3	NS
Obesity (%)	40.2	43.1	35.3	NS
Ischemic heart disease (except for myocardial infarction) (%)	91.3	93.1	88.2	NS
Myocardial infarction (%)	9.79	5.2	17.6	0.059
Valvular heart disease (%)	16.31	9 5.5	17.6	NS
Valve prostheses (%)	3.26	1.70	5.9	NS
Atrial fibrillation (%)	10.87	8.6	14.7	NS
Other arrhythmias (%)	42.4	41.4	44.1	NS
Heart failure (%)	21.74	19	26.5	NS
Arterial disease (%)	8.7	3.4	17.6	0.027
Post-stroke condition (%)	6.53	3.4	11.8	NS

Table II. Procedures followed by patients during their first admission

<i>Procedures</i>	<i>Women (%)</i>	<i>Men (%)</i>	<i>p</i>
Mofette therapy	60.3	41.2	0.059
Aerotherapy	100	91.2	0.048
Electrophysiotherapy	94.8	76.5	0.012
Physical training	36.2	29.4	NS
CO ₂ baths	89.7	79.4	NS

As Table I shows, regarding cardiovascular risk factors, there were no statistically significant differences between the two sexes, except for total cholesterol and HDL-cholesterol values, which were higher in women. It can also be seen that the prevalence of a history of myocardial infarction and arterial disease was significantly higher in men.

As mentioned before, all these patients attended complex rehabilitation programs, including physical training - 33.7%, CO₂ baths - 85.9%, mofette therapy - 53.3%, aerotherapy - 96.7%, electrotherapy - 88% - Table II.

The patients were reevaluated after their second admission, which took place after a mean time period of 350.43 ± 114.99 days.

Assuming that at home, patients complied with secondary prevention measures and followed a physical exercise program as recommended at their first discharge from hospital, we monitored the way in which the main cardiovascular risk factors were influenced. Thus, Table III and Figure 1 illustrate lipid fraction and glycemic values comparatively, between the first and the second admission. As it can be seen in this table, the results were statistically significant only for LDL-cholesterol values.

Table III. Evolution of lipid fractions and glycemia

Studied parameters	Mean ± standard deviation (mmol/dl)	p
Cholesterol 1	5.28±1.57	0.53
Cholesterol 2	5.38±1.46	
HDL-cholesterol 1	1.06±0.61	0.075
HDL-cholesterol 2	1.19±0.41	
LDL-cholesterol 1	3.15±1.26	0.004
LDL-cholesterol 2	2.58±1.65	
Triglycerides 1	1.83±1.21	0.122
Triglycerides 2	2.03±1.95	
Glycemia 1	6.0±1.86	0.577
Glycemia 2	5.87±2.37	

