

Endovascular Interventions On Lower Limb Arterial Thrombosis After Coronavirus Infection

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Abstract: 86 patients were divided into 2 groups: the primary group, isolated endovascular thromboaspiration and thrombolysis were performed to, and the control group, endovascular thromboaspiration and systemic thrombolysis were performed to. In control group patients, in 2 cases, rethrombosis was noted in the early postoperative period, as well as in 1 case, there was no regression of ischemia and, as a result, high amputation was performed to. In the primary group, revascularization was carried out without postoperative complications. The results demonstrate applying of isolated endovascular thromboaspiration and thrombolysis instead of systemic thrombolysis reduces the incidence of complications and the rethrombosis rate.

Keywords: lower limb arterial thrombosis, acute ischemia, thrombectomy, endovascular thromboaspiration and systemic thrombolysis, coronavirus infection

Relevance. 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, 2, 3]. 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 [4, 5].

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 [6]. 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 due to the

systemic endothelial dysfunction and initiating hypercoagulation over hemorrhagic complications [7-13]. 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 endovascular treatment results on lower limb arterial thrombosis after coronavirus infection, by comparing different types of minor invasive surgical interventions.

Materials and methods. For the period from November 2020 to December 2022, 86 patients with acute lower limbs' arterial thromboses had been treated at the Emergency Surgery Department of the Multidisciplinary Clinic of the Tashkent Medical Academy. The average age was 64 ± 0.5 years. 64 (74.4%) of them were male, 22 (25.6%) female. Patients were divided into 2 groups depending on the applied treatment tactics: the primary group - 44 (51%) and the control one - 42 (49%) patients. All of patients, 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 (USDS) of the lower limbs' vessels, multisliced CT with 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 12 (27.2%) patients in the primary group, whom were diagnosed II-a degree of acute ischemia; 24 (54.5%) — II-b; 8 (18.3%) — III-a. In the control group, the distribution according to the degree of acute ischemia next: 10 (23.8%) patients — II-a degree; 27 (64.3%) — II-b; 5 (11.9%) - III-a. According to the level of arterial damage: in the primary group, 25

(56.8%) patients had thrombotic lesion at femoral segment, 19 (43.2%) patients had thrombosis of the femoral-popliteal segment. In the control group: 23 (54.8%) patients had thrombotic lesion at femoral segment, 19 (45.2%) patients had thrombosis of the femoral-popliteal 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 with further hospitalization to the department. No one patient from any research group was undergone to mechanical thrombectomy via Ken's incision, though fasciotomy were performed to all patients with III degree ischemia.

On control group patients', who underwent endovascular thromboaspiration, after completion the very stage of mechanical thromboaspiration from arterial lumen, started systemic thrombolysis. The dose of urokinase ranged from 300,000 to 900,000 IU. In cases of impossibility of puncture the femoral artery on the affected limb, access was performed through the contralateral lower limb.

On primary group patients was performed elaborated tactic: 1) performed cannulation of distal arterial segment from the affected level with USDS-control (both tibial arteries and peroneal artery); 2) retrograde approached arteries below the distal thrombotic mass edge were enclosed with balloon dilatator for isolation of affected arterial pool; 3) antegrade catheterisation with side holes for thrombolysis was approached from either ipsilateral femoral artery or, in case of impossibility, from contralateral femoral artery; 4) direct applying of Urokinase as a thrombolytic drug with periodical thromboaspiration. The effectiveness of the method was determined on the basis of 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 thrombolysis. However, the main objective criterion for thrombolysis was angiography data during and after the

procedure.

After performed endovascular interventions regression of ischemia was estimated both in primary and control group in 80 (93.02%) patients. In 2 (4.7%) patients from control group, rethrombosis was noted within 24 hours (14 and 16 hours) after the surgical intervention. In addition, in 1 (2.35%) patient of control group, after intervention, there was no regression of ischemia, and a following secondary high amputation of the lower limb was performed. Lethality in the researched group was not observed.

