CORRELATION OF FUNCTIONAL VALUES OF LEFT VENTRICULAR MYOCARDIUM AND THE DATA OF SUBJECTIVE STATE OF PATIENTS WITH CHRONIC CORONARY OCCLUSION

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The aim of the investigation is to study the correlation of functional values of left ventricular myocardium and the data of subjective state of patients with chronic coronary occlusion according to echocardiography findings and a new technique of subjective state assessment of patients with incomplete myocardial revascularization.

Materials and methods. The treatment results of 74 patients with coronary occlusion were analyzed. The 1st group consisted of 35 (47%) patients with chronic occlusion localized in the right coronary artery, the 2nd — 15 (20%) patients with chronic occlusion in anterior descending artery, the 3rd — 24 (33%) patients with chronic occlusion of circumflex branch of coronary artery. All the patients underwent complete clinical and instrumental examination including echocardiography, angiography and history taking of subjective state of patients. Subjective state of patients was assessed by an original technique three times: preoperatively, a day after admission; on the 3rd day after the operation, and 3 months after surgery. The results obtained were correlated with the effect of the disease and X-ray endovascular treatment on physical, psychological, emotional and social states of a person.

Conclusion. According to the technique of subjective state assessment of patients developed by the authors, incomplete X-ray endovascular myocardial revascularization contributes to the increase of psychological and social level functioning in early postoperative periods. In accordance with the echocardiography findings, complete recovery of left ventricular myocardial function in arterial occlusive disease can fail to be observed in early postoperative periods due to collateral myocardial hypoperfusion in the zone of chronic ischemia.

Key words: incomplete revascularization, chronic occlusions, echocardiographic indices, subjective state.

Correlation of functional values of left ventricular myocardium and the data of subjective state of patients with chronic coronary occlusion.

At present it is acknowledged to require maximally complete recanalization in endovascular correction of blood flow [1–3]. However, the opportunity of coronary occlusions recanalization in endovascular procedures can be limited by anatomic features of coronary vessels and a number of technical difficulties reducing the frequency of successful surgeries up to 55–70%. Therefore, the number of patients who undergo incomplete or partial revascularization [4] is increasing.

Over the last years, along with well-known and recommended techniques to estimate the myocardial function of the left ventricle (LV), there have appeared new methods of studying patients' subjective state. The estimation of subjective state of individuals is used in medical science and practice including cardiology, cardiosurgery and interventional cardiovasology [5].

In the present study we have attempted to answer the following questions: how to estimate the success of the performed endovascular surgery taking into account the assessment of a patient's subjective state with occlusive diseases in pre- and postoperative periods; whether incomplete revascularization enables to improve functional values of LV myocardium, as well as subjective state of the operated patient.

The aim of the investigation is to estimate the functional

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values of left ventricular myocardium depending on the subjective state of patients with chronic coronary occlusions by the findings of echocardiography and the data of the developed technique for estimation of subjective sensations of patients with incomplete myocardial revascularization.

Materials and Methods. There have been analyzed the treatment results of 74 patients with arterial occlusive diseases, who underwent treatment in City Clinical Hospital No.5, Nizhny Novgorod, from January 2009 to March 2011. There were 61 (82%) male and 13 (12%) female, the mean age being 54.1±0.9 years (from 38 to 75 years).

The patients have been interviewed about patients' subjective state to study the effect of incomplete revascularization of LV myocardium on life quality of patients with vascular diseases combined with chronic occlusion in one of the affected bed. The interview was held in accordance with algorithms of the developed and registered computer program "The estimation of the efficiency of the therapeutic treatment and X-ray endovascular intervention in patients with coronary heart disease" (Registration Certificate No. 2008613268). The data on patient's subjective sensations was gathered three times: preoperative period: in a day after hospitalization (initial data), on the 3rd day after the operation (before being discharged from hospital), and 3 months after the operation. In the interview a patient was offered 17 questions to answer. The questions enabled to estimate a patient's subjective sensations using five-grade scale, number "1" equals to "feeling sick", and "5" — subjective sensation of well-being. The results were organized according to the developed technique and correlated with the effect of the disease and X-ray endovascular treatment on physical, psychological, emotional and social functioning of the individual.

All the patients also underwent complete clinical laboratory examination. Doppler and echocardiography were performed on Medison 8000 EX (Korea), Acuson 128 XP/10 (USA) and sensors of 3.0 and 3.5 MHz. The emphasis was made on the study of echocardiography parameters describing LV function: ejection fraction (EF), regional contractility disorder index (RCDI), diastolic function (DF) — vE/vA parameter.

Selective coronary angiography (SCA) as well as treatment endovascular procedures were performed in interventional radiology operating room equipped by angiography device Advantx LCV+ (General Electric, USA).

All patients under study underwent incomplete revascularization of myocardium — interventional radiology correction of non-occlusive defects only with occlusion persisting in one of coronary beds. When staying in hospital, as well as after the operation, all the patients received therapeutic treatment: ACE (angiotensin converting enzyme) inhibitors, β-blockers, disaggregants, anticoagulants and statins.

