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COMPLEX REHABILITATIONS OF PATIENTS WITH COMPLICATED COURSE OF POSTINFARCTION CARDIOSCLEROSIS

Summary. *There was developed and proved the program of complex rehabilitation of the patients with the complicated course of postinfarction cardiosclerosis, performed its efficiency and safety. It was established that the combination of regular physical load regime according to the first stage of the protocol "Progressive walking" and medication directed to optimization of load programs, promotes correction of patients' body weight at the expense of fat content reduction and increasing of muscular weight; improvement of indices of 6-minute walk test, reduction of a functional class of insufficiency of blood circulation and angina pectoris, increasing ejection fraction, decreasing duration and frequency of painless ischemia, liquidation of heart rate variability as they had probable character. Continuation of complex rehabilitation by developed algorithm at next stages of the program will help to improve forecast and global index of life quality for such patients in a future.*

Key words: *postinfarction cardiosclerosis, rehabilitation.*

Introduction

The real problem of introduction of physical rehabilitation in daily clinical treatment practice of patients with postinfarction cardiosclerosis is the extremely many-sided. On the one hand, fast development of insufficiency of blood circulation, high lethality, poor quality of life, negative attitude to people around are featured for such clinically serious contingent of patients. From the other hand - numerous researches [Kilavory et al., 1999] have proved that physical trainings of the patients suffered from myocardial infarction through raising the tolerance to physical load improve metabolic processes in myocardium, increase the maximum oxygen consumption by a cardiac muscle, reduce myocardium need in the last one and contribute oxygen saving because of reduction of internal heart performance, increasing stroke volume, decreasing lactate content in blood. Besides, the scientific researches of the last years [Бобров и др., 2001] proved that there are many similarities between two conditions - insufficiency of blood circulation and detraining of myocardium. One of the important directions in development of problems for rehabilitation of patients with postinfarction cardiosclerosis is research of influence of individual features of the patient to optimum rates of activation. Clinical features of a disease (recurrent myocardial infarction, existence of arterial hypertension, complication by chronic aneurism of heart, etc.) cause significant variability of activation rates for such patients. However, we did not meet the scientific works devoted to development of actions of complex rehabilitation for patients with the complicated course of postinfarction cardiosclerosis and scale criteria of efficiency of rehabilitation for such patients. Marked changes of geometry and geometry and left-ventricular contractile ability in these patients are among the leading reasons of blood circulation insufficiency, which causes a significant decreasing in life quality and steady loss disability.

However, growing successes in conservative treatment of acute myocardial infarction for the last 10 years, early improvement of blood circulation of heart attack zone lead

to preservation of areas of satisfactory vascularity even in aneurismal wall [Белов и др., 2002] where significant amount of viable muscle tissue preserved, which is one of favorable factors in favor of recovery processes of contractile ability of myocardium.

This problem is very actual one due to the improvement of treatment methods of acute myocardial infarction; there is a possibility of rehabilitation of patients with the complicated course of postinfarction cardiosclerosis. Such patients need complex (drug and non-drug) rehabilitation actions. Regarding this fact, successful combination of physical training regime and medical correction intended for basic level of loading program optimization is possible at sanatorium stage of rehabilitation.

The purpose of our study was development and studying of complex rehabilitation efficiency of patients with complicated course of postinfarction cardiosclerosis at a stage of sanatorium treatment.

Materials and study methods

There were examined 86 patients of age from 36 to 67 suffered from postinfarction cardiosclerosis complicated with chronic postinfarction heart aneurism (CCPHA), who were on treatment in rehabilitation department of sanatorium "Khmilnyk" in Vinnytsia region. The III functional class (FC) of NYHA heart insufficiency was defined in most of patients (90 % of patients). Verification of the diagnosis of CCPHA was carried out on the basis of the international standard criteria [Борисов и др., 2002], all of patients on presanatorium stage was made coronography. The first control group was made of 42 patients receiving traditional therapy of blood circulation insufficiency (APF inhibitors, -adrenoblockers, diuretics, digoxin, nitrates, antiaggregants). The second group included 44 patients who received Mildronate in a dose of 1,0 g per day (two times a day) and Verospiron in a dose of 50 mg one time in the morning within 3 weeks staying in sanatorium as a part of complex therapy of the main disease. Activation of patients of both

groups was according to 1 stage of the protocol of physical activities "Progressive walking" [Kavanagh et al., 1996] which included: training frequency - 5 times a week, distance - 10 km a week, speed of movement - 1 km per 13 minutes. Patients of both groups before their inclusion into study within 60 days were in stable condition (fluctuations of body weight no more than 0,5 kg). All patients before they were diagnosed myocardial infarction complicated with CCPHA, worked by profession in full.

