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Role of minimally invasive interventions in the treatment of critical lower limb ischemia

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Abstract

Purpose of the study. Optimization of clinical results of treatment of patients with critical lower limb ischemia through the use of interventional technologies.

Material and methods. The analysis of the results of surgical treatment of 78 patients with critical ischemia of the lower extremities, who underwent endovascular and hybrid reconstructive interventions, was carried out.

Results. In the early postoperative period (up to 30 days), hemodynamic improvement was observed in almost all patients; on average, ABI in these patients increased from the initial 0.37 ± 0.2 to 0.78 ± 0.2 ($t=2.4$, $P<0.05$). Disease progression, that is, critical ischemia was observed in 11 (18.6%) patients. At the same time, stroke developed in 2 (3.3%) patients, acute myocardial infarction in 2 (3.3%) patients, high amputations were performed in 6 (10.1%) patients. Mortality from stroke and myocardial infarction, in general, was 3.3%.

Conclusion. An adequate choice of the volume and stage of the intervention, as well as the widespread use of hybrid technologies, hemodynamically and clinically, gives the result no worse than open reconstructions, and the number of complications and deaths is much less.

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RELEVANCE

About 2% of the Earth's population suffer from chronic occlusive diseases of the lower extremities. Men suffer 5 times more often than women [1]. In patients with chronic lower limb ischemia, diabetes mellitus occurs in 20-30% of cases, 70-90% of them are smokers, 75% have hyperlipidemia, 30% are arterial hypertension. In 20-25% of cases, in patients with chronic lower limb ischemia, critical lower limb ischemia (CLLI) develops [2].

Critical ischemia of the lower extremities is a complex manifestation of insufficiency of distal blood circulation of the lower extremities with necrotic changes. An irreversible consequence of CLLI is amputation, which inhibits the physical and psycho - emotional state of the patient. Mortality after amputation during the first two years' ranges from 25-30%, and after 5 years-50-75% [3,4].

In 95% of cases, the causes of ischemia of the lower extremities are atherosclerotic vascu-

lar lesions. Atherosclerosis, unfortunately, is a complex systemic disease, which in most cases affects several arterial pools. Multi-level arteriosclerotic lesions are most often found in elderly patients with many concomitant pathology, which increases the risk in performing arterial reconstructions [5]. The development of CLLI is associated precisely with multi-level arterial defeat: the deficiency of the “inflow paths” (ileofemoral segment) and “outflow paths” (popliteal - tibial segment). Problems of reducing the degree of surgical trauma and reducing the risk of surgical intervention, as well as solving simultaneous reconstruction as ways of inflow and outflow, have prompted the development of hybrid methods of restoring blood circulation of the lower extremities [6].

Hybrid operations combine a traditional angiosurgical approach and interventional methods. The use of hybrid interventions in the treatment of occlusive processes in the arteries of the lower extremities has several advantages. In particular, the need to perform large open surgical interventions is excluded, which helps to reduce complications, reduces the time of its conduct and traumatic consequences [7]. Thus, the foregoing indicates the need for a comprehensive and individual approach to the treatment of patients with a CLLI.

AIM OF THE STUDY

Improving the clinical results of the treatment of patients with critical ischemia of the lower extremities by applying interventional technologies.

MATERIAL AND METHODS

We analysed the results of examination and treatment of 78 patients with CLLI, who received treatment in the Department of vascular surgery of the multidisciplinary clinic of the Tashkent Medical Academy for the period from 2016 to 2021. Of the 45 patients included in our study, 66 (84.6%) were male, 12 (15.4%) - female. The mean age of patients was 61.3 ± 3.1 years. In all cases, atherosclerosis was the cause of the disease. The criterion for the selection of patients was the presence of ischemic ulcers on the lower extremities, the pain in rest lasting for two weeks or more, decrease in regional systolic pressure (RSD) below 40 mm RT. The priority was a mini-invasiveness of surgical interventions.

In addition to general clinical studies, we studied neurological status in patients, conducted an ultrasound study, computed tomographic and X-ray contrast angiography. All this made it possible to determine the level and length of the

occlusal - stenotic process, the nature and morphology of atherosclerotic plaques and determine the adequate tactics of treatment.

