



RESULTS OF A COMPREHENSIVE STUDY OF PATIENTS WITH CHRONIC VENOUS INSUFFICIENCY OF THE LOWER LIMB COMPLICATED BY TROPHIC ULCERS

Azizov G.A., Komiljonov A.E.

Uzbekistan, Andijan State Medical Institute

Article history:	Abstract:
Received: 28 th February 2025 Accepted: 26 th March 2025	<p>We studied the results of an examination of 96 patients with postthrombophlebitic and varicose ulcers of the lower extremities. In order to determine the state of microcirculation, transcapillary diffusion along the veno-venous gradient was studied. In order to study the resorption and transport capabilities of the lymphatic system, the technique of indirect lymphoscintigraphy was used. The level and monitoring of oxygen tension in tissue were studied. In patients with chronic venous insufficiency of the lower extremities, complicated by trophic ulcers, a violation of microhemo- and lymphocirculation in the affected limb was revealed.</p> <p>In patients with post-thrombophlebitic and varicose ulcers of the lower extremities, it is necessary to correct not only venous insufficiency, but also lymphatic drainage in the complex treatment of this category of patients.</p>

Keywords:

INTRODUCTION. The problem of identifying optimal methods for the treatment and rehabilitation of patients with trophic ulcers of the lower extremities remains highly relevant today [4, 11]. Venous trophic ulcers are notoriously slow to heal, even with comprehensive treatment, and often relapse after epithelialization. In cases of lympho-venous insufficiency, venous hypertension impairs the outflow through the main venous trunks, which in turn leads to dysfunction in the vascular, lymphatic, and tissue drainage systems [1, 3, 4, 9]. Hypertension in the venous system causes various secondary disturbances in the lymphatic circulation. Venous insufficiency progresses into lymphovenous insufficiency, further aggravating the severity of the condition, as the compromised function of both drainage systems results not only in increased interstitial fluid volume but also in the accumulation of pathological metabolites in tissues, which provoke trophic disorders [2, 5, 7, 8, 10, 12]. Pathological changes in the lymphatic system and impairment of its function significantly influence both the development and the course of the disease [7]. The aforementioned factors clearly demonstrate the urgency of this issue and highlight the need for further research in this area.

MATERIALS AND METHODS. A total of 96 patients with chronic lympho-venous insufficiency and trophic ulcers in the lower leg region were examined. The duration of the disease ranged from 5 years to over 5 years. Edema was present in 86% of the patients. In most cases, swelling was observed in the foot and lower leg, often extending to the thigh. Among the examined patients, 64% exhibited hyperpigmentation, and 43% showed indurative changes in the lower leg region. Signs of cellulitis, dermatitis, and eczema were observed in 17% of the patients. Out of the total, 64 patients had post-thrombotic trophic ulcers, while 32 had varicose ulcers. Microcirculation was assessed using transcapillary diffusion and veno-venous gradient analysis. Fluid filtration and protein permeability through capillary walls were evaluated by comparing hematocrit values and protein concentrations. Protein loss was calculated using a specific formula per 100 ml of blood. The resorptive and transport capacity of the lymphatic system was studied through indirect lymphoscintigraphy, using ^{99m}Tc-labeled Technetium (3–5 MBq). Lymphatic drainage was assessed using a Gamma camera model MB 9200 "Microsegans." Tissue oxygen tension in the lower third of the leg was measured using the TCM-2 radiometer (Radiometer, Denmark). In patients with post-thrombotic disease, duplex scanning revealed an occlusive pattern of venous damage in 25%, recanalization in 42%, and partial recanalization with valvular insufficiency in 33% of cases.

