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# JUSTIFICATION OF THE SURGICAL APPROACH IN TREATMENT OF PATIENTS WITH LOWER LIMB VARIOUS VEIN DISEASE CONSIDERING THE SUPPLEMENT TO THE CEAP CLINICAL CLASSIFICATION

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***Abstract***

*Varicose disease of the lower limbs nowadays remains an actual medical problem, due to the widespread prevalence of this disease, as well as an increase in the number of complicated cases.*

*Identification of the peculiarities of the functioning of the venous system in patients with varicose disease of the lower limbs will justify the need to modify the CEAP clinical classification, change and standardize the volume of low-trauma surgery, create the best conditions for stabilizing the course and prompt healing of the trophic ulcer.*

*The results of examination and surgical treatment of 132 patients with lower limbs varicose vein disease of type C2-C6 according to CEAP who were on treatment in the surgical department on the basis of the Department of Surgery and Minimally Invasive Technologies of the State Institution "Zaporozhye Medical Academy of Postgraduate Education of the Ministry of Health of Ukraine" were analyzed.*

*Supplements to clinical CEAP classification are suggested with the aim to adapt it to the surgical approach with identification of three clinical variants of stage C6: C6a, C6в and C6c as well as verification of competent perforating veins of "re-entry" and incompetent perforating tibia veins marked with the symbols "Apc" and "Apin", respectively.*

*A combined method for diagnosing the inconsistency of perforating corneal veins in case of varicose veins of lower limbs is developed (Declaration patent of Ukraine No. 70282). The method allows differential diagnostics between a well-founded and inconsistent perforating vein of the tibia, which makes it possible to determine surgical tactics and choose the mode of operation in patients with leg varicose veins.*

*A method of low-traumatic surgical treatment of varicose disease of the lower limbs has been developed, which consists of performing a crossectomy, short stripping of the great saphenous vein trunk with removal of Boyd's perforator, mini collection of collaterals according to Muller. The developed method of surgical treatment of varicose veins of the lower limbs is radical, allows to reduce the traumatism and duration of the operation, to achieve the best cosmetic results.*

*In the postoperative period after 12 months or more, all (100%) patients had complete disappearance of the pain syndrome, edema of the shin, healing of the trophic ulcer in all cases.*

***Keywords:***varicose veins of lower limbs, CEAP classification, surgical treatment.

## Introduction

Varicose disease of the lower limbs remains a serious medical, social and economic problem due to the widespread prevalence of this disease, occurring in more than 20% of the world's economically developed countries, as well as an increase in the number of complicated cases, which is the main cause of a persistent life quality decrease. [*Kotenko K, 2012; Zolotukhin I., et al., 2016*].

The introduction of new non-invasive methods of preoperative ultrasound diagnostics of the varicous bed of the lower limbs allowed us to revise the features of the venous system func-

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tioning in case of varicose vein disease and became a stimulus to find new ways and volumes of surgical treatment of the disease [*Rij A et al., 2011, De Maeseneer M et al., 2011 Churikov D, Kirienko A, 2016*].

This led to the fact that surgical treatment of varicose vein disease of the lower limbs has become less aggressive, and standard intervention is increasingly giving way to "map-based" surgery, which is based on the data from Echo-Doppler, which allows us to limit ourselves to removing only the affected venous segments with an incompetent valvular apparatus which varicose transformation is irreversible [*Gloviczki P et al., 2011; Shevchenko Y, Stoyko YM, 2016*].

In this case, the choice of the method and volume of the operation in patients with stage C6 disease according to the CEAP classification remains the most difficult task. The lack of a common understanding in the choice of treatment tactics and the existing different approaches of surgeons to the choice of the volume of surgery with the presence of trophic ulcer of the tibia lead to the aggravation of the local status in the immediate postoperative period in a number of cases, which leads to prolonged conservative treatment and justifies the need to resolve this issue [*Russian clinical guidelines, 2013; Malas MB et al., 2014*].

It has been proved that in the pathogenesis of trophic disorders in Chronic Venous Insufficiency, the leading role is played by blood reflux through incompetent perforating veins, in particular, vein of the tibia. Its elimination leads to the healing of trophic ulcers in 80% of cases and prevents their recurrence for many years [*Askerov NG et al., 2012; Perrin M et al., 2016; Ricci St, 2015*]. These guidelines can serve as the basis for solving the problem of developing new low-traumatic surgical methods to correct these conditions [*Jacquet R, 2015, Wittens C et al.,2015*].

