

## ORIGINAL ARTICLE

## Mini-invasive treatment of acute superficial varic thrombophlebitis of the lower extremities

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## ABSTRACT

**BACKGROUND:** Conservative treatment of acute varic thrombophlebitis of superficial veins does not allow to achieve a significant reduction of venous thromboembolic complications. The discussion regarding the choice of method and method of treatment of these patients is constantly ongoing. The aim of the study was to improve the results of treatment of patients with acute superficial varic thrombophlebitis by introducing minimally invasive treatment methods.

**METHODS:** The results of examination and minimally invasive surgical treatment of 53 patients with acute superficial varic thrombophlebitis treated between 2020 and January 2023 were analyzed. All surgical interventions were performed under constant ultrasound control.

**RESULTS:** Acute superficial varic thrombophlebitis in the basin of the large saphenous vein was found in 48 (90.6%) patients, in the system of the small saphenous vein – in 2 (3.7%) and in the intersaphenous veins – in 3 (5.7%) patients. The length of the thrombotic lesion according to ultrasound data was from 3 to 12.5 cm, on average 5.7±1.7 cm. The surgical intervention consisted in the elimination of the thrombotic process in varicose superficial veins, endovascular laser coagulation (N.=35) or radiofrequency ablation (N.=18) femoral and upper third tibial segments, mini-phlebectomy. During 1-2 years of observation, signs of recanalization of the femoral segment of the great saphenous vein, recurrence of varicose veins, venous thromboembolic complications and complications of a general nature were not detected in any patient. In the postoperative period, 41 (77.4%) patients had no signs of chronic venous insufficiency, and 12 (22.6%) patients had a significant regression of clinical symptoms.

**CONCLUSIONS:** The implementation of minimally invasive methods of surgical treatment of acute superficial varic thrombophlebitis allows to effectively prevent venous thromboembolic complications, eliminate manifestations and prevent recurrence of varicose disease, completely eliminate or cause a significant regression of clinical manifestations of chronic venous insufficiency, and expand the indications for surgical intervention in patients with severe concomitant pathology.

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**KEY WORDS:** Thrombophlebitis; Venous insufficiency; Laser coagulation; Radiofrequency ablation.

One of the most formidable complications of varicose veins is acute superficial thrombophlebitis, which often carries the risk of the spread of thrombotic masses to the deep venous system and, as a result, the threat of thromboembolism of the pulmonary artery.<sup>1-5</sup> The frequency of acute superficial thrombophlebitis ranges from 0.64% to 5.4%.<sup>1, 2, 5</sup> Data from other studies indicate that the frequency of superficial thrombophlebitis is almost six times higher than the prevalence of deep vein thrombosis.<sup>2, 5, 6</sup> The risk of venous thromboembolic complications after acute varic thrombophlebitis persists for up to 30 years.<sup>7</sup>

According to most authors, the optimal treatment of acute superficial varic thrombophlebitis has not yet been determined. The discussion regarding the choice of method and method of treatment of patients with superficial thrombophlebitis: outpatient or inpatient, conservative or operative, urgent or planned, one-time or staged, is constantly ongoing. The vast majority of authors prefer conservative treatment,<sup>3, 5, 8</sup> although they note a much lower percentage of venous thromboembolic complications after surgical treatment in combination with compression stockings.<sup>8-10</sup> At the same time, in most of the literature sources available to us, the evidence regarding the effectiveness of

surgical intervention is based on a small number of observations and has a single character.<sup>8</sup>

At the same time, adequate anticoagulant therapy for acute varicthrombophlebitis is prescribed only in 77% of patients,<sup>2</sup> and the frequency of venous thromboembolic complications is increasing every year.

Thus, even the real threat of deep vein thrombosis and pulmonary embolism does not remove the discussion regarding the choice of treatment method for patients with acute superficial varicthrombophlebitis.

The aim of the study was to improve the results of treatment of patients with acute superficial varicthrombophlebitis by introducing minimally invasive treatment methods.