Clinical, laboratory and instrumental examination was done in full at the beginning of complex rehabilitation program and at the end of the third week of stay in sanatorium. As a control of efficiency of rehabilitation actions, there was analyzed dynamics of disease clinical symptoms, the main indices of haemodynamics - heart rate, arterial pressure, Holter electrocardiographic monitoring, echocardiography by standard methods [Бобров и др., 2001]. There were calculated indices of body weight, measuring gastrocnemius muscle diameter, analyzed indicators of 6-minute walk test. Statistical processing of the results was performed by variation statistician methods using test of the Student and the Newman-Keuls. Distinctions at $p < 0,05$ considered as reliable ones.

Results. Discussion

The prescription of the last myocardial infarction at admission of a patient to rehabilitation department was $2,34 \pm 1,7$ years in average in patients of both groups. Duration of ischemic heart disease till of a transmural infarction caused to CCPHA formation made was from couple of hours to 6 years in patients of both groups, in average $1,68 \pm 1,6$ years. The average FC of angina pectoris in the 1 group made $2,98 \pm 0,12$, in the 2nd - $2,87 \pm 0,11$. The average ejection fraction in the 1 group made $43,6 \pm 3,4$ %, in the 2nd - $42,9 \pm 3,1$ %.

As for the injury of coronary arteries by data of coronarography in patients of both groups, the most marked occlusive process was observed in anterior interventricular artery and in posterior interventricular branch of the right coronary artery.

The injury of proximal part of major coronary artery were observed in the majority of (81,48 %) cases. As for coronary occlusion, the maximal frequency of injury was observed in posterolateral branch of the circumflex artery - 80 patients (92,59 %). The second and the third place belonged, respectively, posterior interventricular artery - 41 patient (48,15 %) and posterolateral branch of the circumflex artery - 34 patients (40,74 %). The average number of affected arteries in patients of the 1 and the 2 group did not significantly differ and respectively made $2,56 \pm 0,32$ and $2,71 \pm 0,34$. Thus, severity of coronary atherosclerosis (number of stenotic coronary arteries, stenosis rate) in both groups was average identical and correlate with T-dominant character of ST segment elevation by Holter monitoring data.

Accompanying pathology in patients of both groups by

percentage composition did not differ significantly and was presented with hypertension, diabetes, chronic calculous cholecystitis.

While 3-week rehabilitation course, health significantly improved in all examined patients: decreased dyspnea, number of angina pectoris, there was a subjective impression of increasing endurance of physical activities. However, these changes were accompanied by improving test with 6-minute walking only in patients in the 2 group. The maximum distance which the patient passed in 6 minutes increased from 301 ± 17 to 467 ± 32 m ($p < 0,05$). Among the patients of the 1 control group of 11 patients avoided the protocol of physical trainings (irregular performance, disorder in duration of training schedule). The maximum distance according to 6-minute walking test among these 11 patients made 326 ± 13 m compared to the initial 304 ± 15 m. Among other patients of the 1 group who followed the protocol "Progressive walking" there were registered only the tendency to increasing the load volume, increasing maximum distance in 6-minute walk test from 386 ± 28 m. Only the patients of the 2 groups for 3 weeks of comprehensive rehabilitation decreased body weight index from $23,7 \pm 1,6$ to $22,2 \pm 1,5$ ($p < 0,05$), first of all, at the expense of reduction of fat thickness at level of the umbilicus from $3,9 \pm 0,7$ cm to $2,1 \pm 1,3$ cm. Loss of weight is one of processes, which defines a condition of cross-striped muscles. Its loss more than 10,0 % brings to clinically significant reduction of the maximum oxygen consumption that is decreasing in maximum effort and progressing of functional insufficiency. In patients with initially low values of body weight (less than 90% of ideal) while load performing, there wasn't detected decreasing body weight. Thus, the regular physical activities do not lead to cachexia progressing, and correct body weight of a patient at the expense of reduction of fat content and increasing of muscular weight.