However, successful treatment of varicose disease of lower limbs is impossible without the use of an effective clinical classification of the disease. The most applicable in practice is the clinical classification of CEAP (Hawaiian). The basic principles of CEAP classification include a description of the clinical class (C) based on objective characteristics, etiology (E), anatomical features (A) and pathophysiology (P), whether due to reflux and / or obstruction in the superficial, deep and perforating veins of the lower limbs [*Porter JM, Moneta GL, 1995*].

Developed as a document which will be improved and updated over time, CEAP was first officially introduced and reviewed by an international panel of experts under the auspices of the American Venous Forum in 2004 [*Eklöf B et al., 2004*]. The revised document retains, but improves the basic categories of CEAP. In addition, to promote greater use among physicians, a reduced version or "basic CEAP" was adopted as an alternative to a comprehensive CEAP [*De Meissner M et al., 2007*].

At present, the current version of the CEAP classification does not meet all the requirements of surgeons, not allowing to determine tactics and apply some modern surgical interventions [*Voloshin MM, 2014*].

In our opinion, identifying the features of the venous system in patients with varicose disease of the lower limbs will justify the need to modify the CEAP clinical classification, change and standardize the volume of low-trauma surgery, create the best conditions for stabilizing the course and prompt healing of the trophic ulcer.

The objective is to develop supplements to the CEAP clinical classification to justify surgical tactics and to choose the method of low-traumatic surgical treatment of patients with varicose veins of the lower limbs.

## Material and methods

The study included 132 patients with varicose disease of the lower limbs of C2-C6 type by CEAP, who underwent treatment in the surgical department on the basis of the Department of Surgery and Minimally Invasive Technologies of the State Institution "Zaporizhzhia Medical Academy of Postgraduate Education of the Ministry of Health of Ukraine."

There were 91 women (68.9%) and 41 men (31.1%) involved in the study. The average age of the patients was 46.3 ± 4.5 years, and the duration of the disease was 18.3 ± 5.1 years.

Depending on the class of varicose disease of the lower limbs, the patients were distributed as follows: C2 - 8 (6.06%), C3 - 47 (35.6%), C4a - 33 (25.0%), C4b - 32 (24.3%), C5 - 4 (3.0%), C6 - 7 (5.3%) patients. Trophic ulcers were located in the

area of the medial malleolus, their size did not exceed 3 *cm* in diameter, averaging 2.5 ± 0.4 *cm*, and the duration of existence was 0.5 to 5 years. Clinical severity of the disease was from 5 to 21 points according to Rutherford (2000).

All patients underwent ultrasonic duplex scanning of the veins of the lower limbs with the help of the "Logic C-5" device ["Logic C-5", GE, USA]. Deep venous patency, presence of venous reflux, establishment of the reflux limits on stem saphenous veins, degree of degenerative changes in the venous wall of the main veins, determination of the exact localization, diameter and presence of reflux on the perforating veins were assessed.

To describe the selective normal distribution of quantitative characteristics, the mean value (M) of the characteristic and the standard deviation (m) were indicated error of the mean in the form M±m.

To obtain a reliable estimate of the correspondence of the distribution under study to the normal distribution law, a statistical hypothesis on the form of the distribution was verified. The critical level of statistical significance in the work is 0.05. Further analysis was carried out using a parametric Student t-test.

**Results and discussion.**

All patients underwent surgical treatment of varicose disease of the lower limbs. Patients were divided into 2 clinical groups:

1) the first group (control) - 22 (16.7%) patients with true incompetence of the perforating veins of the tibia, who underwent crossectomy, long stripping of the trunk of the great saphenous vein, phlebectomy of collaterals, ligation of the perforating veins of the tibia;
2) the second group (primary) - 110 (83.3%) patients with competent ("re-entry") perforating veins, who underwent radical surgical intervention according to the developed method: crossectomy, short stripping of the trunk of the great saphenous vein with the removal of the Boyd's perforator, microphlebectomy of collaterals by Muller.