### Materials and methods

The results of examination and minimally invasive surgical treatment of 53 patients with acute superficial varicthrombophlebitis treated between 2020 and January 2023 were analyzed.

The age of the patients ranged widely from 19 to 75 years, the average age was  $42 \pm 2.7$  years. Among them, there were 16 (30.2%) men, and 37 (69.8%) women. Most of the treated patients – 49 (92.5%) were of working age. At the same time, half of all examined and treated patients – 28 (52.8%) were young and middle-aged (up to 40 years old).

The study was conducted in accordance with the provisions of the Helsinki Declaration of the World Medical Association “Ethical principles of medical research involving a person as an object of research” (revision of 2008) and was approved by the bioethics commission of the medical faculty of the Uzhgorod National University State Medical University. No violations of ethical norms during the conduct of research work were found. All patients signed an informed consent to participate in the research work.

Laboratory (general clinical tests of blood and urine, blood sugar, biochemical blood analysis, coagulogram), as well as instrumental (electrocardiography and ultrasound examinations) research methods were used to examine patients. In addition, all patients were consulted by a cardiologist and other, as needed, narrow specialists. Patients with transfacial thrombosis and deep vein thrombosis were excluded from the study.

All surgical interventions were performed under constant ultrasound control. Pain relief was provided by tumescent anesthesia with Crail solution using a pump. Anesthesiological monitoring of the patient’s condition

was a mandatory condition of the surgical intervention. In order to carry out edovasal laser coagulation, we used a surgical diode laser “LIKA-surgeon+” produced by PP Fotonik Plus (Cherkasy, Ukraine) with a wavelength of 1470 nm and a power of 0.5-10 W and radial light guides. For radiofrequency ablation, VNUS™ devices from COVDIEN (Switzerland) with Closure FAST electrodes from Medtronic (USA) size 7 Fr (2.3 mm) were used.

### Results

During the clinical examination, all patients, according to the classification of SEAR (1994), observed various signs of chronic venous insufficiency, in particular:

- C2s (varicose veins+symptoms) in 3 (5.6%);
- SZa (edema) in 9 (17.0%);
- C3s (edema+symptoms) in 29 (54.7%);
- C4a (trophic changes) in 2 (3.8%);
- C4s (trophic changes+symptoms) in 5 (9.4%);
- C5a (healed trophic ulcer) in 1 (1.9%);
- C5s (healed trophic ulcer+symptoms) in 2 (3.8%);
- C6a (active trophic ulcer) in 1 (1.9%);
- C6s (active trophic ulcer+symptoms) in 1 (1.9%).

Immediately before surgery, all patients underwent an ultrasound examination with marking of varicose veins and localization of the thrombotic process.

Ultrasound examination was performed in the horizontal, on the back and stomach, and vertical, sitting and standing positions of the patient using compression tests and the Valsalva Test. The variability of the normal anatomy of the small saphenous vein required a more detailed and precise examination. The condition of the superficial, deep, and communicating venous system was consistently assessed. The study necessarily ended with ultrasound screening of the contralateral limb.

At the same time, the localization, extent and limits of thrombotic occlusion, the level of proximal and distal limits of thrombotic occlusion, the nature of thrombotic masses, the presence of flotation of the top of thrombotic masses were detected. The condition of the valvular apparatus of the veins, the localization of varicose transformation, and the prevalence of vertical and horizontal refluxes were also evaluated.

Conditions for minimally invasive intervention were observed in the case of thrombotic lesions of varicosely altered tributaries of the large and small saphenous veins, local occlusion of the main saphenous veins.

