DOI 10.11603/2414-4533.2024.1.14649
УДК 616.84-008.64-085.212

©O. V. KOLOMIETS[1]
vascularkolomiiets@gmail.com; ORCID https://orcid.org/0000-0002-2850-1638

©A. I. SUKHODOLIA[2]
ORCID https://orcid.org/0000-0002-8744-5584

Khmelnytskyi Regional Clinical Hospital, Khmelnytskyi, Ukraine[1]
M. Pyrohov Vinnytsia National Medical University, Vinnytsia, Ukraine[2]

Comparison of endovascular and stripping methods in combination with prolonged intravenous infusion therapy of lidocaine in treatment of chronic venous insufficiency

The aim of the work: to compare the results of using endovascular and classical stripping methods in combination with intravenous administration of lidocaine solution for the treatment of chronic venous disease in the stage of trophic wounds.
Materials and Methods. The results of treatment of 78 patients with chronic venous insufficiency in stage C6 and C6r were evaluated. Subjects were divided into two clinical groups: group 1 - endovenous laser ablation (n=31) and group 2 (n=47) – classical surgical intervention (high ligation + great saphein vein stripping). In both groups method of prolonged intravenous lidocaine 2 % solution injection was used according to the proposed method. Postoperative monitoring was performed 1, 3, 6 months and 1 year after the surgical treatment. The result was evaluated when compared with the VCSS, VDS, VSDS scales.
Results and Discussion. The dynamics of the pain syndrome when evaluated after 1, 3, 6 months generally showed its rapid regression among patients of both groups. In both experimental groups, the average value of the "number of active ulcers" before surgical treatment was (1.89 ± 0.06) points in the prospective group and (1.92 ± 0.08) points in the retrospective group, respectively, which indicated the presence of an average almost 2 active ulcers in one patient. After the treatment in group 1, rapid dynamics of healing of the wound surfaces was observed already after 1-3 months of postoperative treatment. While in group 2, after 6 months, somewhat slower dynamics were observed. In the same group, a year after treatment, the presence of recurrence of active trophic ulcers was noted in 10 % of patients.It was established that the combination of minimally invasive methods of treatment of varicose veins with endovenous laser coagulation in combination with prolonged administration of lidocaine solution significantly accelerates the healing of trophic wounds. At the same time, analyzing the indicators of the VCSS, VDS, VSDS scales, significantly better clinical indicators were established in terms of follow-up up to 1 year.

Key words: VCSS; VDS; VSDS; varicose veins; active trophic ulcers.

Introduction. Modern approaches to the treatment of chronic venous insufficiency are based on the principle of stages, as well as a rational combination of compression, conservative and surgical treatment, taking into account the stages of venous insufficiency, clinical manifestations and the presence of complications [3]. In general, chronic venous disease with trophic skin changes, including leg ulcers (C5 – C6) occurs in almost 5 % of the global population [8]. The number of people in Africa is staggering, with estimates ranging from 25 to 135 million people with chronic wounds, up to 2.2 million people in Europe, and over 6 million people in the United States.

The most common method of treatment today remains surgical [4]. However, the use of all modern methods of treatment does not ensure the expected rapid healing of ulcers. Moreover, many surgeons unjustifiably consider it impossible to perform operations involving the correction of venous hemodynamic disorders with an open trophic ulcer. Even with a combination of surgical treatment and compression therapy, healing takes an average of up to 6 months.

In recent years, there have been works on determining the role of Lidocaine solution in regenerative injection therapy [11], which confirm the clinical effect caused by the induction of fibroblast proliferation and increased collagen synthesis.

The aim of the work: to compare the results of using endovascular and classical stripping methods in combination with intravenous administration of lidocaine solution for the treatment of chronic venous disease in the stage of trophic wounds.

Materials and Methods. The results of treatment of 78 patients with chronic venous insufficiency in stage C6 and C6r were evaluated. Subjects were divided into two clinical groups: group 1 – endovenous laser ablation (n=31) and group 2 (n=47) – classical surgical intervention (high ligation + great saphein vein stripping). In both groups method of prolonged intravenous lidocaine 2 % solution injection was used according to the proposed

method [9]. Patients of both groups were representative by sex, age, number of comorbidities, risk factors, and conditions of surgical treatment (surgical treatment was performed in the same surgical department).

