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INTEGRAL EVALUATION OF EFFECTIVENESS OF THE RENEWAL TREATMENT OF PATIENTS WITH ISCHEMIC HEART DISEASE AFTER MYOCARDIUM SURGICAL REVASCULARIZATION

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Abstract

Cardiovascular diseases are the one of main causes of lethality in all developed countries. In the structure of this group of diseases ischemic heart disease (IHD) occupies the leading place. In the last decade methods of myocardium surgical revascularization that allow to remodel the myocardium essentially and to increase its functional features significantly are developed. Alongside with it, myocardium surgical revascularization doesn't eliminate main causes of atherosclerotic diseases. Ineffective rehabilitation, including insufficient management of main factors of the cardiovascular risk may essentially decrease results of this operation.

The aim of the study was to elaborate the integral evaluation of the effectiveness of the renewal treatment of patients with IHD after myocardium surgical revascularization. For this aim we offer to use metabolic (leptin, HOMA index, atherogenicity index) and clinical-functional indices (body mass index, physical working ability and ejection fraction (EF) of the left ventricle, anxiety and depression level) before and after the renewal treatment and the result – integral index (I), calculated by the formula: $I = \frac{M_{(1+,2,..+n)} + F_{(1+,2,..+n)}}{N}$, where $M_{(1+2+n)}$ – metabolic (leptin, HOMA index, atherogenicity index) indices, $F_{(1+2+n)}$ – functional and anthropometric ones (BMI, physical working ability, and EF of the left ventricle).

The use of the integral index before the renewal treatment allows to elaborate the effective rehabilitation program, and after – to study the effectiveness of elaborated complexes and to decrease risks of IHD progression.

Keywords: Ischemic heart disease, renewal treatment, surgical revascularization, effectiveness, integral evaluation.

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1. Introduction

Among methods of surgical treatment of ischemic heart disease (IHD) the most often used are aortocoronary (ACB) and mammary bypass (MCB), intra-skin interventions on coronary vessels [1]. The aim of any of aforesaid cardiovascular interventions is a renewal of the coronary blood circulation, elimination of mean clinical manifestations of IHD, increase of operated patients' life quality and duration, increase of their physical working ability [2]. According to the data of many authors, myocardium surgical revascularization (MSR) in 75–85 % of cases takes off from the pain syndrome, increases the life quality and 5-year prognosis of survivability. Alongside with it, MSR doesn't eliminate main causes of atherosclerotic diseases. Ineffective rehabilitation, including insufficient management of main factors of the cardiovascular risk may essentially decrease results of this operation [3, 4].

Despite the fact that operations on myocardium revascularization are directed on the working ability renewal and human life quality increase, these cardiovascular interventions themselves are the essential stress and dysadaptation factors for a patient [5]. The absence of the united strategy and tactics of the renewal treatment after myocardium surgical revascularization, and also underes-

timation of hypodynamia and hypokinesia factors in the pathogenesis of postsurgical complications leads to IHD progression [6, 7]. The analysis of literary data and own experience testify to the fact that the system approach, including the use of the integral evaluation of the risk of complications progression after myocardium surgical revascularization, especially at the concomitant pathology, wasn't properly developed and used in the stage renewal treatment [8].

There are well-known different methods of forecasting the development of cardiovascular complications after myocardium revascularization by the determination of cholesterol level, detection of features of stenosis and localization of the atherosclerotic plaque in coronary arteries; stenosis type, myocardium ischemia degree by data of Holter monitoring of an electrocardiogram; analysis of the speed of nitrogen-containing preparation metabolism; study of polymorphism genotypes and other [9, 10]. But these methods don't have the complex approach to the integral evaluation of patients with IHD after myocardium surgical revascularization and are difficult in use at the renewal treatment stage.

2. Aim of research

To elaborate the integral evaluation of the effectiveness of the renewal treatment of patients after myocardium surgical revascularization.

3. Materials and methods of research

65 patients, 58,7±8,9 years old after aortocoronary bypass (ACB), who received the standard medicamental therapy, namely nitrates, beta-blockers, calcium antagonists, ATE inhibitors, disagregants, diuretics, hypolipidemic drugs and the complex of sanatorium rehabilitation were under observation at the treating-recovery complex "Bila acacia" (Odessa city, Ukraine). Patients of the first group (17 persons) were admitted for rehabilitation in 7 days after the surgical treatment at the absence of postsurgical complications at severe concomitant diseases. The contraindications for early admission at the specialized rehabilitation department were: often and long attacks of angina of rest and effort, unstable angina; recent myocardium infarction; insufficiency of blood circulation of IV f.c. by NYHA; expressed rhythm disorders; expressed arterial hypertension with an injury of inside organs, that is badly subjected to correction; postsurgical complications; concomitant diseases, accompanied by fever; residual phenomena of thromboembolia in cerebral vessels. Patients of the second group (48 persons) were admitted for rehabilitation in 1–2 months after the operation. The research algorithm (before and after treatment) included the collection of anamnesis, dynamic clinical observation of objective and subjective state of patients, laboratory diagnostics by the standard methods [11] (biochemical blood analysis *(aspartat-aminotransferase alanine-aminotransferase, creatinine, phosphokinase, troponin, C-reactive protein,* lipidogram, blood sugar, insulin, HOMA index, leptin and instrumental research methods (ECG, heart US, Holter monitoring of ECG, measuring of arterial pressure, heart contractions frequency, six-minute test (SMT)). For evaluating the psychological state, HADS and Spielberg anxiety scales were used, life quality was evaluated by SF-36 scale.

