

Influence of working out at home on the expansion of cardiovascular disease risk factors

ANATOLIY TSOS¹, LIUDMYLA SUSHCHENKO², NATALIA BIELIKOVA¹, SVITLANA INDYKA¹

¹Lesya Ukrainka Eastern European National University, Lutsk, UKRAINE

²National Pedagogical Dragomonov University, Kyiv, UKRAINE

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Abstract:

Currently, the concept of correction of cardiovascular disease risk factors is a generally accepted strategy for cardiological pathology prevention. Adequate physical activity serves as a generating factor in prevention or minimization of complications after acute myocardial infarction. Patients who irregularly attend specially organized classes in rehabilitation centers, because of lack of time or otherwise, have an alternative, i.e., self-organized physical activity at home. The purpose of the research was introduction of the author physical training at home for people who had heart attack for the purpose of secondary prevention of complications and for rehabilitation. Two groups were formed by random sampling: 1st - the main group (used the author program of physical training at home) and the 2nd - the group of comparison (proceeded with the treatment (course of physical training) in a specialized rehabilitation department). Each group consisted of 30 males who were in a phase of recovery after acute myocardial infarction. Methodology of the author program is based on the principles of complexity and individualization, and included strict dosage and gradual increase of physical activity by amplitude, intensity and complexity of exercises. It differs from the methodology of the rehabilitation center's program in duration of classes and their strict division; in orientation of special exercises of dynamic nature on moto-visceral reflexes that innervate the heart and stimulate central and peripheral mechanisms of blood circulation; in daily monitoring. The educational part of the program included attendance of School "Step to Healthy Heart", distance learning with online patients' support site. By estimation of the major risk factors for cardiovascular disease among patients of both groups at the beginning of the research it was found out that obesity, abdominal obesity, high blood pressure, high cholesterol, smoking are the most common risk factors among the above mentioned two groups. As a result statistically significant weight loss, cholesterol reduction and systolic blood pressure loss were recorded among the patients of the main group. Significant and steady reductions of the listed above indicators emphasize adequacy of selected physical activity at home. In the group of comparison such changes are observed only at the beginning of the study.

Keywords: myocardial infarction, risk factors, physical education, independent study.

Introduction.

The emergence and progress of cardiovascular disease are closely related to existence of risk factors. Nowadays, the concept of adjustment is a common strategy for the prevention of cardiac disease. Especially important is the correction of risk factors among patients with myocardial infarction. It is proved that, on the one hand, this category of patients has the worst prognosis, on the other hand - active preventive intervention can greatly improve the course of the disease and prolong the active life of individuals [2, p. 4-8; 3, p. 22-29; 4, p. 101-109; 5, p. 45-48].

One of the prevailing leverage of influence on the risk factors of cardiovascular disease pathology are adequate physical activity, which serves as generating and stimulating factor in the prevention or minimization of complications after acute myocardial infarction, and improvement of patients' life quality. Properly organized independent physical activity at home can be an alternative or supplement for people who due to lack of time or other reasons (long distance, no convenient time, financial inability, and unwillingness of a patient) attend specially organized classes in rehabilitation centers irregularly.

Taking into consideration all the mentioned above, we state the need for scientific study, development and implementation of physical training at home for people after heart attack for the purpose of secondary prevention of complications, rehabilitation and return to labor activity.

Objectives of the research: to study the effect of the author's physical training at home on the main risk factors for cardiovascular disease among patients after myocardial infarction in follow-up care period.

Materials and methods of the research: theoretical analysis and synthesis of scientific sources; sociological, biomedical and laboratory techniques; methods of mathematical statistics.

60 people, who were in a phase of recovery after acute myocardial infarction and completed the full course of hospital treatment in the cardiology department at Lusk City Clinical Hospital participated in our research.