In the patients of the primary group, who underwent endovascular thromboaspiration and thrombolysis, no episodes of retrombosis were observed.

The efficiency monitoring of performed system thrombolysis was estimated by levels of INR (2-3), D-dimer (>500 ng/ml) and fibrinogen (100-150 mg%) concentration. The catheter for system usage was removed after the normalization of the parameters of the blood coagulation system (on the 3rd day after the procedure).

Despite the advantage of thrombolysis in peripheral arterial 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 64 (74.4%) patients.

To determine the correlation between the incidence of complications, the blood coagulation system was assessed every 24 hours after the interventions.

Table 1.

Blood clotting time by the groups

| | BCT start time in the primary group | BCT start time in the control group | BCT finish time in the primary group | BCT finish in the control group |
|-------|-------------------------------------|-------------------------------------|--------------------------------------|---------------------------------|
| 1 day | 261± 1 | 237± 1 | 298± 3 | 286± 1 |
| 2 day | 253± 3 | 231± 3 | 284± 1 | 289± 2 |
| 3 day | 247± 2 | 228± 3 | 289± 2 | 291± 2 |

Significant coagulograms changes in primary group patient were reflected as the increasing of INR 0.4-1.8 (deviation~450%); D-dimer 520-876 ng/ml (deviation~68%); decreasing of fibrinogen 422-113mg% (deviation~73%). In control group coagulogram studies reflected the increasing of INR 0.3-1.7 (deviation~425%); D-dimer 534-882 ng/ml (deviation~65%); decreasing of fibrinogen 433-120mg% (deviation~73%).

Table 2.