CEAP classification was used for clinical examination (2020) [5]. Duplex ultrasound venous system of the lower extremities was performed using Toshiba Aplio 500. Trophic wounds were evaluated: number of wounds, their location, area, duration of wound anamnesis.

Endovenouse laser ablation was performed by the "Lika-Surgeon" device, which generates a wavelength of 1470 nm and radial light guides.

Postoperative monitoring was performed 1, 3, 6 months and 1 year after the surgical treatment. The result was evaluated when compared with the VCSS, VDS, VSDS scales.

Analysis and processing of statistical data of conducted clinical studies was carried out on a personal computer using the STATISTIC A 5.0 application program package, MS Excel XP.

The obtained results are presented in the form of absolute and relative values, averages with standard deviations. The significance of differences in quantitative data was assessed using the Student's t-test. Critical values of the level of statistical significance when testing the null hypothesis were taken equal $p \leq 0.05$.

Results. Comparing the total value of the severity of the disease in both groups (23.03±2.06) and (22.92±1.72) points, it was stated that these indicators did not reliably differ from each other ($p<0.05$) (Table 1).

The dynamics of the pain syndrome when evaluated after 1, 3, 6 months generally showed its rapid regression among patients of both groups. On the 30th day, the vast majority of people did not experience pain in the areas of surgical intervention. (Fig. 1). 1 year after the surgical interventions, the pain syndrome was actually absent. Faster regression of pain in group 1 was due to minimally invasive surgical intervention.

Table 1 – Preoperative Clinical Severity Score (VCSS) in both groups

VCSS	group 1 (n=31)	group 2 (n=47)
Anatomical account (A)	3,31 ± 0,30*	3,25 ± 0,14
General clinical score (C)	18,14 ± 0,80*	18,03 ± 1,42
Account of physical activity (D)	1,47 ± 0,12*	1,75 ± 0,10
Severity of the disease (CAD score)	22,92 ± 1,72*	23,03 ± 2,06

Note. *(p>0.05) compared to the 2nd group

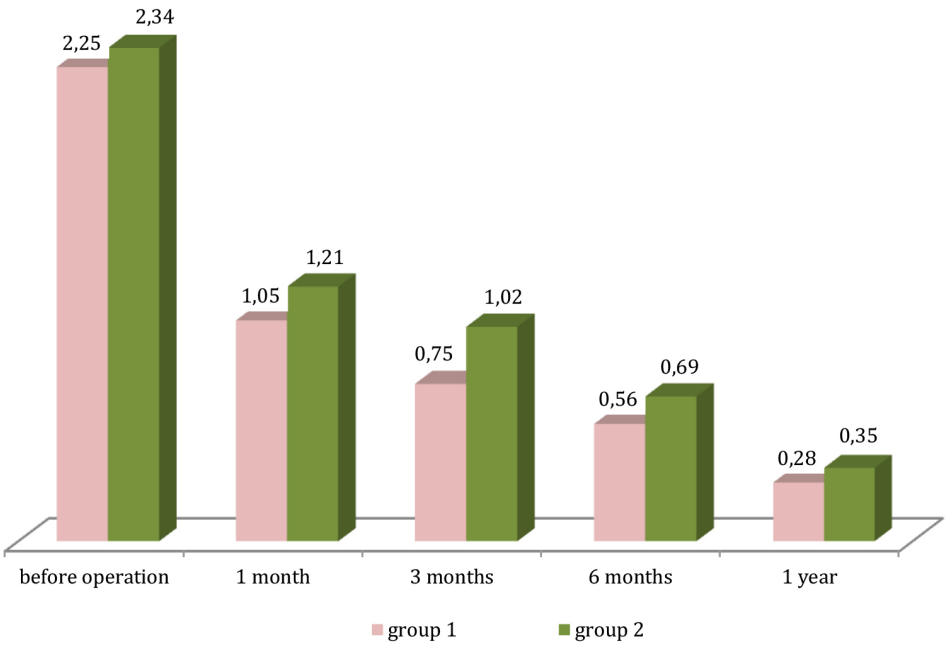

Fig. 1. Average "pain" index of patients of two groups during 1 year of observation

Since all patients of both groups had active trophic ulcers, high preoperative mean scores were noted for such parameters of the scale as the number of active ulcers, the duration of the wound history, and the size of the ulcer.

In both experimental groups, the average value of the "number of active ulcers" before surgical treatment was (1.89 ± 0.06) points in the prospective group and (1.92±0.08) points in the retrospective group, respectively, which indicated the presence of an average almost 2 active ulcers in one patient.