The determination of the degree of chronic lower limb ischemia in all patients was carried out in accordance with the classification of A.V. Pokrovsky (1979). Moreover, in 54 (69.2%) patients, III stage of ischemia was revealed, and in 24 (30.8%) patients - stage IV.

In all patients, multiple lesions of the vessels of the lower extremities were revealed (Tab. 1).

Table 1
Localization of occlusal - stenotic lesions of the vessels

Localization of the lesion	n	%
Aorto-ileo-femoral segment	31	39,7
Femoropopliteal segment	31	39,7
Popliteo-tibial segment	11	14,1
Femoro-popliteo-tibial segment	5	6,4

55% of patients had concomitant diseases, such as hypertension - 14.3%, diabetes mellitus - 28.6%, peptic ulcer of stomach and duodenum - 6.6%, chronic renal failure - 17.1%, obesity - 13, 2%. Coronary heart disease, angina pectoris were detected in 60% of patients.

The criterion and the principle of choosing surgical interventions on the arteries of the lower extremities was the implementation of adequate reconstruction with minimal surgical aggression, that is, the implementation of hybrid and endovascular interventions. When staging the choice between endovascular methods and the implementation of hybrid operations were based on the clinical recommendations of the TASC II international consensus. All patients had preoperative preparation, and after surgery patients received standard conservative therapy.

Endovascular methods of treatment in an independent form were performed to 41 patients, hybrid interventions to 37 patients (Tab. 2).

When evaluating the results of the treatment of patients, we used the standards recommended by Russian consensus of angiologists and vascular surgeons (2005).

RESULTS AND DISCUSSION

The assessment of the short-term results of surgical treatment of patients was carried out according to the following criteria: maintaining the operated limb, the patency of the reconstruction zone, and regress of CLLI.

41 patients with CLLI had endovascular interventions, more angioplasty and the iliac and femoral artery stenting. 37 patients had hybrid

interventions, the largest percentage of these interventions was carried out in patients with lesions of the iliofemoral segment.

Table 2
Types and number of surgical interventions

Hybrid interventions	
Endarterectomy from the iliofemoral segment and stenting of the iliac arteries	19
Endarterectomy from the iliofemoral segment and stenting of the iliac arteries, femoro-femoral shunting	3
Endarterectomy from the iliofemoral segment and stenting of the iliac arteries and angioplasty of the superficial femoral artery	8
Endarterectomy from the femoral arteries with patch and angioplasty of the popliteal and tibial arteries	7
Endovascular interventions	
Bifurcation “Kissing” abdominal aortic stenting	2
Angioplasty and stenting of the iliac arteries	10
Angioplasty of the superficial femoral artery	5
Angioplasty and stenting of the superficial femoral artery	15
Angioplasty of the popliteal and tibial arteries	9

With extended iliac artery occlusion in 19 cases, stenting of iliac artery was performed, with open and loop endarterectomy from a common femoral and external iliac artery. Three patients with bilateral occlusal-stenotic lesions of the iliac arteries had stenting and endarterectomy of the iliofemoral segment, the patency of one side of the iliofemoral segment was restored, and after, the operation was supplemented by femoro-femoral crossover bypassing.

Important criteria for evaluating the effectiveness of the operation is the frequency of a return of symptoms of critical ischemia and the percentage of limb salvation.

In patients (n=75) who had endovascular and hybrid reconstructions on the arteries of the lower extremities, a significant improvement in the clinical status is noted, which was associated with a decrease or disappearance of pain at rest, an increase in distance without pain, a decrease in symptoms such as numbness, pain, etc.

In the short-term postoperative period (up to 30 days), almost all patients had a hemodynamic improvement, on average ABI in these patients with the original 0.37 ± 0.2 increased to 0.78 ± 0.2 ($t=2.4$, $P < 0.05$). Saturation of oxygen tissues - SpO_2 comparatively to the initial, which was $82.4 \pm 1.1\%$, after treatment rose to $94.0 \pm 1.1\%$ ($T=2.2$, $P < 0.05$).

When assessing the immediate results of treatment, most patients had a significant and

moderate improvement (Table 3).

