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LEFT VENTRICLE REARRANGEMENT IN PATIENTS WITH CRITICAL OSTIAL STENOSIS OF THE LEFT MAIN TRUNK COMPLICATED WITH ISCHEMIC MITRAL REGURGITATION

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ABSTRACT — In this work, we studied the possibility of stenting the left coronary artery trunk in patients with subacute myocardial infarction on a background of critical stenosis of the left coronary artery trunk, reduced left ventricular ejection fraction and surgically significant mitral regurgitation. We analyzed treatment outcomes of 97 patients who underwent stenting of left main trunk for subacute stage of myocardial infarction. All patients had mitral insufficiency of II-III degree. The echocardiography data were analyzed before surgery, 7 days, 30 days and 12 months after surgical treatment. Direct stenting of the left coronary artery trunk was performed in 38 (39.2%) patients. 59 (60.8%) patients underwent Culotte bifurcation stenting. A good treatment effect was achieved in 89 (91.2%) patients. As a result of the LV myocardial remodeling, EF increased by 1.44 times (p < 0.05). There was a significant decrease in the degree of mitral insufficiency by 39% to surgically insignificant from 5.9 to 3.6 mm (p < 0.05). Stent placement as an initial treatment in elderly patients with more than 24 hours after the onset of acute myocardial infarction (AMI) originated from a critical lesion of the left coronary artery trunk and concomitant pronounced mitral insufficiency proved as fully justified and safe. We assume that this treatment enables to improve ejection fraction and reduce severity of mitral regurgitation in elderly AMI patients.

KEYWORDS — myocardial remodeling, coronary stenting, left main trunk stenosis, mitral regurgitation (MR), myocardial infarction (MI), echocardiography.

RELEVANCE

At the moment, a combination of left main trunk stenosis and surgically significant mitral insufficiency is increasingly occurring in the world. Most often, patients with a combination of such pathologies show a decrease in the contractility of the left ventricular (LV) myocardium due to its hibernation [1]. A gradual de-

crease in pumping function leads to an increase in the volumes of the left parts of the heart, dilation of the mitral ring, violation of the closure of the valve leaflets and the appearance of a jet of regurgitation. Often, this whole process is accompanied by compensatory tachycardia, which only worsens the general condition of the patient [2]. In the organization of planned surgical treatment, preference is given to thoracic aortic coronary bypass surgery with prosthetics or mitral valve repair. If a significant atherosclerotic lesion of the first portion of the right coronary artery accompanies the pathology, the above described changes are further aggravated. However, if patients are admitted in the hospital with obvious changes in ECG interpreted as acute myocardial infarction, then in this case, majority of surgeons choose a wait-and-see attitude, due to the high risks of surgical treatment. The presence of *flabby* myocardium in acute coronary syndrome up to 6–8 hours often leads to the need to plan intraoperative LV remodeling, which poses a number of challenges: a high risk of cutting the myocardium with suture, the inability to suture the source of bleeding from the myocardium, the use of hemostatic sponges and other devices. All this contributes to an increase in the duration of assisted circulation (AC), the development of post-perfusion syndrome, which, on a background of reduced LV pumping function, can lead to severe complications, up to the impossibility of disconnecting the AC apparatus. The use of the stenting technique on the left coronary artery trunk shows good results and is increasingly used in such situations, especially against the background of the use of additional hemodynamics support devices, such as extracorporeal membrane oxygenation and intra-aortic balloon counterpulsion [3, 4, 5].

If patients with a myocardial infarction are admitted in hospital later than 24 hours after MI onset, in this case, a choice of treatment is quite disputable. Many authors argue the necessity of emergent surgical revascularization which can be fatal for the patient. Cardiac surgeons prefer delayed execution of thoracic aorta coronary bypass surgery with prosthetics or mitral valve plastics after 3–4 weeks. Often (in 48% of cases) patients do not survive to this, or decompensation of physical condition occurs, which is a contraindication to the operation [6]. The use of isolated stenting is often also not considered, due to the high risks and high material costs for the clinic.

However, the implementation of stenting against the background of the application of various methods of hemodynamic support should be considered and studied.

Purpose of the work

is to study the possibility of stenting the left coronary artery trunk in patients with subacute myocardial infarction in the setting of critical stenosis of the left coronary artery trunk, a reduced LV ejection fraction and surgically significant mitral regurgitation.