For the integral evaluation before and after the renewal treatment metabolic and clinical functional indices before and after treatment, namely, metabolic (leptin, HOMA index, atherogenicity index) and clinical-functional (body mass index, (BMI) physical working ability and ejection fraction (EF) of the left ventricle, anxiety and depression level) and the result – integral index (I) was calculated by the formula:

$$I = \frac{M_{(1+,\,2\,+\,..n)} + F_{(1\,+\,2,\,+..n)}}{N},$$

where $M_{(1+2+n)}$ – metabolic indices (leptin, HOMA index, atherogenicity index); $F_{(1+2+n)}$ – functional and anthropometric indices (BMI, physical working ability and ejection fraction (EF) of the left ventricle); N – number of calculated indices.

At that the quantitative evaluation of indices from 1 to 3 points was taken into account (**Table 1**).

Table 1
Criteria of point evaluation of clinical indices

Indices	Criteria		
	Low (1 point)	Critical (2 points)	High (3 points)
1. Metabolic			
1.1. Leptin level, mcg/l	≤18,55	18,55–20,69	≥20,69
1.2. Atherogenicity level	≤4,36	4,36–5,21	≥5,21
1.3. HOMA index	≤4,6	4,6–10,9	≥10,9
2. Clinical-functional			
2.1. BMI kg/m^2	≤23,1	23,1–34,4	≥34,4
2.2. Physical working ability (SMT)	≥310	310–265	≤265
2.3. EF, %	≥68,1	55,3–68,1	≤55,3
2.4. Anxiety (by HADS), points	0–7	8–10	≥11
2.5. Depression (by HADS), points	0–7	8–10	≥11

The renewal treatment (RT) course included: the saving-training regime of moving activity, climate-, diet-, physiotherapy (magnitolazerotherapy), balneotherapy ("dry" carbonic bathes) and TFC. The treatment course was 21 days.

5. Results

At admission to RT the absence of complaints, connected with the complete regression of IHD symptoms after surgical MR was observed in 15,8 % of patients, but 35,4 % of patients complained for discomfort in the precordial zone, 64,3 % of patients suffered from general weakness and fast tiredness, 10,7 % observed short-term pressing pains behind the breastbone at physical loads, inessential short breath was observed in 25,9 % of patients, 17,1 % complained for tachycardia, 20,3 % – for "breaks" in the heart work.

In 55,2 % of patients was observed an excessive weight before RT, BMI in patients of the second group was by 7,0 % higher (**Table 2**). Before RT in both groups of patients were revealed metabolic changes – the increase of atherogenicity index in the first group by 11,3 % more), HOMA and leptin (in the second group by 21,6 % and by 11,2 % more comparing with the first one). In patients of the second group was observed the rise of anxiety and depression levels by HADS by 33,9 % and 22,5 % comparing with patients of the first group. We didn't observe any reliable differences at the determination of tolerance to physical loads and EF in patients of both groups. After RT we observed the reliable improvement of metabolic and clinical-functional indices (**Table 2**), namely the decrease of atherogenicity indices by 25,5 and 18,0 % in the first and second groups, HOMA – 13,2 and 8,0 %, leptin level – 28,7 and 19,3 % respectively ($p \leq 0,05$).

At the evaluation of the neuropsychic state after RT we observed the decrease of the anxiety level (by 29,1 and 25,2 %) and depression level (by 25,4 and 21,7 %) in patients of the first and second groups, respectively. At the analysis of the dynamics of tolerance to physical loads – the increase of distance, passed by patients in six minutes – in the first and second groups by 18,1 and 10,7 % respectively. The positive dynamics was also at EchoCS examination – EF increase in patients of both groups – by 9,2 and 8,2 % respectively.

At the determination of the integral index at admission to RT in patients of the second group, I was by 12,5 % higher, than in patients of the first one. After RT – the decrease of this index in the first group by 37,5 %, and in the second one – by 29,3 %.