Studying of peripheral muscle work [Hornig et al., 1996] in patients with insufficiency of blood circulation revealed that their condition may be connected with two processes - dysfunction and weight loss. Regular physical training leads to increasing of blood-flow volume in muscle group which is subject to be trained [European Heart Failure Training Group, 1998]. Dysfunction of cross-striped muscles is caused by reducing of active capillaries quantity in unit of volume; forming mainly anaerobic way of energy generation. In the basis of modern approaches to the optimization of the energy exchange in myocardium at ischemia and reperfusion is "switching" of ATF resynthesis from fatty acid metabolism to glucose metabolism that allows to increase the use of oxygen for the energy generation and, respectively, economic cardiac performance [Parker, 1995]. As the structural analog of natural - butyrobetaine metabolite, Mildronate modulates fatty acids by decrease endogenous carnitine biosynthesis and its concentration in myocardium, slows down the transferring of activated forms of long-chain fatty acids through cell membranes and

preventing the accumulation of surface active metabolites in cell. This process inhibits oxidation of free fatty acids and activates alternative mechanisms of energy supply - glycolysis and the Krebs cycle [Kirimoto et al., 1996].

Besides, it is known that Mildronate help to improve the conditions of oxygen transportation at the expense of influence on ligand spectrum of hemoglobin, mechanical resistance of erythrocytes and rheological blood properties [Skarda et al., 1997]. Specific effect of the drug is able to increase tolerance of organism tissue to hypoxia, especially kidney tissue, brain and skeletal muscle, their hypoperfusion determinates clinical symptoms of blood circulation insufficiency [Wolff et al., 2002]. The patients of the 2 group showed the bigger tolerance to physical activity, the lower intensity of unpleasant subjective feelings comparing to the patients of control group because of stimulating effect of Mildronate on extracardiac compensation mechanisms of hemodynamic disorders.

Another important problem of cross-stripped muscle dysfunction is fibrosis progressing, caused significant increasing collagen synthesis. In the basis of fibrosis formation is stimulation of fibroblasts with aldosterone which overly synthesized in patients with insufficiency of blood circulation. At excessive amount of collagen, a muscular bundle moves from capillary that makes worse its nutrition and leads to functional insufficiency of a muscle. Thus, Verospiron, taken by the patients of the 2 group caused to improvement of capillary nutrition and respectively, to optimization of physical training. At cellular level functional insufficiency of a muscle is characterized by mitochondrion restructuring. The above-mentioned processes occur, primarily, because of impossibility to develop sufficient effort. Kilavori K. i co-authors [Kilavori et al., 1999] established that maximum effort of cross-stripped muscles in a patient with blood circulation insufficiency of III-IV FC in 2,8 times less, than a healthy person has, so the index of maximum effort developed by cross-stripped muscles, is reverse proportional to FC of blood circulation insufficiency, and feeling tired in the patient with blood circulation insufficiency during performing dosed physical load directly correlates with stage of muscle functional insufficiency. As a result of complex rehabilitation program the diameter of gastrocnemius muscle increased from 33,9±2,3 cm to 36,8±3,1 cm (p<0,05) only in patients of the 2 group. E. Hambrecht [Hambrecht, 1995] found that 24-week training provides significant increasing of blood flow volume in gastrocnemius muscles, maximum oxygen consumption, that is maximum developed effort. Biopsy of gastrocnemius muscle showed that training results in recovering of impaired mitochondrial architectonics.

Dynamics of clinical finding, morphometric indices and

physical endurance responded changes in echocardiographic data which characterized contractile function of the heart. Significant (<0,05) increasing of indices of heart contractile function observed in the patients of the 2 group compare to initial indices and control group. So, at the end of 3 week of treatment in rehabilitation department ejection fraction size was 51,0±4,5% in the 2 group compare to the 1st - 44,7±3,6 % (p<0,05), that was respectively accompanied by decreasing FC insufficiency of blood circulation in patients of the 2 groups.