After the treatment in group 1, rapid dynamics of healing of the wound surfaces was observed already after 1–3 months of postoperative treatment (Fig. 2). While in group 2, after 6 months, somewhat slower dynamics were observed. In the same group, a year after treatment, the presence of recurrence of active trophic ulcers was noted in 10 % of patients.

The wound history was assessed by the indicator "duration of the existence of the ulcer". In both experimental groups, the average value of the "number of active ulcers" before surgical treatment was (2.31±0.12) points in group 1 and (2.45±0.10) points in group 2, respectively, which indicated the average duration of wound the anamnesis was about 1 year.

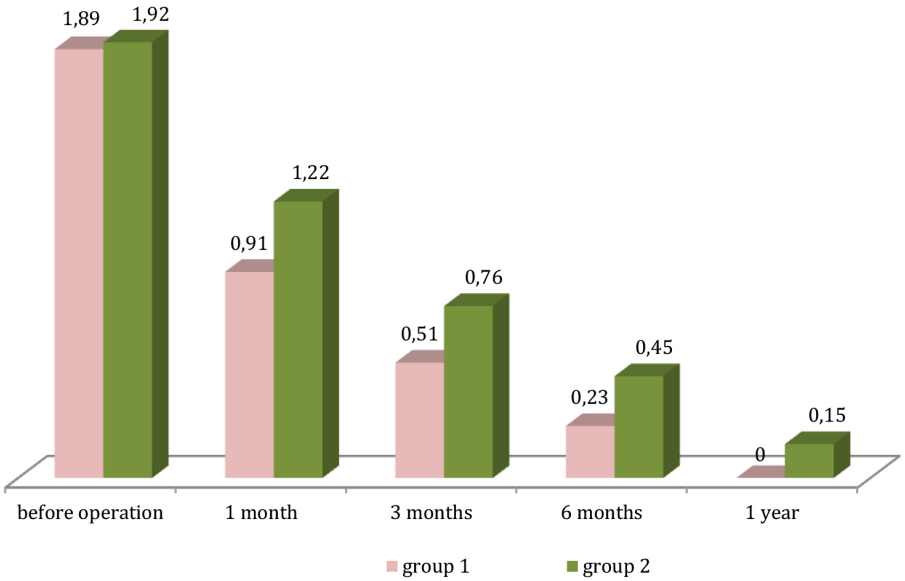

Fig. 2. Average "number of active ulcers" of patients of two groups during 1 year of observation.

According to the "ulcer size" indicator, the following preoperative data were established: (2.05±0.14) points in group 1 and (2.13±0.11) points in group 2, respectively. That is, widespread wound defects prevailed, which was due to a rather long history and severity of clinical manifestations of varicose disease in general. For a more detailed assessment of the dynamics of changes in the size of trophic ulcers, we present the data of observations on the 7th, 14th and 28th days after the applied surgical treatment according to our own method (Table 2).

Table 2. Dynamics of the average area of an active trophic ulcer in both groups during the observation period up to 1 month (M±m)

Observation term	Average area, sm^2	
	1 group (n=31)	2 group (n=47)
Before the operation	13.96±0.02	14.21±0.02
7 days p/o period	12.63±0.03	13.95±0.05
14 days p/o period	11.82±0.01	13.37±0.04
21 days p/o period	10.12±0.04	12.04±0.02
28 days p/o period	9.52±0.03*	11.48±0.03**

Note: *p<0.05 – compared to the preoperative indicator, **p<0.05 – compared to group 2.

The most important effect provided by operative methods of treatment is the elimination of the main pathogenetic link and prevention of relapse, namely the elimination of vertical and horizontal refluxes. Positive segmentation index data (VSDS ($p<0.05$)) were found in patients of both groups (Fig. 3).

When assessing physical activity after surgical treatment in both groups, it was established that it recovered somewhat faster in group 1 due to accelerated healing of the active ulcer and less "operative trauma" (Fig. 4).