Acute superficial varicthrombophlebitis in the basin of the large saphenous vein was found in 48 (90.6%) patients,

in the system of the small saphenous vein – in 2 (3.7%) – and in the intersaphenous veins in 3 (5.7%) patients. According to ultrasound data, the length of the thrombotic lesion was from 3 to 12.5 cm, on average 5.7±1.7 cm. In the majority of patients – 32 (60.4%) cases – thrombotic masses spread from the tributary to the large subcutaneous vein with local thrombotic occlusion of the latter. The localization of the thrombotic process in superficial varicose veins was as follows:

- local thrombotic occlusion of the LSV on the thigh – 17 (32.1%);
- local thrombotic occlusion of the LSV on the lower leg – 7 (13.2%);
- medial additional branch of the LSV – 10 (18.9%);
- lateral additional branch of the LSV – 4 (7.5%);
- anterior popliteal tributary of the LSV – 3 (5.6%);
- anterior arch vein on the lower leg – 2 (3.8%);
- posterior arch vein (vein of Leonardo) – 5 (9.4%);
- vein of Giacomini – 1 (1.9%);
- other SSV tributaries – 1 (1.9%);
- medial intersaphenic vein on the thigh – 1 (1.9%);
- medial intersaphenous vein on the lower leg – 2 (3.8%).

The determination of valvular insufficiency and the presence of venous reflux (Table I) is important during ultrasound diagnostics, which also determined the surgical tactics in this contingent of patients.

Simultaneous elimination of valvular insufficiency, vertical and horizontal reflux along with the elimination of the thrombotic process in the superficial veins allows not only to effectively prevent venous thromboembolic complications, but also to prevent the recurrence of varicose veins in the distant postoperative period.

The first stage of surgical intervention in all patients

was the elimination of the thrombotic process in varicose superficial veins. At the same time, preliminary marking of the borders of the thrombotic lesion of the superficial venous main and/or its tributaries, penetrating veins in the place of the thrombotic process, if they are present, was of great importance. Under ultrasound control, with the help of a Varodi hook, a thrombosed segment of a varicosely changed superficial vein was isolated from two punctures above and below the site of thrombotic occlusion, and, in the case of the spread of thrombotic masses to a large subcutaneous vein from the affected tributary, also below the distal border of the thrombotic process in the tributary. In 16 (30.2%) patients with local thrombotic occlusion of a varicose vein, after ligation of the distal end, phlebocentesis was performed followed by scleroobliteration of the affected segment using the “foam-foam” method.

In the presence of a failed penetrating vein in the area of the thrombotic process, in 6 (11.3%) patients, the operation was started with subfascial ligation of the penetrating vein. The next step was removal of the thrombosed segment of the varicose vein from two or more punctures.

In 31 (58.5%) patients, it was possible to remove the thrombosed segment from two to three punctures using a Varodi hook.

The next stage of the operation, after elimination of the thrombotic process in the superficial veins, was performed endovasal laser coagulation (N.=35) or radiofrequency ablation (N.=18) of the femoral and upper third of the leg segments. The surgical intervention was completed with a miniphlebectomy with the removal of pre-marked varicose superficial veins on the lower leg and thigh (Figure 1).

In 12 (22.6%) patients, trophic changes in the skin of the leg were observed, which limited the volume of surgical intervention. At the same time, 2 (16.7%) of 12 patients

TABLE I.—*Venous hemodynamics in acute superficial varicothrombophlebitis.*

Ultrasound of the trunk/varicothrombophlebitis		Varicose veins transformation			Valve capability insolventy		Reflux			
		Local	Diffuse	No	Yes	No	Local	Common	Total	No
LSV (N.=48)	Local thrombotic occlusion on the thigh (N.=17)	12	5	-	17	-	12	5	-	-
	Local thrombotic occlusion on the leg (N.=7)	2	4	1	6	1	1	5	-	1
	Medial additional branch of the LSV (N.=10)	2	5	3	8	2	1	5	3	1
	Lateral additional branch (N.=4)	2	1	1	3	1	1	2	-	1
	Anterior popliteal tributary (N.=3)	3	-	-	2	1	2	-	-	1
	Anterior arch vein on the lower leg (N.=2)	1	-	1	1	1	1	-	-	1
	Posterior arch vein (vein of Leonardo) (N.=5)	2	3	-	5	-	2	3	-	-
SSV (N.=2)	Vein of Giacomini (N.=1)	1	-	-	1	-	1	-	-	-
	Other tributaries (N.=1)	1	-	-	1	-	1	-	-	-
Interbasin (N.=2)	Medial intersaphenic vein on the thigh (N.=1)	-	1	-	1	-	-	1	-	-
	Medial intersaphenous vein on the lower leg (N.=1)	-	1	-	1	-	-	1	-	-
Total (N.=53)		26	20	6	46	6	22	22	3	5