Two groups were formed by random sampling: 1st - the main group and the 2nd - the group of comparison. In each group there were 30 males. The criterion for inclusion into the study group was patient's agreement in writing to participate in the author's program of independent physical training at home. The comparison group undertook a course of physical training in a specialized rehabilitation department at Lutsk City Clinical Hospital. Age of participants ranged from 47 to 60 years, the average age in the main group was $52,69 \pm 3,95$ years, in the comparative group - $53,40 \pm 3,22$ years.

Methodology of the author program was based on the principles of complexity and individualization and included: strict dosage and gradual increase of physical activity in extension and intensity, number and complexity of exercises, taking into account the clinical course of the prior disease and comorbidity, age of patients, analysis of laboratory and instrumental data, functional methods, tolerability of physical activity and procedures. Besides, it was implemented a conditional division of patients into functional groups depending on their degree of physical activity, which enabled to choose a safe program of physical training at home, taking into account the individual characteristics of patients.

The author program of independent physical training for patients after myocardial infarction at home included: morning hygienic gymnastics; the complex of general physical exercises, breathing exercises and special exercises of dynamic nature for the cervical and cervical-thoracic spine; metered walking, climbing stairs, elements of tempering, domestic loads; educational program that motivated people positively to the author's daily activities program.

The author program of independent physical training for patients after myocardial infarction at home differs from the physical training course of the group of comparison in organizational and semantic features:

- Duration of classes and their clear division (preparatory period (2 weeks) was held in dose-sparing regimen; the main period (4 weeks) was held in sparing-training mode; sustaining period carried out in training condition was unlimited in time), as opposed to the program sessions of physical education in the group of comparison, in which the duration of the preparatory, primary and maintenance periods was significantly lower (only for 7-10 days each);

- orientation of specific exercises of the dynamic nature of moto-visceral reflexes at the level of spinal cord segments C3-C4, Th1-Th7, which innervate the heart and stimulates the central and peripheral mechanisms of blood circulation;

- availability of educational part, which includes lessons at "School for patients with cardiovascular disease" and distance learning with online support site, as well as keeping a diary of self-control of patients' health;

- daily operational control of physical training by practitioner for implementation of the author program of independent physical training of patients of the main group up to 6 weeks; in the group of comparison - daily monitoring up to 2 weeks, in the future - at least 3-times a week.

To assess the effectiveness of the physical training program in both groups of patients and its correction using operational, current and stage controls. Stage control was carried out at release of patients of the main group and the group of comparison of the cardiology department in Lutsk City Clinical Hospital, and at intervals of two, six and twelve weeks after patients' release from hospital.

Results and discussion. At the beginning of the study the presence of major risk factors for cardiovascular disease among patients of the main group and the group of comparison after myocardial infarction were analyzed (Table 1).

Table 1

Dynamics of the major risk factors of cardiovascular disease among patients of the main group and the group of comparison during the period of the research

Risk factors	The main group				The group of comparison			
	Beginning of the research	After 2 weeks	After 6 weeks	After 12 weeks	Beginning of the research	After 2 weeks	After 6 weeks	After 12 weeks
Body mass index, kg/m ²	28,67±1,62	28,50±1,64	27,96±1,24	26,45±1,24* [^]	28,28±1,26	27,98±1,18	28,16±1,15	29,49±1,90
Index waistline/hipline	0,98±0,08	0,98±0,08	0,98±0,08	0,98±0,08	1,00±0,08	1,00±0,08	1,00±0,07	1,02±0,08
total cholesterol, millimole/l	5,25±0,35	4,87±0,37	4,62±0,33* [^]	4,56±0,38* [^]	5,23±0,24	4,89±0,38	5,09±0,33	5,14±0,38
systolic pressure, mm Hg	148,47±3,15	142,07±3,14	138,10±3,49	137,00±3,43* [^]	146,33±3,82	139,90±3,48	140,63±4,02	143,37±3,66
diastolic pressure, mm Hg	83,37±2,93	81,97±2,81	79,60±2,42	79,13±2,55	83,57±2,54	82,57±2,20	83,23±2,29	82,77±2,45
Frequency of tobacco smoking, %	36,7	30	30	26,7	20	16,7	20	20

Notes:

* - Statistically significant changes from baseline results ($p < 0.05$);[^] - Statistically significant changes compared to the results of the group of comparison ($p < 0.05$).