1 - first admission; 2 - second admission

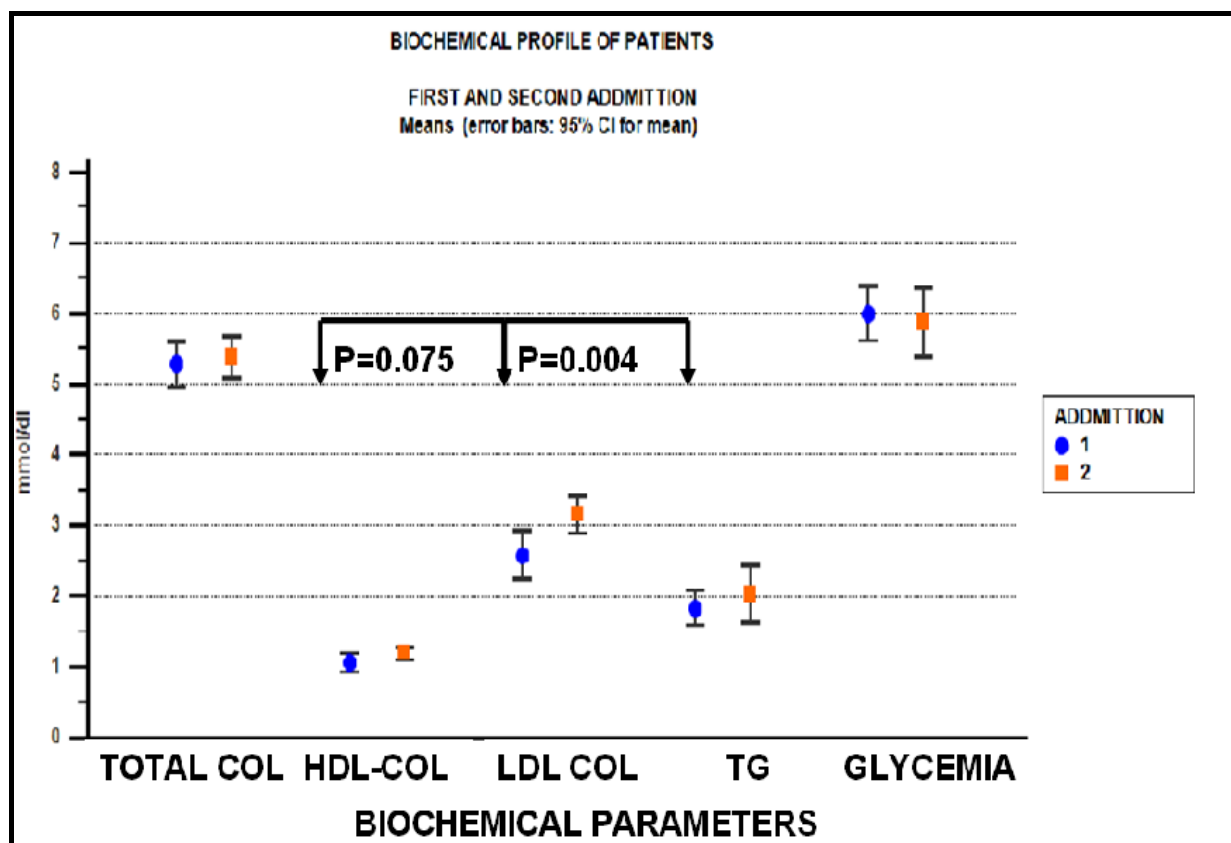


Figure 1. Biochemical profile of patients: first admission vs second admission

An analysis of the other risk factors showed that their prevalence was insignificantly changed ($p > 0.05$) compared to the previous admission: overweight - 31.5%, obesity - 42.4%, hypertension -

78.3%, dyslipidemia - 64.1%, diabetes - 30.4%.

Discussions

According to the European Association for Cardiovascular Prevention & Rehabilitation, phase II and III cardiovascular rehabilitation is achieved in Romania only in a proportion of 10% [9]. In our country, there are currently very few cardiovascular rehabilitation hospitals (Timișoara, Cluj-Napoca, Iași, Tg. Mureș and Covasna). In this context, we should also mention the fact that major changes are currently taking place: physical training is paralleled by secondary prevention measures, the indications and content of rehabilitation are changing, with the extension of physical training indications beyond the increase of exercise capacity. All this under the conditions in which many patients with ischemic heart disease are subjected to revascularization procedures. These patients will be discharged very rapidly (3-4 days after revascularization), which will not leave the time required for conducting residential rehabilitation (phase I rehabilitation). Unfortunately, very few of these patients will follow outpatient rehabilitation programs. Thus, the presence of hospitals equipped with a large number of beds and very complex cardiovascular rehabilitation possibilities becomes extremely beneficial. The “Dr Benedek Geza” Hospital of Rehabilitation in Cardiovascular Diseases Covasna is undoubtedly such a hospital. This is the only cardiology hospital situated in a balneoclimatic resort in Romania. It has 695 beds for adult and pediatric cardiovascular patients. In addition to the drug treatment required by each patient depending on their specific pathology, all patients attend classic residential rehabilitation programs including: supervised and dosed physical training, psychotherapy, counseling for lifestyle change, diet therapy. At the same time, they receive non-pharmacological treatment consisting of climatotherapy, CO₂ baths, aerotherapy and mofette therapy.

The patients of our study followed all these rehabilitation procedures. Thus, 96.74%

of them benefited from aerotherapy. This or climatotherapy is a therapeutic means that uses the biological action of climatic factors for reinvigoration and strengthening of the work capacity and health. Climatic factors with a therapeutic action are represented by: air temperature and humidity, atmospheric pressure, air currents, solar radiation, natural aerosols, air ionization, water and soil temperature. To obtain a maximal therapeutic effect, climatotherapeutic procedures (aerotherapy, air baths, sun baths - heliotherapy) should be progressively dosed, according to the doctor's indications. At the same time, 85.87% of the patients benefited from carbon dioxide baths. Their therapeutic effects are due to the action of CO₂. CO₂ induces cutaneous arterial vasodilatation, decreasing blood pressure values. It also causes an increase of cardiac output, while decreasing blood pressure and heart rate.

Electrotherapy was prescribed for 88.05% of the patients, at moderate intensity, over a medium duration. This method was applied for its effect of activating local cutaneous or muscular circulation, using low frequency currents in the form of partial galvanic baths, medium frequency currents in longitudinal applications, as well as continuous electromagnetic fields generated by the Magnetodiaflux device.

Mofette therapy was recommended in 53.25% of the patients. This has cutaneous vasodilator effects, increasing cerebral and muscular blood flow. The mofettes used for therapeutic purposes in Romania, at the “Dr Benedek Geza” Hospital of Rehabilitation in Cardiovascular Diseases Covasna, are a unique phenomenon in the world. They are natural emanations along the Harghita volcanic massif, which contain CO₂ in concentrations of 90-98%, and small amounts of H₂S, N₂ and Rn.

Finally, physical training, medical physical exercise, plays an essential role in the rehabilitation of cardiovascular patients. It has many beneficial effects: preventive effect, increasing exercise capacity, reduction of cardiovascular risk in healthy subjects as well as cardiovascular patients;

it favorably influences risk factors both indirectly, by increasing treatment compliance, and directly. Physical training has effects beyond the increase of exercise capacity, significantly decreasing global CV risk [10, 11, 12, 13, 14]. In our study, although no significant effects on risk factors were obtained, we mention the non-negligible decrease of LDL-cholesterol and increase of HDL-cholesterol, under the conditions of the maintenance of hypolipidemic treatment over the period between the two admissions. Data in this respect are in accordance with the literature data [15, 16, 17, 18]. Two recent studies have demonstrated that long-term physical training has a beneficial action on cardiovascular risk factors: decrease of the body mass index by 1%, decrease of the levels of total cholesterol by 1%, triglycerides by 5%, decrease of the LDL-cholesterol/HDL-cholesterol ratio by 3%, increase of HDL-cholesterol levels by 3%, improvement of psychological factors, with a reduction of the depression score by 12.6%, of the anxiety score by 4.3%, and of the hostility score by 2.3% [19, 20].

In conclusion, in cardiovascular patients, obtaining improvements of cardiovascular risk factors requires long-term cardiovascular rehabilitation programs, in parallel to the application of measures for lifestyle change and for secondary drug prevention.

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