According to preoperative ultrasound duplex scanning deep veins were passable in all patients. The diameter of the big saphenous vein on the affected limb at the femur level was 13.2 ± 2.37 *mm*, on the tibia – 11.6 ± 3.21 *mm*. The diameter of the small saphenous vein was 2.7 ± 1.71 *mm*. The ostial valves of the sapheno-femoral anastomosis were incompetent in 129 (97.7%) patients and of saphenopopliteal anastomosis in 21 (15.9%) patients.

A method of diagnosing the incompetence of perforating tibia veins in case of varicose veins of lower limbs has been developed (Declaration Patent of Ukraine No. 70282). The method allows differential diagnostics between a competent and incompetent perforating vein of the tibia. This helps to avoid the removal of an unchanged section of the saphenous vein during the surgery, which reduces injuries, shortens the duration of the surgery and the time of recovery.

The method is performed in the following way: in the patient's standing position, duplex doppler of the perforating tibia veins is performed. In this case the increase in the internal diameter of the saphenous vein and perforating veins, as well as the presence of retrograde blood flow are diagnosed and measured. Then the patient is transferred to the supine position and the veins of the lower limb are emptied by lifting the limbs upward at an angle of 45-60 degrees and performing massage movements in the direction from the foot to the inguinal fold along the saphenous veins of the limb for 1-2 minutes. After this, a venous tourniquet is placed in the upper third of the shin at the distance of 30-35 *cm* from the plantar surface of the foot, that is, proximal to the non-centered Sherman perforator of Leonardo's vein and distal of the centered direct Boyd's perforator of the great saphenous vein. The patient is transferred to the standing position and duplex doppler of the perforating veins of the lower leg distal of the applied tourniquet is performed. The internal diameter of the perforating vein and the direction of blood flow are measured. In case doppler ultrasound shows a decrease in the internal diameter of the perforating tibia veins and the absence of retrograde blood flow, the competence of the perforating tibia veins is recorded.

With an increase in the internal diameter of the perforated veins and the presence of retrograde blood flow, the incompetence of the perforating veins of the tibia is determined.

An increase in the internal diameter of the perforating veins of the tibia was revealed in patients of both groups in the standing position, as well as the presence of a retrograde blood flow.

At the same time, in the patients of the first group, these indices were: Cockett perforator 1 - 3.1 ± 0.36 *mm*, Cockett 2 - 3.6 ± 0.13 *mm*, Cockett 3 - 3.3 ± 0.21 *mm*, Sherman - 4.1 ± 0.19 *mm*. Patients of the second group also showed an increase in the internal diameter of the perforating veins: Cockett 1 - 3.2 ± 0.23 *mm*, Cockett 2 - 3.3 ± 0.31 *mm*, Cockett 3 - 3.2 ± 0.17 *mm*, Sherman - 4.0 ± 0.28 *mm*.

After emptying the veins in the lying position and applying a tourniquet in the upper third of the tibia, duplex scanning of the perforating veins of the tibia distal to the applied tourniquet was performed according to the above procedure. The diameter of the veins in the first group of patients was not significantly reduced, thus indicating the presence of a true failure perforators of the tibia, and the average values were: Cockett 1 – 3.0 ± 0.22 *mm*, Cockett 2 – 3.4 ± 0.29 *mm*, Cockett 3 - 3.3 ± 0.22 *mm*, Sherman - 3.9 ± 0.39 mm. The patients of the second group showed a significant decrease in the diameter of the perforating veins: Cockett 1 - 2.2 ± 0.1 *mm*, Cocket 2 - 2.0 ± 0.1 *mm*, Cockett 3 - 2.1 ± 0.2 *mm*, Sherman - 1.9 ± 0.46 *mm*.

The analysis of the data showed that only in 22 (16.7%) of 132 patients with initial increase in the internal diameter of the perforating tibia veins a true incompetence with the presence of pathological reflux was present. In 110 (83.3%) patients the internal diameter of the perforating veins decreased, and a retrograde blood flow was absent, which indicated their competence (perforating veins "re-entry").

The results of preoperative examination showed that the difference in the indices during the examination without a tourniquet and with a tourniquet in the first group was statistically significant ($p<0.05$), while in the second group it was statistically insignificant ($p>0.05$). It was found that the difference in the indices between the groups during the examination with the tourniquet was statistically significant ($p<0.05$), which confirms the presence of "re-entry" in the patients of the first group with perforating veins.