RESULTS AND DISCUSSION. Our examinations revealed disturbances in transcapillary exchange. The capillary filter increased to 15.5 ± 0.5 ml, protein loss to $5.68 \pm 0.5\%$, the sodium content in the regional bloodstream decreased to 145 ± 0.50 (Table 1). Due to the increased output of protein and sodium from the venous part of the microcirculatory bed, it leads to a decrease in oxygen-osmotic pressure, which ultimately contributes to the filtration of the liquid part

of the blood into the surrounding tissue and to an increase in the osmotic pressure of the extracellular fluid, which subsequently leads to edema and disruption of tissue trophism.

Table 1
Transcapillary permeability in patients with lymphovenous insufficiency with ulcers (n-53)

Clinical forms of the group	Capillary filter. (ml)	Loss of protein (%)	Sodium content m.mol/l
Postthrombophlebitic trophic ulcers	14,1±0,4	4,88±0,5	136±0,50
Varicose. Pain complicated by trophic ulcers	8,12±0,31	2,96±0,24	138±0,7
Control group Healthy persons (n-22)	2,05±0,11	2,08±0,12	148±0,14

The level of tissue oxygen tension depends on the state of blood supply and the intensity of redox processes within the tissues. We assessed tissue oxygen tension using the method of transcutaneous contact polarography, performed with a TCM-2 Radiometer (Radiometer, Denmark) equipped with a Clark-type contact sensor. During the examination, the sensor was placed on the middle third of the medial surface of the lower leg, or, in the presence of an ulcer, directly over the ulcerated area.

As microcirculatory disturbances progress, the trophic supply to surrounding tissues deteriorates, which is evidenced by significant impairments in the utilization of delivered oxygen. To identify metabolic disorders in the tissues, oxidation-reduction (redox) processes were investigated. Transcutaneous oxygen tension (TcPO₂) was measured as an indicator. In the examined lower leg tissues, oxygen tension decreased and ranged between 25 to 47 mmHg. An increase in TcPO₂ levels during the oxygen challenge test was observed in the range of 66–80%, while the absolute oxygen partial pressure component decreased to 16–28 mmHg (see Table 2). The assessment revealed that, based on TcPO₂ data, patients in the study group exhibited impairments in both oxygen delivery and its utilization in the affected limb tissues.

Table 2

Oxygen tension in the studied tissues in patients with lymphovenous insufficiency with the presence of trophic ulcers (n-43)

Survey groups.	TcPO ₂ level mcg/ml Hg	TsPO ₂ tk. oxidized (%)	Acid capacity of tissues, ml Hg
Postthrombophlebitic ulcers	25-48	64-75	17,4-19,7
Varicose ulcers	37-49	74-82	25-29
Healthy individuals (n-25)	57	90-95	53

Radionuclide examination of patients with post-thrombophlebitic lymphovenous insufficiency showed that the rate of lymph outflow in the limb was 8.2±0.6 mm/min, and the removal of the radionuclide in the interval up to 1 hour was 13%. In patients with varicose ulcers, these indicators were 9.4±1.5 and 15%. The examination revealed that there are significant disturbances in the lymph flow in the affected limb. The control group of healthy individuals is also presented in Table No. 3

Table 3

Lymph flow rate and intensity of radiopharmaceutical elimination from tissue depots in patients with post-thrombophlebitic and varicose trophic ulcers (n-47)

Clinical forms examined group	Lymph flow velocity indicators mm/min	Elimination of radiopharmaceuticals from tissues (%)
Post-thrombophlebitic trophic ulcers	8,2±0,6	13
Varicose veins complicated by trophic ulcers	9,4±1,5	15
Control group: healthy individuals (n-20).	16,1	24

CONCLUSION. In patients with lympho-venous insufficiency accompanied by lower extremity ulcers, significant impairments in venous outflow were observed, followed by worsening lymphatic drainage. This subsequently affected both microvascular hemodynamics and lymphatic circulation in the affected limb. As a result, metabolic disorders developed, which further aggravated the progression and outcome of the pathological process. Therefore, when correcting venous outflow, it is essential to take into account the condition of lymphatic drainage in order to improve treatment outcomes for this patient group.

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