Analyzing the indicator of average severity of the disease (VCSS) during the year of observation, its

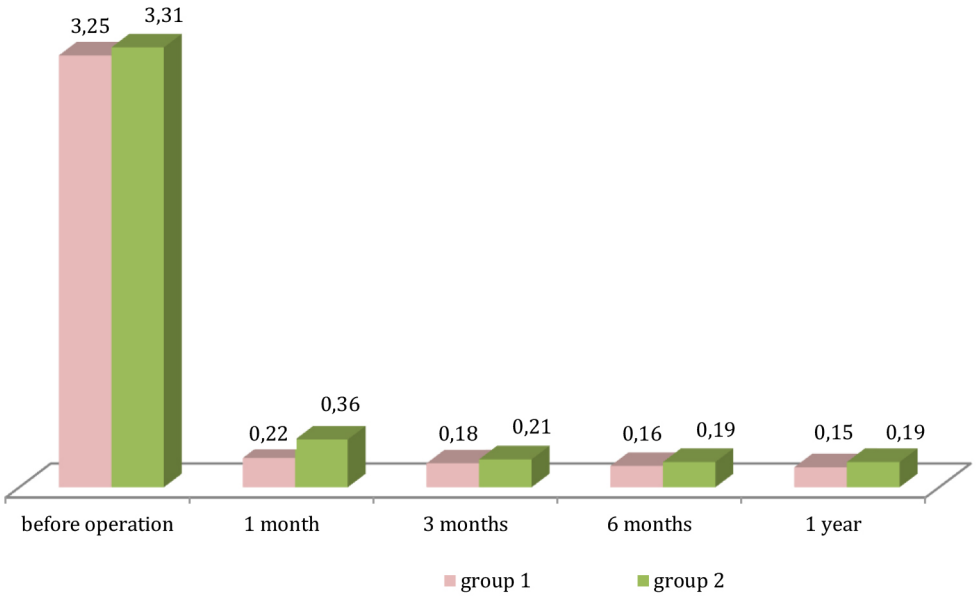

Fig. 3. The average VSDS (anatomical reflux score) of patients of two groups during 1 year of observation.

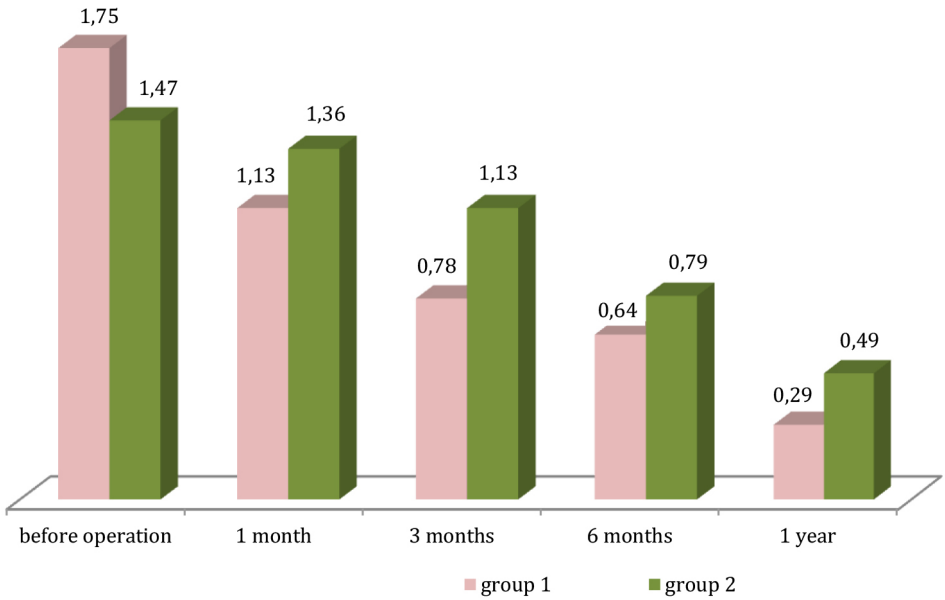

Fig. 4. The average VDS (physical activity) of patients of two groups during 1 year of observation.

significant decrease was noted already 1 month after the surgical treatment according to our own method (Fig. 5).

Thus, it was established that already after 1 month, this indicator significantly decreased in both groups.