Table 3

Assessment of treatment results

+3	Significant improvement	There are no symptoms of ischemia, all the ulcers healed, ABI normalized (increased more than 0.9)	n=25
+2	Moderate improvement	The patient has symptoms, but pain appears at a greater load than before treatment; improvements for at least one degree of ischemia; ABI did not normalize, but increased more than 0.1	n=42
+1	Minimal improvement	Increase in ABI by more than 0.1, but no clinical improvement or vice versa	n=8
0	Without changes	There are no changes in the degree of ischemia and there is no increase of ABI	n=3

In the short-term postoperative period (3-4 days), 3 patients due to the progression of CLLI had primary high amputation of the limb. Within a month after the operation, the patency of the reconstruction zone was preserved in 75 (96.1%) patients. In terms of up to 1 month, 2 (2.5%) patients died, from acute myocardial infarction.

Long-term results of the treatment of examined patients were studied in 59 patients in terms of 6 to 36 months after surgery. The progression of the disease, i.e., critical ischemia was observed in 11 (18.6%) patients. At the same time, stroke developed in 2 (3.3%) patients, acute myocardial infarction in 2 (3.3%) patients, high amputations were performed at 6 (10.1%) patients. The mortality from stroke and from myocardial infarction, in general, amounted to 3.3%.

Analysing the results of our study, we came to the conclusion that the endovascular technique is the least aggressive for the patient. However, the completeness of revascularization and the patency of the reconstruction zone are slightly doubtful and limited. Though hybrid technique, combining the advantages of “open” and “endovascular” technologies, simultaneously increases the duration and volume of surgical treatment, which in some cases can negatively affect the degree of surgical risk. But the advantage of the method is the possibility of simultaneous restoration of inflow and outflow.

CONCLUSION

Given the severity of the initial condition of patients with CLLI, the choice of volume and type of intervention should be individual. At the

same time, priority is given to accurate approach to the choice of reconstructive interventions, namely an increase of hybrid and endovascular operations. Our experience shows that an adequate choice of volume and stage of intervention, as well as the widespread use of hybrid technologies, hemodynamically and clinically makes the result no worse than open reconstructions, and the number of complications and deaths is much less.

Conflict of interest - The author declares no conflict of interest.

Financing - The study was performed without external funding.

Compliance with patient rights & principles of bioethics - All patients gave written informed consent to participate in the study.

REFERENCES:

1. Patel A.Y., Gurm H.S. *Medical Management of Lower Extremity Peripheral Artery Disease. Practical Approach to Peripheral Arterial Chronic Total Occlusions.* Springer Singapore; 2017;1–8. http://dx.doi.org/10.1007/978-981-10-3053-6_1

2. Kurnianingsih N. *Diagnosis and Treatment of Lower Extremity Peripheral Artery Disease.* *Heart Science Journal. Brawijaya University*; 2021 Apr 1;2(2):1–3. <http://dx.doi.org/10.21776/ub.hsj.2021.002.02.1>

3. Gavrilenko A.V., Kravchenko A.A., Kotov A.Je., Kirichenko V.V. *Hybrid reconstructions in patients with chronic lower limb ischemia and multilevel arterial lesions* // *Angiologija i sosudistaja hirurgija.* Tom 24 №3./2021. S. 183-186. (In Russ.)

4. McDermott M.M. *Medical Management of Lower Extremity Manifestations of Peripheral Artery Disease.* *DeckerMed Family Medicine. Decker Medicine*; 2015 Mar 1; <http://dx.doi.org/10.2310/fm.3025>

5. Gavrilenko A.V., Kravchenko A.A., Shatalova D.V. *Treatment of patients with critical lower limb ischemia: endovascular methods or reconstructive surgery* // *Angiologija i sosudistaja hirurgija.* Tom 23 №3./2021. S. 145-149. (In Russ.)

6. Papojan S.A., Shhegolev A.A., Radchenko A.N. i dr. *Long-term results of endovascular treatment of lesions of the superficial femoral artery of types C and D according to the TASCII classification* // *Anigiologija i sosudistaja hirurgija.* Tom 24. №1/2020. S. 73-76. (In Russ.)

7. Kireev K.A., Fokin A.A., Rodnjanskij D.V. *Hybrid intervention for atherosclerotic lesions of the arteries of the ilio-femoral segment* // *Angiologija i sosudistaja hirurgija.* Tom 24 №1./2021. S. 156-158. (In Russ.)