

## **SURGICAL TREATMENT METHODS OF ACUTE LOWER LIMB ARTERIAL THROMBOSIS ON PATIENTS AFTER CORONAVIRUS INFECTION**

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### **ABSTRACT**

This article reflects the result of different types of surgical interventions on patients with lower limb arterial thromboses, who had had coronavirus infection. 43 patients were divided into 2 groups: the 1st group underwent to thrombectomies, whereas 2nd group – catheter thrombolysis and thrombaspiration. The results demonstrates applying of catheter thrombolysis instead of thrombectomy significantly decreases frequency of complications, rethromboses and mortality.

**Key words:** lower limb arterial thrombosis, acute ischemia, thrombectomy, catheter thrombolysis, coronavirus infection.

### **INTRODUCTION**

Information regarding the incidence of acute lower limb ischemia is scarce, but several national registries and regional surveys give figures of 140,000,000 per year. According to I. N. Bokarev, one case of acute ischemia occurs annually per 6,000 people [1, 6, 5]. The incidence of acute ischemia associated with embolism has decreased in recent years, probably because of a decrease in rheumatic valvular heart disease, improved monitoring of such patients, and progress in the treatment of patients with cardiac arrhythmias. On the contrary, cases of acute thrombotic ischemia have become more common [3, 4].

The most common cause of acute thrombosis is atherosclerosis, in which thrombosis can develop as a primary thrombosis against the background of an asymptomatic ulcerated plaque, or as a secondary one against the background of a long-term occlusive-stenotic process [2]. Primary acute thrombosis (up to 42% of the total number of cases of acute thrombosis) clinically differs little from arterial embolism - a sudden onset is characteristic. Coronavirus affected pandemic significantly had spread the frequency both arterial and venous thrombosis. Identification of acute arterial thrombosis due to the coronavirus-associated coagulopathy and its further complications, their possible ways of managing and recovering still has their actuality and in demand.

**Purpose of study.** Improvement the results of treatment of patients with lower limbs arterial thrombosis, who have had coronavirus infection, by optimizing the diagnosis and treatment tactics.

**Materials and methods.** For the period from September 2020 to January 2022, 43 patients with acute lower limbs' arterial thrombosis were treated at the Emergency Surgery Department of the Multidisciplinary Clinic of the Tashkent Medical Academy. The average age was  $61.3 \pm 0.6$  years. 27 (62.8%) of them were male, 16 (37.2%) female. Patients were divided into 2 groups depending on the applied treatment tactics: the main group - 15 (34.8%) and control - 28 (65.2%) patients. All of patient, underwent to the research had anamnesis of coronavirus infection. An average duration of recovering from COVID-19 was 2 months.

Diagnosis included standard clinical laboratory and instrumental examinations, supplemented by ultrasound dopplerography (USDG), ultrasound duplex scanning of the lower limbs vessels, multisliced CT and contrasting angiography of the lower limbs arteries. Confirmation of positive coronavirus infection anamnesis included enzyme-linked immunosorbent assay technique.

All patients had standard preoperative preparation, including double anticoagulant, infusion therapy, improving of blood circulation in the microvasculature.

**Results and discussion.** The degree of ischemia was determined according to A.S. Saveliev's classification; and there were 4 (26.67%) patients in the main group, whom were diagnosed with acute ischemia II-a degree to; 8 (53.33%) — II-b; 3 (20%) — III-a. In the control group, the distribution according to the degree of acute ischemia was: 8 (28.57%) patients — II-a degree; 13 (46.43%) — II-b; 7 (25%) - III-a. According to the level of arterial damage: in the main group, 5 (33.33%) patients had thrombosis of the iliac-femoral segment, 7 (46.67%) patients had thrombosis of the femoral-popliteal segment; 3 (20%) - popliteal-tibial segment. In the control group: 10 (35.71%) patients had thrombosis of the iliac-

femoral segment, 12 (42.86%) patients had thrombosis of the femoral-popliteal segment; 6 (21.43%) - popliteal-tibial segment. According to the ratio of concomitant diseases, a significant preponderance of a certain nosology was not determined in any of the researched groups.

Surgical interventions on patients were performed within 24 hours after admission to the hospital. Patients in the control group underwent thrombectomy from the affected arterial segment and fasciotomy (according to indications), while patients in the main group underwent endovascular thrombolysis and thrombaspiration. In cases where it was impossible to puncture the femoral artery on the affected limb, access performed through the contralateral lower limb. Urokinase used as a thrombolytic drug. The effectiveness of the method was determined based on a number of subjective and objective criteria. Changes in clinical dynamics were considered as subjective criteria: limb warming, skin color change, improvement in motor and sensory functions, and the appearance of pulsation distal to thrombosis. The objective criteria included changes in USDG parameters in the form of an improvement in the ankle-brachial index (ABI), changes in speed indicators and visual sonographic control of thrombus lysis. However, the main objective criterion for thrombus lysis was angiography data during and after the procedure.