Table 1

Characteristic of patients' groups

Information	1st group (n=35)	2nd group (n=15)	3rd group (n=24)
Females, absolute number/%	5/14	5/33	3/12
Male, absolute number/%	30/86	10/67	21/88
Mean age, years	53.4±0.4	55.1±1.3	53.8±1.6
Occlusion location	RCA	ADA	CA
Accompanying diseases	ADA, CA	RCA, CA	ADA, RCA

Note: the percentage of the number of patients in the group under study is given

Based on the selective coronary angiography finings of the location of chronic coronary occlusion, the patients were divided into three groups. The first group consisted of 35 patients (47%) with chronic occlusion in the right coronary artery (RCA), the second — 15 patients (20%) with chronic occlusion in the anterior descending artery (ADA), and the 3rd — 24 patients with chronic occlusive circumflexing artery (CA) (Table 1).

All the patients were examined early after the surgery (3 months after the stenting).

Results. 8 patients (23%) of the 1st group had decreased LVEF, in 13 (37%) — the defect of myocardial regional contractility was diagnosed. In 14 patients (40%) there was initially revealed diastolic function (DF) disturbance of hypertrophic type, so the mean DF value in the group was below the standard (Table 2). On performing incomplete myocardial revascularization, EF recovery was found in 5 from 8 cases, and regional contractility normalization — in 4 of 13 cases. There was no diastolic function after X-ray endovascular correction in 2 of 14 cases. Thus, the intervention led to the change of mean values. In 8 patients with EF defects, 3 months after the surgery the EF value was completely restored. Normal segmental contractility in early postoperative period was diagnosed in 8 of initially revealed cases. There absence of diastolic function in early

Table 2

Mean values of functional parameters of the left ventricle in patients with chronic occlusion of various location before, after and in early postoperative period after incomplete revascularization of myocardium, p>0.05 (M±m)

Values	Norm	1st group (n=35)			2nd group (n=15)			3rd group (n=24)		
		Initial data	After the operation	3 months after the operation	Initial data	After the operation	3 months after the operation	Initial data	After the operation	3 months after the operation
EF LV, %	50%	52.3±2.1	53.9±3.3	54.6±3.2	47.3±2.4	54.3±3.1	55.3±2.9	52.2±2.2	51.0±2.3	52.0±3.8
RCDI	1.00	1.23±0.17	1.11±0.10	1.06±0.12	1.33±0.14	1.25±0.16	1.25±0.18	1.21±0.20	1.26±0.25	1.15±0.15
vE/vA	1.050	0.82±0.10	1.10±0.16	1.16±0.12	0.81±0.18	0.88±0.11	1.11±0.14	0.94±0.15	1.09±0.19	1.11±0.10

Note: the norm for all values is 4–5.

Table 3

Mean values of parameters of subjective state of the patients with chronic occlusion of various location before, after and in early postoperative period after incomplete revascularization of myocardium, p>0.05 (M±m)

Values	1st group (n=35)			2nd group (n=15)			3rd group (n=24)		
	Initial data	After the operation	3 months after the operation	Initial data	After the operation	3 months after the operation	Initial data	After the operation	3 months after the operation
PhF	2.91±0.51	3.33±0.75	4.00±0.50	2.00±0.79	2.90±0.91	3.70±0.44	2.71±0.68	3.30±0.51	4.50±0.79
PsF	2.94±0.58	3.30±0.80	4.60±0.88	2.30±0.60	2.70±0.80	3.81±0.69	2.90±0.61	3.61±0.72	4.49±0.45
EF	2.70±0.89	3.70±0.61	4.43±0.85	2.09±0.49	3.30±0.67	4.11±0.85	2.20±0.89	3.90±0.92	3.90±0.52
SF	3.10±0.99	3.69±0.67	4.57±0.77	2.11±0.58	3.12±0.97	3.92±0.62	2.71±0.68	3.30±0.51	4.50±0.79

postoperative period was in 6 of 14 cases. Mean values have changed significantly (See Table 2).

In the 2nd group the initial decrease in EF was observed in 5 patients (33%), regional contractility defect — in 6 (40%). 4 patients (27%) had diastolic function of hypertrophic type. On performing incomplete X-ray endovascular correction of atherosclerotic coronary arteries, EF was restored in one case of five and the recovery of regional contractility — in two of six cases. In two patients of four there was DF recovery, and in the other cases there was positive dynamics for recovery peak E-to-peak A ratio. 3 months after the operation, EF was already restored in 3 patients, in one patient had marked positive dynamics compared to initial data. The recovery of regional contractility was already found in 4 cases, in the other there was weak positive dynamics having no significant effect on RCDI average value in the group (See Table 2). Despite the positive dynamics, normal DF values were found in early period only in two cases of four initially revealed.