Safety of protocol implementation is proved by results of Holter monitoring: physical activities did not lead to increasing of number of cardiac rhythm disturbance. The other way, there were decreasing of heart rate and liquidation of rhythm variability, increasing of ST depression depth from 2 mm to 1 mm against the background of regular physical load. Duration and frequency of painless ischemia according to daily Holter monitoring decreased on the average for 71,0 % (p<0,05).

Thereby, the sanatorium stage of treatment is a good opportunity as to start physical rehabilitations of the patients with the complicated course of postinfarction cardiosclerosis, and successful combination of physical load requiem and drug correction. The offered scheme of complex rehabilitation of such patients at this stage of treatment effective and safe; all patients of the 2 group met the first stage of physical load regime appropriately according to the protocol "Progressive walking". At the moment of the termination of stay period at rehabilitation department, the scheme of gradual load increase was developed for all patients of the 2 group according to the protocol at the out-patient stage, including physical training by the first stage for another 3 weeks and changing to the second stage (6 weeks) - gradual increase distance to 21 km week, speed of movement of 1 km in 11,5 minutes agrees the first stage. In case of bad physical load tolerance during this term patients are recommended to return to the first stage regime which is necessary to adhere for life. In case of good physical load tolerance within 16 weeks - lifelong keeping up of the offered regime.

Conclusion

1. Using of the offered scheme of complex rehabilitation of patients with complicated course of postinfarction cardiosclerosis at a stage of sanatorium treatment help to sufficient improving myocardium contractile ability and physical load tolerance in the patients, overcoming myocardium detraining, decreasing duration and frequency of painless ischemia, downgrading functional class of blood circulation insufficiency and angina pectoris.

2. Continuation of complex rehabilitation at the next stages of the program will help to improve further forecast and global life index of such patients.

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Солейко О.В.

КОМПЛЕКСНА РЕАБІЛІТАЦІЯ ХВОРИХ ІЗ УСКЛАДНЕНИМ ПЕРЕБІГОМ ПОСТІНФАРКТНОГО КАРДІОСКЛЕРОЗУ

Резюме. Розроблена та обґрунтована програма комплексної реабілітації хворих із ускладненим перебігом постінфарктного кардіосклерозу, проведена оцінка її ефективності та безпеки. Встановлено, що поєднання режиму регулярних фізичних тренувань відповідно до першого етапу протоколу "Прогресуюча хода" та медикаментозного лікування, спрямованого на основні ланки оптимізації забезпечення навантажувальних програм, сприяє корекції маси тіла пацієнтів за рахунок зменшення вмісту жиру і зростання м'язової маси; покращенню показників тесту з 6-хвилинною ходьбою, зменшенню функціонального класу недостатності кровообігу та стенокардії, зростанню фракції викиду, зниженню тривалості і частоти безбольової ішемії, усуненню варіабельності серцевого ритму, що мали вірогідний характер. Продовження комплексної реабілітації за розробленим алгоритмом на наступних етапах програми в подальшому дозволить значно покращити прогноз та глобальний показник якості життя таких пацієнтів.

Ключові слова: постінфарктний кардіосклероз, реабілітація.

Солейко Е.В.

КОМПЛЕКСНАЯ РЕАБИЛИТАЦИЯ БОЛЬНЫХ С ОСЛОЖНЕННЫМ ТЕЧЕНИЕМ ПОСТИНФАРКТНОГО КАРДИОСКЛЕРОЗА

Резюме. Разработана и обоснована программа комплексной реабилитации больных с осложнённым течением постинфарктного кардиосклероза, проведена оценка её эффективности и безопасности. Установлено, что сочетание режима регулярных физических тренировок в соответствии с первым этапом протокола "Прогрессирующая ходьба" и медикаментозного лечения, направленного на основные звенья оптимизации обеспечения нагрузочных программ способствует достоверным коррекции массы тела пациента за счёт снижения содержания жира и наращивания мышечной массы; улучшению показателей теста с 6-минутной ходьбой, снижению функционального класса недостаточности кровообращения и стенокардии, увеличению фракции выброса, снижению длительности и частоты безболевого ишемии, устранению вариабельности сердечного ритма. Продолжение комплексной реабилитации в соответствии с разработанным алгоритмом на следующих этапах программы в дальнейшем позволит значительно улучшить прогноз и глобальный показатель качества жизни таких пациентов.

Ключевые слова: постинфарктный кардиосклероз, реабилитация.