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**PATHOMORPHOLOGICAL CHANGES OF A LARGE DIAMETER
GREAT SAPHENOUS VEIN AFTER ENDOVENOUS LASER
ABLATION WITH A WAVELENGTH OF 1940 NM**

**ПАТОМОРФОЛОГІЧНІ ЗМІНИ ВЕЛИКОЇ ПІДШКІРНОЇ ВЕНИ
ВЕЛИКОГО ДІАМЕТРУ ПІСЛЯ ЕНДОВЕНОЗНОЇ ЛАЗЕРНОЇ
КОАГУЛЯЦІЇ З ДОВЖИНОЮ ХВИЛІ 1940 НМ**

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The development of minimally invasive surgery led to the introduction of the method of endovenous laser ablation (EVLA) of the veins of the lower extremities as a leading method of treatment of chronic venous disease. More recently, diode lasers with wavelengths of 810 nm, 940 nm, and 980 nm targeting hemoglobin as a chromophore have been used in EVLA. However, now the “industry standard” for EVLA are lasers with wavelengths of 1320 nm, 1470 nm and 1940 nm aimed at water as a chromophore [1, p. 704-706; 2, 234-245].

The lack of need to remove a vein treated with an endolaser has led to the fact that there are relatively few targeted reports on morphological

changes in the vein wall after EVLA, and most of them are based on experimental data [3, p. 7-11; 4, p. 160-170].

The aim of the study: to evaluate the effectiveness of EVLA application with a wavelength of 1940 nm and a fluence of 50 J/cm in the treatment of large-diameter veins by evaluating the morphological changes of the great saphenous vein (GSV).

Materials and methods. 15 patients with varicose veins of the lower extremities were included in the study. The criterion for inclusion in the study was that the diameter of GSV > 10 mm. It was determined at the level of the lower third of thigh using ultrasound the SonoScape S6 apparatus with an L741 linear probe (frequency range of 7-13 MHz) in the gray-scale B-mode.

The age of the patients ranged from 30 to 65 years, on average 48 (48.64 ± 10.16), women made up 86.7% (13 people). The duration of the disease – from 7 to 20 years. Written consent was obtained from each patient after a full explanation of the purpose and nature of all procedures used. To carry out the EVLA procedure, a laser universal coagulator «Lika-surgeon» manufactured by OOO «Photonika Plus» (Cherkasy, Ukraine) with a wavelength of 1940 nm was used. The diameter of the GSV was 13.21 ± 2.69 mm.

During the last stage of the EVLA operation, a 3-cm long segment of the GSV was removed at the level of the lower third of the thigh, after it exited the saphenous sheath. Histological examination was performed on deparaffinized sections of 5 x 10 mm, 4 to 7 microns. 60 samples (4 sample from each vein) were stained with hematoxylin and eosin according to the standard method. For light microscopy, a Carl Zeiss Primo Star light microscope (Germany, ZEISS Microscopy) was used.

The condition of the venous wall, the nature and depth of morphological changes, which was determined by the degree of severity of pathological processes in the intima, media, and adventitia, were evaluated.

Results: Visually, the vein treated with laser energy immediately after removal appeared shrunken, dense, deformed, compressed, gray in color, with a reduced lumen due to initial fibrous transformation with multiple, crater-like, black coagulation necrosis covering part or the entire thickness of the venous wall. Microscopic analysis of 60 samples of the venous wall of both groups showed different pathomorphological signs of thermal damage to the vein walls. The results were evaluated based on the depth of damage: «excellent» – thermal damage within the endothelium/subendothelium or thermal damage within the endothelium and media,

«satisfactory» – thermal damage of all venous layers, «unsatisfactory» – no thermal damage.

Histological examination of the slices revealed signs of varicose vasodilatation (myoelastosis and myoelastofibrosis) with continuous carbonization over the entire inner surface of the vein. Carbonization (charring), localized exclusively in the endothelial/subendothelial layers, was found in 8 slices (13.3%). Spread to underlying tissues with moderate edema, cell vacuolization, and disorganization of elastic and collagen fibers were present in 48 slices (80.0%). Dystrophic-necrotic changes at the level of the adventitia were found in 4 slices (6.7%). No cases of tissue damages with extravasation were present

Conclusion. The share of «excellent» results at EVLA with a wavelength of 1940 nm in patients with an expansion of the GSV ≥ 10 mm is 93.3%. The revealed morphological changes of the vein prove the presence of effective influence of laser energy, which provides stable photocoagulation in the lumen of the vein and changes in its wall, which contribute to a favorable postoperative result.

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