Table 2
Clinical-laboratory characteristics of examined patients that were at the sanatorium treatment

Indices	Groups			
	A1		A2	
	Before RT	After RT	Before RT	After RT
BMI kg/m^2	34,4±2,6	30,9±2,2	36,8±2,7	34±2,7
Atherogenicity index	7.33+0,15	5,46±0,09**	6.51±1,18	5,34±0,16*
HOMA index	13,55±1,25	11,76±1,34**	16,47±1,18	15,16±1,57
Leptin, mcg/l	21,62±1,07	15,4±1,27**	25,55±3,41	19,3±2,45*
Anxiety scale HADS (points)	6,12±0,95	4,34±1,57**	8,20±1,73	6,13±1,11*
Depression scale HADS (points)	7,51±1,24	5,6±1,1**	9,2±1,2	7,2±1,4*
SMT (M)	262,6±30,47	310,2±25,91**	285,1±14,33	315,5±17,47*
EF (%)	54,15±2,73	59,14±2,12*	54,37±2,81	58,85±2,44*
Integral index (I)	2,0±0,75	1,25±0,37**	2,25±0,56	1,59±0,50*

*Note: The difference of indices is reliable comparing with: * – before and after treatment (p<0,05); ** – between groups after treatment (p< 0,05)*

6. Discussion of results

Literary data prove the effectiveness of physical rehabilitation of patients after cardiosurgical interventions, who are at 2 or 3 rehabilitation level and have practically no complications risk after ACB [12]. But rehabilitation protocols of cardiorehabilitation, used at the early stage, are subjective. More often the physical rehabilitation after ACB includes respiratory exercises, because it is used to think, that physical exercises must be avoided during at least 3 months after surgery [13]. From the other side, if one avoids physical activity in first weeks after surgery, it results in the more expressed atrophy of breast muscles and shoulder girdle [14]. That is just why, we find it necessary to realize the early RT, and the use of the integral evaluation helps to elaborate RT complexes and to determine its effectiveness. Thus, according to our data, in patients, admitted to hospital after myocardium surgical revascularization was observed the essential increase of health state, because the surgical intervention eliminates the anatomic base of pathology and leads to hemodynamics and life quality increase that is noted in works by many authors [15, 16].

Among risk factors of IHD development in examined persons prevailed insufficient physical activity that resulted in BMI increase, especially in the group of patients, who didn't receive the early RT. As it is known, obesity is considered by many researchers as a predictor of angina return development and late myocardium infarction after aortocoronary bypass [17]. At the same time insulin resistance or hyperinsulinemia that are just risk factors of cardiovascular diseases, favoring dyslipidemia development, strengthening rheological properties, hemostasis and water balance disorder, often develop in patients at the background of obesity [18], that is distinctly traced also in our studies – the increase of HOMA index and leptin level in patients of the second group is more than in ones of the first group. The lower atherogenicity indices in patients of the second group comparing with ones of the first group before RV are connected, from our point of view, with the regular intake of hypolipidemic drugs (recommended at the stationary stage), but after RT the reliable decrease of this index was observed in patients of the first group after all.

Data of the Institute of sport medicine, prophylaxis and rehabilitation testify to the fact that the early (1–2 weak after surgery) start of the adapted program of cardiorehabilitation is safe, accelerates recovery, doesn't increase problems with the sternum and favors psychological recovery [19]. It is used to think that depression can be both a factor of myocardium infarction development

and a cause of the complicated clinical course after cardiosurgical operations [20]. In our study at the evaluation of the neuropsychic state in patients of the second group the indices of anxiety and depression before RT were reliably higher, and after TR – their reliable decrease was observed in patients of the first group that also testifies to the necessity of the early renewal treatment.

In was proved, that the renewal of the myocardium contraction ability after ACB is realized gradually that is connected also with the state of myocardium devitalization [21], so EchoCG with EF determination was carried out in 3–6 months after the surgical intervention. That is just why patients before RT had no essential differences of EF between groups, and after the treatment we observed the positive dynamics, especially in the first group.

At the complex evaluation of patients before RT the integral index (I) in the first group was by 12, % lower, comparing with the second one that proves all aforesaid about the fact that patients, who don't receive the correspondent early renewal treatment have a higher risk of IHD progression, considered by us as IHD critical progression. After the renewal treatment in patients of both groups was observed the low level of IHD progression, better result, namely the reliable decrease ($p \leq 0,05$) of I by 8,2 % comparing with patients from the second group.

The shortcoming of our research is an insufficient term of observation of patients after the renewal treatment, at the same time it is necessary to carry out the correlative analysis of factors that influence IHD progression.

7. Conclusions

1. The early stage of RT in patients with IHD after myocardium surgical revascularization is a necessary part of medical rehabilitation of this category of patients that allows to realize the timely correction of metabolic, neuropsychic and functional deviations and optimization of the renewal treatment.

2. The integral evaluation before the beginning of RT allows to elaborate the effective renewal treatment of these patients.

3. The evaluation of the effectiveness of the renewal treatment of patients with IHD after myocardium surgical revascularization is an important problem of medical rehabilitation.

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