After performed thrombectomies on patients of the control group, regression of ischemia was estimated in 24 (55.81%) patients. In 2 (4.65%) cases, rethrombosis was noted within 12 hours after the surgical intervention and therefore these patients underwent thrombectomy repeatedly. In addition, in 2 (4.65%) cases, after thrombectomy, there was no regression of ischemia, and a following secondary high amputation of the lower limb was performed. Lethality in the comparison group was not observed. In all 7 (16.27%) patients with acute grade 3 ischemia, thrombectomy was mandatory supplemented with anterior and posterior fasciotomy. Thrombectomy was performed in all cases with an incision along the Ken line.

In the patients of the main group, who underwent catheter thrombolysis and thromboaspiration, no episodes of retrombosis were observed. However, in 1 (2.32%) case, a partial regression of ischemia was detected with irreversible necrotic changes, limited in the foot by a demarcation line, which was subsequently disarticulated. To perform catheter thrombolysis and thrombaspiration, femoral angiography was performed by antegrade puncture of the femoral artery with the installation of a catheter for subsequent lysis.

Due to selective administration, in most cases it was possible to obtain positive results with a lower dose of fibrinolytics than with systemic use. The dose

of urokinase ranged from 300,000 to 900,000 IU. After completion of thrombolysis, the catheter was not removed, but an intra-arterial infusion of anticoagulants, antiplatelet agents, and antispasmodics was performed. The catheter was removed after the normalization of the parameters of the blood coagulation system (on the 3<sup>rd</sup> day after the procedure).

Despite the advantage of regional thrombolysis in peripheral thrombosis, not all patients managed to completely lyse thrombi. However, even with successful thrombolysis, the causative factors of thrombosis were not eliminated. Therefore, peroral anticoagulant medicament for prolonged taking was prescribed for 3 (6.97%) patients.

To determine the correlation between the incidence of complications, the blood coagulation system was assessed every 48 hours after the interventions (Tables 1, 2).

**Table 1.**

**Blood clotting time by the groups**

	BCT start time in the main group	BCT start time in the comparison group	BCT finish time in the main group	BCT finish in the comparison group
1 day	270± 2	250± 3	290± 1	265± 3
3 days	250± 3	223± 1	268± 2	240± 2
5 days	230± 2	197 ± 2	255± 3	233± 1
7 days	225± 1	190± 1	263± 2	227± 2

Despite the fact that the treatment of this category of patients is an extremely difficult problem, nevertheless, certain prospects are associated with the optimization of the diagnostic algorithm and the differentiated choice of one or another method of surgical intervention. According to the results of our research, indirect thrombectomy is an unpromising method, since in many cases it is insufficient to free the arterial lumen from atherothrombotic masses, especially in medium and small caliber vessels. After thrombectomy, 2 (4.65%) patients underwent amputation, while no complications were observed in patients with thrombolysis.

**Table 2.****PTI and APTT by the groups**

Day	Main group PTI	PTI comparison group	Main group APTT	Comparison group APTT
1 day	65± 1	70± 2	28 ± 2	31 ± 1
3 days	71 ± 2	78± 1	32 ± 1	35± 2
5 days	75± 2	89 ± 1	35 ± 3	38 ± 2
7 day	82 ± 2	98 ± 2	37 ± 1	40± 3

Somewhat better results were obtained during various reconstructive operations. But the possibility of their implementation is limited in patients who do not have a peripheral blood flow. In this group of patients, the only method of revascularization is the regional thrombolysis. The effect achieved in the process of lysis, as well as in case of unsuccessful lysis, can be supplemented with a subsequent operation.

Traditionally performed thrombectomy with further anticoagulant therapy in the postoperative period has been standard for many years. Reperfusion syndrome after revascularization and reconstruction of the affected arterial segments proceeds more aggressively, which is the cause of more frequent complications. For patients who underwent endovascular thrombolysis and thromboaspiration, the approach to the use of a fibrinolytic drug and its advancement in the distal direction up to the microvasculature is promising.

**Conclusions**

1. In the course of diagnostic measures, thrombosis was detected against the background of an atherosclerotic process in combination with a passable tibial segment; primary reconstructive surgery is indicated for such patients.

2. Indirect thrombectomy is indicated for thrombosis of the main arteries without significant atheromatous lesions or emboli.

3. Indications for endovascular thrombolytic therapy are peripheral forms of thrombosis or long-standing thrombosis against the background of a pronounced atherosclerotic lesion with an unsatisfactory peripheral vascular bed, i.e. when indirect thrombectomy is unfavorable prognostically, and reconstructive surgery cannot be performed.

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