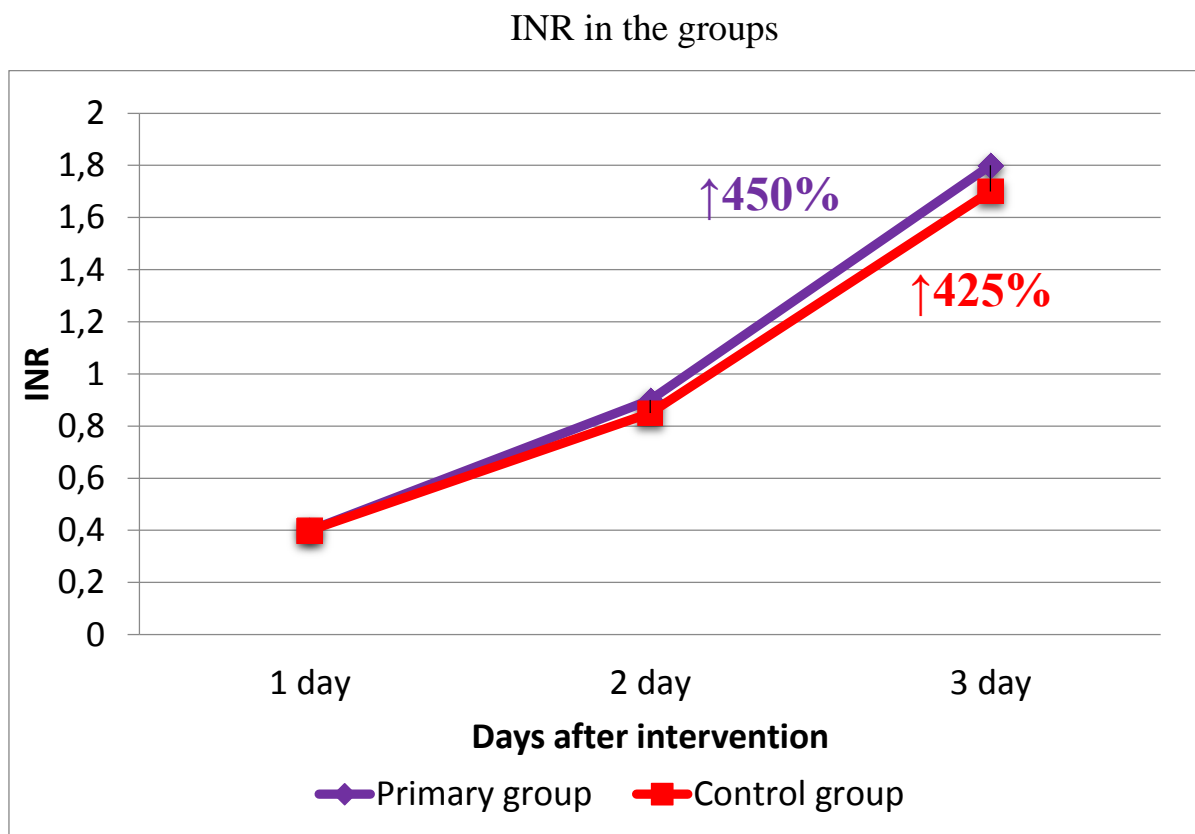


Table 3.