In the 3rd group the initial decrease in EF was observed in nine patients (37%), segmental contractility defect — in 9 (37%) too. 6 patients (26%) had diastolic function of hypertrophic type. On performing stenting, in 5 cases of 9 EF was restored, one patient had minimal negative dynamics, and only positive dynamics without complete recovery of EF values was found in 3 patients. The recovery of RCDI was found in 7 of 9 cases, in other cases there was marked positive dynamics. DF recovery immediately after the operation was diagnosed in 5 of 6 cases. 3 months after the operative intervention normal EF values were still diagnosed in 5 of 9 cases. The recovery of RCDI in early postoperative period was already revealed in 8 cases. In one patient in spite there was no complete recovery of regional contractility of LV myocardium, positive dynamics was diagnosed. All 6 patients 3 months after the operation had no diastolic function (See Table 2).

The assessment of subjective sensations of patients with incomplete revascularization of myocardium by means of the developed and registered computer program of the efficiency of the therapeutic treatment and X-ray endovascular intervention in patients with coronary heart disease shoed the following results (Table 3).

In the 1st group the initial data of subjective state including physical (PhF), psychological (PsF), emotional (EF) and social functioning (SF) were estimated as “low” and ranged from 2.70±0.89 to 3.10±0.99. In the postoperative period (on the 3rd day after the operation) these parameters were assessed as “medium” ranging from 3.33±0.75 to 3.70±0.61. And 3 months after the operation they were assessed as “good” and were over the range 4.00±0.50 to 4.60±0.88 (See Table 3).

In the 2nd group the initial data of physical, psychological, emotional and social functioning were estimated as “low” and ranged from 2.00±0.79 to 2.30±0.60. In the postoperative period they were assessed as “close to medium” and ranged from 2.70±0.80 to 3.30±0.67. And 3 months after the operation the levels of the parameters were assessed as “close to good” and were over the range 3.70±0.44 to 4.11±0.85 (See Table 3).

In the 3rd group the initial data of subjective state were assessed as “low” and ranged from 2.20±0.89 to 2.90±0.61, in the postoperative period — as “medium” ranging from 3.30±0.51 to 3.90±0.92. And 3 months after the operation they were assessed as “good” and were over the range 3.90±0.52 to 4.50±0.79 (See Table 3).

Discussion. Analyzing the dynamics of the basic echocardiography values of LV function in patients with chronic occlusion of various location, it should be noted that the positive tendency to the improvement of EF, RCDI, and DF were observed in all patients favouring the view of J.R. Margolis, according to whom even incomplete revascularization of myocardium can contribute to the recovery and improvement of systolic, diastolic, and contractility function of myocardium [6].

The assessment of EF in patients with incomplete revascularization of myocardium showed the initial EF values in the patients of the 1st and the 3rd groups to be within the norm in the majority of cases, and only in the 2nd group they were insignificantly reduced. At the same time, in all three groups there were revealed significant RCDI and DF defects. Referring to the data of B. Meier et al [7], such situation can be explained by myocardial response to ischemia in the conditions of the existing hetero- and intracoronary collateral perfusion of myocardium in the occlusion area. The researchers emphasize that in the conditions of chronic ischemia and good collateral reserve there can be no EF decrease, but there will be revealed the defect of diastolic function and regional contractility.

When analyzing echocardiography findings of the patients 3 months after the operation one could not but notice the absence of both negative and positive dynamics in regard to EF value in the patients of the 1st and the 3rd groups along with a pronounced tendency to the recovery of DF and RCDI in these patients. In the 2nd group, except for

the significant improvement of the values characterizing DF and regional contractility, there was observed EF recovery in the majority of the patients studied. The situation can be explained by infallible success of the performed incomplete revascularization of myocardium that contributes to additional increase of collateral perfusion of myocardial hibernation areas in ADA playing a leading role in LV blood supply [8, 9].

The study of subjective state of patients before and after incomplete revascularization revealed the initial low levels of physical, psychological, emotional and social functioning in all the groups under study, in the 2nd group particularly, that is explained by lower life quality in patients with coronary heart disease after previous myocardial infarction (especially in anterior wall zone) [5, 10].

In postoperative period (before the discharge from hospital) and in early period after the operation (up to 3 months after the operation) the patients' subjective sensations gave evidence of the increase of the levels of psychological and emotional functioning that can be explained by positive emotions in patients after successful endovascular treatment, extending regime, absence of anxiety before the operation, communication with relatives and friends before and after discharge [11]. Nevertheless, low level of physical functioning in the 2nd group seems to be indicative of poor exercise capacity after incomplete recovery of myocardial coronary blood supply [9, 12].

Conclusion. In performing incomplete revascularization of myocardium of the left ventricle in patients with occlusive diseases of coronary circulation according to echocardiography findings, there is a pronounced tendency to significant improvement of myocardial functional capacity up to the level close to normal 3 months after the operation. This is evidenced by the increase of psychological and emotional functioning of the patients in early postoperative period according to the assessment of their subjective state.

There can be no complete recovery of myocardial function of the left ventricle, as well as the subjective state of the patients, particularly if the occlusion is located in the anterior descending artery, in early postoperative period due to insufficient collateral perfusion of myocardium in the zone of chronic ischemia.

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