MATERIALS AND METHODS

We studied medical histories of patients over past 8 years (2012–2020) who underwent stenting of the left coronary artery trunk on a background of subacute stage of LV myocardial infarction. (Fig. 1, Fig. 2).



Fig. 1. Critical lesion of the mouth of the left coronary artery trunk

An analysis of the treatment results in 97 patients (the median age was 72 ± 4.7 years), was performed. The echocardiography showed in all patients mitral insufficiency of II–III degree (mean v.c. 5.9 ± 0.3 mm), the average LV ejection fraction (LVEF) was $36 \pm 2.1\%$. There were 62 men and 35 women. In all patients, the average surgical time after the onset of a heart attack was 72 ± 12 hours. Intra-aortic balloon



Fig. 2. The result of stenting for left main trunk stenosis

counterpulsation was applied in 23 (23.7%) patients; 17 (17.5%) patients had simdax infusion after surgical treatment. 62 (63.9%) patients were stented in the setting of developing cardiogenic shock. 28 (28.9%) patients had a concomitant tachysystolic form of atrial fibrillation. The average systolic blood pressure before the intervention was 86 ± 7.5 mm Hg. In 82 (84.5%) patients, large scar changes in the LV myocardium were previously identified.

An analysis of echocardiography data was performed: LVEF dynamics, LV sizes — end-diastolic volume (EDV), end-systolic volume (ESV), enddiastolic size (EDS), end-systolic size (ESS) in the time frame: before surgery, 7 days, 30 days and 12 months after surgical treatment. Efficacy was estimated with a 15% or more reduction in EDV, 15% or more ESV, and a reduction in regurgitation jet size (v.c. by more than 1.5 mm).

The received results statistically processed by means of the Statistica 10.0 program (StatSoftInc., the USA), defining a median (Me), and interquartile scope (Q1-Q3). The statistical significance of differences between groups was assessed using the non-parametric Mann-Whitney test. Values were considered significant at p < 0.05.

RESULTS AND DISCUSSION

Direct stenting of the left main trunk was performed in 38 (39.2%) patients. 59 (60.8%) patients underwent Culotte bifurcation stenting. Drug-coated stents of zotarolimus were used. In 46 (47.4%) patients, stenting of the right coronary artery was additionally performed. The average number of implantable stents in the patient was 2.1 ± 0.3 .

Indicator	Statistical indicator	Before treatment	After 5 days	After 30 days	After 12 months
end-diastolic size, cm	M±σ Me	6,87±0,42	5,51±0,31	5,32±0,22	5,43±0,21
	[Q1-Q3] p		0,003	0,005	0,005
end-systolic size, cm	M±σ Me	4,93±0,32	4,16±0,14	4,22±0,12	4,12±0,09
	[Q1-Q3] p		0,005	0,005	0,005
end-systolic volume, ml	M±σ Me	155±18	92±16	89±12	88±16
	[Q1-Q3] p		0,0001	0,0001	0,0001
end-diastolic volume, ml	M±σ Me	199±16	151±18	146±15 мл	139±14
	[Q1-Q3] P		0,0005	0,0005	0,0001
LVEF, %	M±σ Me	32,6±4,1	46,1±3,6	47,4±1,4	45,2±3,3
	[Q1-Q3] P		0,0005	0,0005	0,0005

Table 1. Echocardiographic data

Note: p < 0.05 — the differences are statistically significant compared to the indicator before the installation of intra-aortic balloon counterpulsation

The table below shows initial and final data of echocardiographic results after performed surgical treatment. There was a statistically significant decrease in EDS by 19.8%, ESS (by 16.1%), ESV (by 40.6%), EDV (by 24.2%). As a result of the LV myocardial remodeling, EF increased by 1.44 times (p < 0.05). There was a significant decrease in the degree of mitral insufficiency by 39% to surgically insignificant from 5.9 to 3.6 mm (p < 0.05).

The desired treatment effect was achieved in 89 (91.2%) patients. 8 (8.8%) patients died within 5 days after surgical treatment due to severe heart failure.

CONCLUSION

In elderly AMI patients hospitalized later than 24 hours after onset of AMI with an underlying critical lesion of the left coronary artery trunk and concomitant pronounced mitral insufficiency, the use of stenting as the first stage of treatment is fully justified and safe. Such treatment tactics, especially in combination with modern hemodynamic support methods (simdax, intra-aortic balloon counterpulsion, extracorporeal membrane oxygenation), leads to a statistically significant increase in the ejection fraction and a decrease in the degree of mitral insufficiency.

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