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Figure 1.—Mini-access thrombosed varicose vein removal (A), radiofrequency ablation of the greater saphenous vein in the thigh (B), mini-phlebectomy (C), and sclerotherapy (D).

had an active trophic ulcer. In order to eliminate valvular insufficiency and venous reflux on the leg in this contingent of patients, trunk scleroobliteration of the tibial segment of the LSV (N.=8) and injection scleroobliteration of failed penetrating veins on the leg (N.=5) were used in this contingent of patients, which contributed to the development of venous stasis in the area of the trophic ulcer.

In the postoperative period, elastic knitwear was used, in particular compression class II in patients with chronic venous insufficiency C2s-C3s inclusive, compression class III – in patients with clinical manifestations C4a-C5s. Only 2 (3.8%) patients with an active trophic ulcer (C6a-C6s) had a compression adhesive zinc-gelatin bandage Una applied for 2-3 weeks, which was applied again in 1 patient for 3 weeks, until the ulcer was completely healed.

In the postoperative period, medical treatment was prescribed: rivaroxaban at a dose of 10 mg/day for 1 month, detralex at 1000 mg/day for 2 months, broad-spectrum antibacterial agents for 1-5 days. Dressings were performed on the 1<sup>st</sup>, 5<sup>th</sup> and 10<sup>th</sup> postoperative day with mandatory

ultrasound control. Ultrasound control was also performed in the period 1-3-6-12 months after surgery.

In the immediate postoperative period, local hyperemia and hematomas on the thigh during endovascular laser coagulation or radiofrequency ablation were observed in 5 (14.3%) and 2 (11.1%) patients, respectively. In 49 (92.5%) patients, elimination of thrombotic occlusion in acute superficial varicothrombophlebitis led to rapid regression of skin inflammatory manifestations within the next 5 days, and in 4 (7.5%) within 10 days. In all patients, accesses after miniphlebectomy healed with primary tension.

During 1-2 years of observation, signs of recanalization of the femoral segment of the great saphenous vein, recurrence of varicose veins, venous thromboembolic complications and complications of a general nature were not detected in any patient. Manifestations of chronic venous insufficiency were not observed in 41 (77.4%) patients with preoperative manifestations of C2s-C3s within 1 year after the intervention. With initial chronic venous insufficiency C4s-C6s, during the year of observation, regression of clinical symptoms was observed in 12 (22.6%), in particular: in 8 patients stage C4a, in 2 – C4s, and in 2 – C5a degree of chronic venous insufficiency. No recurrence of trophic ulcer was found in any patient.

Thus, the introduction of minimally invasive methods of surgical treatment of acute superficial varicothrombophlebitis can effectively prevent venous thromboembolic complications, eliminate manifestations and prevent recurrence of varicose disease, completely eliminate or cause a significant regression of clinical manifestations of chronic venous insufficiency, and expand indications for surgical intervention in patients with severe concomitant pathology.

## Conclusions

- Mini-invasive interventions for acute superficial varicothrombophlebitis should include successive stages: elimination of the thrombotic process, laser coagulation or radiofrequency ablation of the venous line, miniphlebectomy and, if necessary, intervention on the trophic ulcer;
- elimination of valvular insufficiency and venous reflux made it possible to eliminate manifestations and prevent recurrence of varicose veins, effectively prevent venous thromboembolic complications in all operated patients;
- the introduction of minimally invasive techniques made it possible not only to expand the indications for the treatment of acute superficial varicothrombophlebitis, but

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also to completely eliminate or cause a significant regression of clinical manifestations of chronic venous insufficiency in 77.4 and 22.6% of patients, respectively.

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### Conflicts of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

### Authors' contributions

Both authors read and approved the final version of the manuscript.

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