Consequently, in patients with the presence of "re-entry" perforating tibia veins there are no indications for their removal or ligation during the operation.

Considering the results obtained during the examination of patients according to the developed method of diagnostics, the features of functioning of the venous system in varicose veins were established, which made it possible to develop a low-traumatic method of radical surgical treatment (Declaration Patent of Ukraine No. 78009).

The following theoretical justification served the basis for the development of this method of surgery:

- the great saphenous vein below the knee does not have centered straight perforators, which eliminates the need for phlebectomy;
- non-centered straight perforators of the posterior additional great saphenous vein of the tibia
- (Leonardo's vein) in 85-90% of cases are "re-entry" perforators;
- the most distal centered direct perforator of the great saphenous vein is Boyd's perforator, which is located in the upper third of the shin and which determines the distal point of the great saphenous vein trunk stripping;
- the small saphenous vein trunk is affected only in 15% of cases, therefore its removal is indicated in the presence of the established indications;
- absence of the perforator under the bottom of the ulcer in 85.7% of cases with a chronic trophic ulcer.

This makes it possible to limit the length of the removal of the great saphenous vein stem by performing a short stripping with the localization of the distal intervention point 6 *cm* below the apex of the patella with the removal of the Boyd's perforator; to intervene on Leonardo's vein and perform ligation of perforating veins on the tibia only if there are indications determined by the results of pre-operative duplex doppler of veins or by clinical data; perform intervention on the trunk of the small saphenous vein only in the presence of indications, determined by the results of pre-operative implementation of duplex doppler of veins; limit the amount of intervention on the trunk of the great saphenous vein in patients with chronic trophic ulcers of the tibia by performing short stripping, and in the presence of indications to additionally perform phlebectomy of collaterals.

In the standard version, the volume of the proposed surgery consists of performing a crossectomy, short stripping of the great saphenous vein trunk with the removal of Boyd's perforators and Muller's microphlebectomy.

On the 5th day after the surgery, according to the developed method, the values of the internal diameter of the perforating veins on the tibia did not differ from the indices of healthy individuals and constituted: Cockett 1 – 2.1 ± 0.73 *mm*, Cockett 2 - 2.0 ± 0.65 *mm*, Cockett 3 – 2.2 ± 0.41 *mm* and Sherman – 2.1 ± 0.36 *mm*, respectively.

In the postoperative period after 12 months or more, the patients had complete disappearance of the pain syndrome, edema of the tibia, healing of the trophic ulcer in all cases.

Consequently, the results of postoperative duplex doppler ultrasound of the perforating tibia veins, clinical examination data confirm the correctness of the justification of the performed surgery volume according to the proposed method.

The developed method of surgical treatment of varicose disease of veins in the lower limbs is radical and allows to reduce the traumatism and duration of the surgery as well as to achieve the best cosmetic results.

The established features of the venous system functioning in patients with varicose vein disease, theoretical and practical justification for changing the volume of surgical intervention in various clinical situations served as the basis for changing the classification of CEAP with the aim of adapting it to the surgical tactics. To do this, we have proposed:

1) to distinguish three variants of stage C6: C6a, C6b and C6c;
2) when describing the perforating veins (Ap), indicate the mechanism of retrograde blood flow in them: competent perforating veins "re-entry" or incompetent perforating veins, adding to the known symbol Ap the sign "c" ("competent") or "in" ("incompetent"). Accordingly, competent perforating veins "re-entry" should be defined as "Apc", and incompetent perforating veins - "Apin".

This allows you to change the tactical approaches and the volume of the surgery on the tibia perforators:

- C6a («re-entry» perforators) – the surgery is not indicated;
- C6в (incompetent tibia perforators away from the ulcer localization) - microphlebectomy with perforation ligation is indicated;
- C6c (incompetent tibia perforators directly below the bottom of the ulcer) - endoscopic ligation of perforators is indicated.

**Conclusion.**

The proposed supplements to the CEAP clinical classification make it possible to determine surgical tactics and to select the surgery method in patients with varicose disease of the lower limbs.

The combined method of examination of patients with varicose disease of the lower limbs makes it possible to establish the true incompetence of the perforating tibia veins and to apply the developed low-traumatic radical method of surgical treatment.

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