Discussion. Instillation of local anesthetics into surgical wounds is one method used to accelerate healing to reduce intraoperative or postoperative pain. The most common agents used are lidocaine and bupivacaine. Some researchers reported that local anesthetics delay the healing of wounds, whereas others claimed that the same substances had a positive effect on the healing process. Generally, lidocaine was used, and

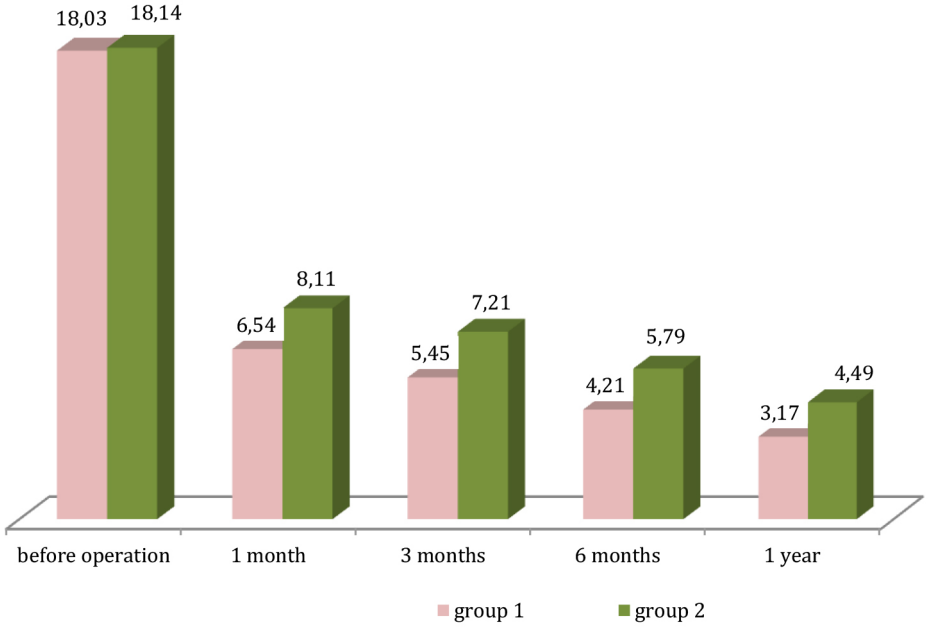

Fig. 5. Average VCSS of patients of two groups during 1 year of observation.

various aspects of the effect of this substance have been observed on the healing of wounds.

Dere et al.[1] reported that patients who received levobupivacaine at various doses exhibited significantly increased wound tension strength. It was noticed that levobupivacaine infiltration, especially at a dose of 2.5 mg/kg, significantly decreased wound tension strength on the 8th day. Levobupivacaine negatively affected wound healing during the early period. On the other hand, positive effects were observed in the late period of observation.

There are some studies evaluating the effects of local anesthetics on the inflammatory response associated with healing. In study of Vasseur et al. [10] was reported that lidocaine infiltration at an incision site inhibits collagen synthesis and causes tissue necrosis. However, Nietgen et al. [6] suggested that lidocaine and bupivacaine inhibited smooth muscle and fibroblast growth by negatively affecting lysophosphatidate.

Acording to the Rodrigues et al. results [7] lidocaine totaly decreased the number of wound mast cells. Some kind of similar results showed Feder et al. [2] where lidocaine, bupivacaine, and ropivacaine had a cytotoxic effect on fibroblasts.

Conclusions. It was established that the combination of minimally invasive methods of treatment of varicose veins with endovenous laser coagulation in combination with prolonged administration of lidocaine solution significantly accelerates the healing of trophic wounds. At the same time, analyzing the indicators of the VCSS, VDS, VSDS scales, significantly better clinical indicators were established in terms of follow-up up to 1 year.

Conflict of interests. The authors declare no conflict of interest.

Funding. The authors declare that they have not received funding.

Contribution of the authors. A.I. Sukhodolia – research idea and design; O.V. Kolomiets literature review, writing text; analysis and discussion

LITERATURE

1. The comparison of the effects of different doses of levobupivacaine infiltration on wound healing / K. Dere, H. Sen, E. Teksoz [et al.] // J. Invest. Surg. – 2009. – Vol. 22. – P. 112–116.
2. In vitro exposure of human fibroblasts to local anaesthetics impairs cell growth / C. Fedder, B. Beck-Schimmer, J. Aguirre [et al.] // Clin. Exp. Immunol. – 2010. – Vol. 162. – P. 280–288.
3. Chronic venous insufficiency / K. Gujja, T. Kayiti, C. Sanina, J. M. Wiley // Interventional Cardiology: Principles and Practice. – 2022. – P. 835–843.
4. Liakhovskyi V. I. Surgical treatment of complicated forms of chronic venous insufficiency in lower limbs / V. I. Liakhovskyi, R. M. Riabushko, A. V. Sydorenko // Актуальні проблеми сучасної медицини: Вісник Української медичної стоматологічної академії. – 2020. – Vol. 20, No 4. – P. 209-215.
5. The 2020 update of the CEAP classification system and reporting standards / F. Lurie, M. Passman, M. Meisner [et al.] // Journal of Vascular Surgery: Venous and Lymphatic Disorders. – 2020. – Vol. 8, No 3. – P. 342–352.
6. Nietgen G.W. Inhibition of lysophosphatidate signaling by lidocaine and bupivacaine / G.W. Nietgen, C. K. Chan, M. E. Durieux //Anesthesiology. – 1997. – Vol. 86. – P. 1112–1129.
7. Effects of lidocaine with epinephrine or with buffer on wound