The results were as follows: excess weight was observed among 73,3% of the ill of the main group and 80% of the ill of the comparative group; body mass index (BMI) of patients of the main group in average was $28,67 \pm 4,62$ kg/m², in the comparative group – $28,28 \pm 4,26$ kg/m²; average indices of waistline were $101,10 \pm 12,23$ cm among the ill of the main group and $103,33 \pm 9,52$ cm among the ill of the comparative group; average indices of hipline were $102,67 \pm 9,41$ cm among the ill of the main group and $103,73 \pm 8,84$ cm among the ill of the comparative group; the index waistline/hipline the measures of which have significance in defining of distribution of fat mass of a human was $0,98 \pm 0,08$ among the ill of the main group and $1,00 \pm 0,08$ among the ill of the comparative group; abdominal obesity was found out among 14 persons (46,7%) of the ill of the main group and among 16 persons (53,3%) of the ill of the comparative group. High blood pressure (BP) (140/90 mm Hg and higher) while observations was found out among 12 persons (40%) of the ill of the main group and among 13 persons (43,3%) of the ill of the comparative group. Among the patients of the main group 22 persons (73,3%) and 24 persons (80%) of the comparative group had high level of total cholesterol ($\geq 4,5$ mmol/l); an average index of total cholesterol was $5,14 \pm 1,01$ mmol/l among the patients of the main group and $5,34 \pm 1,05$ mmol/l among the patients of the comparative group which is much higher than the target levels of this category of the ill. Previously diagnosed diabetes was among 2 patients (6,7%) of the main group and the comparative group, 11 persons (36,7%) of the main group and 6 persons (20%) of the comparative group were smoking.

Thus, in assessing of the major risk factors for cardiovascular pathology among the patients of the main group and the group of comparison at the beginning of the research it was established that obesity, abdominal obesity, high blood pressure, high cholesterol, smoking are the most common risk factors among the examined groups, while frequency of diabetes was less than 6,7%.

After a course of physical training among the patients after myocardial infarction it was observed significantly positive changes. Thus, in the main group, including body mass index, the value of which indicates a direct link with the risk of related complications, by 18,2% decreased the incidence of excessive body weight after 12 weeks of classes according to the author program of physical training at home.

Body mass index in the main group was $26,45 \pm 1,24$ kg/m² and statistically significantly different from the same index at the beginning of the study, which was $28,67 \pm 1,62$ kg/m². No substantial significant difference regarding the body mass index during the indicated period was observed in the group of comparison. However, significant difference of body mass index was noted among the patients of the main group and the group of comparison after 12 weeks of practicing, namely, in the main group the figure was $26,45 \pm 1,24$ kg/m², in the group of comparison - $29,49 \pm 1,90$ kg/m², respectively.

According to the study results, the frequency of recording of the waistline/hipline $> 1,0$ coefficient by the end of the study in the main group decreased by 8,8%, while in the group of comparison, on the contrary, it increased by 13,4%, but these changes were statistically insignificant.

When analyzing the indicators waistline and hipline in the main group and in the group of comparison significant changes between groups were not found.

In the pathogenesis of coronary heart disease the leading role has atherosclerosis, which is mostly the

result of violations of synthesis and metabolism of various lipoproteins. In accordance with the European guidelines on prevention of cardiovascular disease in clinical practice total cholesterol is considered increased (more than 4,5 mmol/l) [1, p. 121-137]. Analysis of the incidence of registration of cholesterol $\geq 4,5$ mmol/l showed that in the main group of people the tendency to decrease was observed during the observation period, the end of the study (from baseline) by 33,3% decreased the number of patients with the rate of cholesterol $\geq 4,5$ mmol/l; in the comparison group after 2 weeks of training according to the physical rehabilitation program in terms of rehabilitation department for patients with an index number of cholesterol $\geq 4,5$ mmol/l decreased by 40% after 6 weeks of observation - by 26.7%, and 12 weeks - by 13, 3% of cases.