D-dimer concentration in the groups

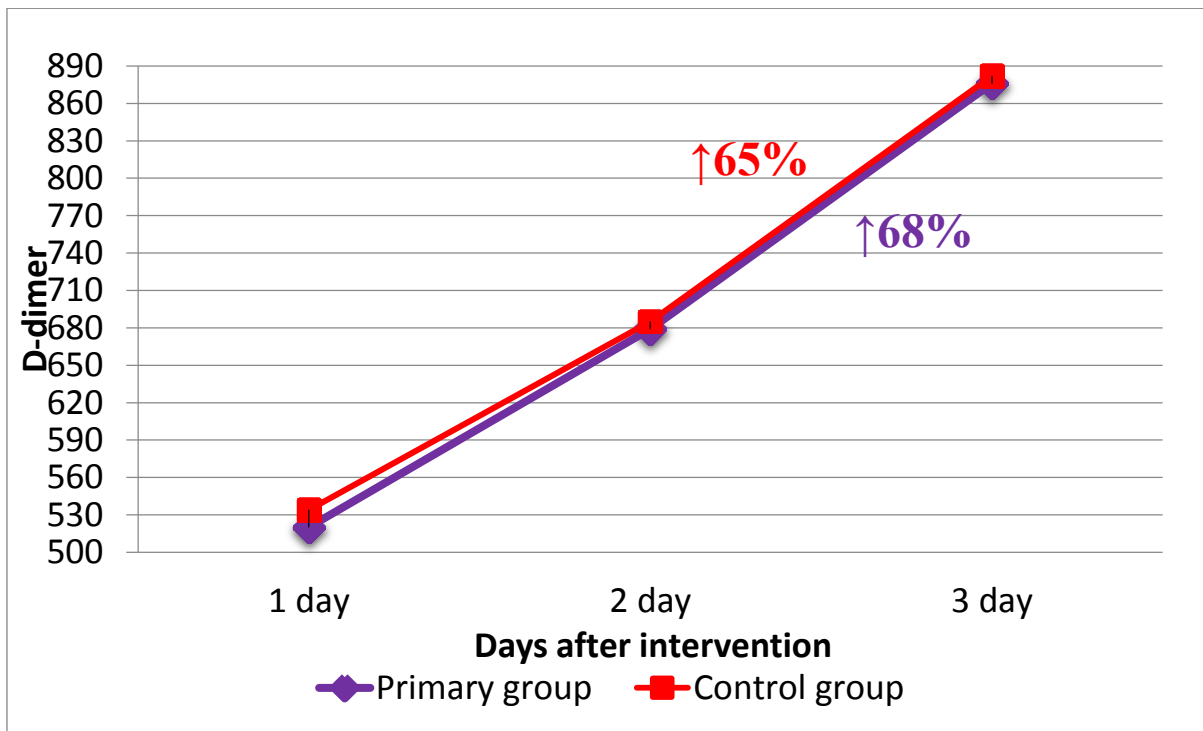
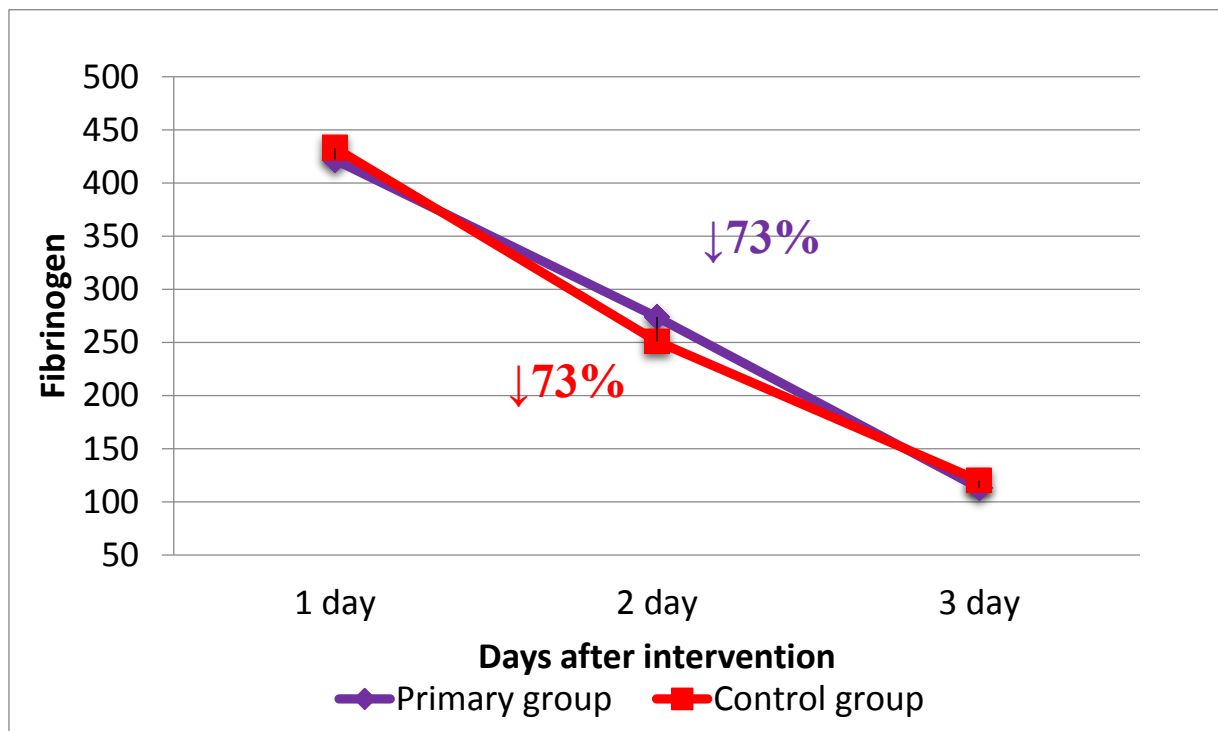


Table 4.

Fibrinogen concentration in the groups



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, both minor invasive types of interventions have efficiency. Obtained coagulogram data had not detected principally significant changes as soon as both applied surgical interventions effect the same pharmacological way. We would like to notice the fact of isolated endovascular thrombospiration and thrombolysis due to the minimal chance of micro thromboemboly spreading distally in arterial pool is preferable type of surgery.

Conclusions

1. Minor invasive surgical interventions are preferable for lower limb arterial thromboses after coronavirus infection.
2. Neither way of applying endovascular tactics may cause principally significant deviation of coagulogram parameters.
3. Isolated endovascular thrombospiration and thrombolysis is preferable type of surgery due to the minimal chance of micro thromboemboly.

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