The risk of cardiovascular diseases and their complications increase progressively with high blood pressure [3, p. 46]. However, adequate control of hypertension course in the case of secondary prevention of myocardial infarction blocks the development of complications and recurrent hospitalizations. The results of studies of the dynamics of high blood pressure AT (arterial tension) $\geq 140/90$ mm Hg among patients of the main group during the examination tended to decrease and after 12 weeks of observation 16,7% of cases decreased from the baseline.

However, in the group of comparison high blood pressure AT $\geq 140/90$ mm decreased by 16.6% of cases from the baseline after 2 weeks of training according to the program in terms of physical rehabilitation by the end of observation - on the contrary, an increase among the patients with AT $\geq 140/90$ mm 3,4% compared with the original data, but these figures were not statistically significant.

The meaning of smoking as a risk factor for cardiovascular disease and premature death is proved by numerous studies. The analysis of the incidence of smoking showed that there was a positive dynamics until the end of the study in the main group of patients, i.e. by 10% decreased the number of patients who smoke cigarettes, although these changes were not statistically significant.

In the group of comparison after two weeks the incidence of smoking has decreased by 3,3% and by the end of the study, in contrast, returned to the previous level.

Conclusions. The author program of independent physical training at home contributed to substantial reduction of frequency of indicators among the patients of the main group that complement the clinical picture of the disease and act as the main risk factors, such as: weight loss, total cholesterol, systolic blood pressure. In the comparison group positive changes are also recorded in these indicators, but only at the beginning of the study.

A significant and steady decline in the indicators listed above in the main group of people indicates the adequacy of selected physical activity, and is a consequence of metered regular workouts at home. However, methodological assistance to patients after myocardial infarction is important. They can get it by attending classes at the School of "Step to Healthy Heart" and using distance learning with online support site, thereby improving awareness of the disease, increasing accountability and formation of motivation to preserve their health. The results allow us to recommend the program of independent exercises at home to patients after myocardial infarction under the terms of its semantic and organizational characteristics.

References

- Kotseva, K., Wood, D., Backer, G. De. (2009), EUROASPIRE III: a survey on the lifestyle, risk factors and use of cardioprotective drug therapies in coronary patients from 22 European countries. *Eur. J. of Cardiovascular Prevention and Rehabilitation*, no. 6, pp. 121–137.
- Kovalenko, V. M. (2012), Suchasni priorityty i rezultaty rozvytku kardiologii v Ukraini [Modern priorities and results of cardiology development in Ukraine]. *Ukrainskyi kardiologichnyi zhurnal, dodatok*. no. 1, pp. 4–8.
- Kovalenko, V. M. (2013), Khvoroby systemy krovoobihu u strukturi smertnosti naseleння Ukrainy: mify i realnist [Blood circulatory system's diseases in the structure of mortality in Ukraine: myths and reality]. *Ukrainskyi kardiologichnyi zhurnal*, no. 9, pp. 22–29.
- Laparidis, K., Lapousis, G., Mougios, V., Tokmakidis, S., Petsiou, E. (2010), A school-based intervention program for improving the risk factors for cardiovascular disease at ages 12 to 16, *Journal of Physical Education and Sport*, vol. 27, no. 2, pp. 101-109.
- Pishchikov, V. A., Yashchenko, Y. B., Kondratiuk, N. Y. (2014), Osnovni pidhody do profilaktyky hvorob systemy krovoobigu [Main approaches to prevention of the blood circulatory system's diseases], *Ukrainskyi medychnyi chasopys*, no. 6 (104), no. 10/12, pp. 45–48.