healing in rat skin / F. V. Rodrigues, B. Hochman, V. T. Wood [et al.] // Wound Repair Regen. – 2011. – Vol. 19. – P. 223–228.
8. Santler B. Chronic venous insufficiency–a review of pathophysiology, diagnosis, and treatment / B. Santler, T. Goerge // JDDG: Journal der Deutschen Dermatologischen Gesellschaft. – 2017. – Vol.15, No. 5. – P. 538–556.
9. Suxodolya A.I., Suxodolya S.A., Kolomiyecz O.V., Krelov K. Yu. Sposib likuvannya trofichnyx vyrazok pry xronichnij venoznij insufficiency. (2018). A61B 17/00, A61M 25/01 (2006.01), A61K 31/167 (2006.01), A61P 17/02 (2006.01). Patent for utility model № 117797. byul. № 18/2018.
10. Effects of local anesthetics on healing of abdominal wounds in rabbits / P. B. Vasseur, H. A. Paul, N. Dybdal, L. Crumley // Am. J. Vet. Res. – 1984. – Vol. 45. – P. 2385–2388.
11. The proper concentrations of dextrose and lidocaine in regenerative injection therapy: in vitro study / M. S. Woo, J. Park, S. H. Ok [et al.] // The Korean Journal of Pain. – 2021. – Vol. 34, No 1. – P. 19–26.

REFERENCES

1. Dere K, Sen H, Teksoz E, Ozkan S, Dagli G, Sucullu I, Filiz AI, Ipcioglu OM, Kucukodaci Z. The comparison of the effects of different doses of levobupivacaine infiltration on wound healing. J Invest Surg. 2009;22: 112-6.
2. Fedder C, Beck-Schimmer B, Aguirre J, Hasler M, Roth-Z'graggen B, Urner M, Kalberer S, Schlicker A, Votta-Velis G, Bonvini JM, Graetz K, Borgeat A. In vitro exposure of human fibroblasts to local anaesthetics impairs cell growth. Clin Exp Immunol. 2010;162: 280-8.
3. Gujja K, Kayiti T, Sanina C, & Wiley JM. Chronic venous insufficiency. Interventional Cardiology: Principles and Practice, 2022; 835-43.
4. Liakhovskyi VI, Riabushko RM, Sydorenko AV. Surgical treatment of complicated forms of chronic venous insufficiency in lower limbs. Aktualn probl such med: Visn Ukr med stomat akad. 2020;20(4): 209-15.
5. Lurie, F., Passman, M., Meisner, M., Dalsing, M., Masuda, E., Welch, H., ... & Wakefield, T. The 2020 update of the CEAP classification system and reporting standards. Journal of Vascular Surgery: Venous and Lymphatic Disorders. 2020;8(3): 342-52.
6. Nietgen GW, Chan CK, Durieux ME. Inhibition of lysophosphatidate signaling by lidocaine and bupivacaine. Anesthesiology. 1997;86: 1112-9.
7. Rodrigues FV, Hochman B, Wood VT, Simões MJ, Juliano Y, Ferreira LM. Effects of lidocaine with epinephrine or with buffer on wound healing in rat skin. Wound Repair Regen. 2011;19: 223-8.
8. Santler B, Goerge T. Chronic venous insufficiency–a review of pathophysiology, diagnosis, and treatment. JDDG: Journal der Deutschen Dermatologischen Gesellschaft, 2017;15(5): 538-56.
9. Suxodolya AI, Suxodolya SA, Kolomiyecz OV, Krelov KYu. Methods of treatment of trophic ulcers when chronic venous insufficiency. (2018). A61B 17/00, A61M 25/01 (2006.01), A61K 31/167 (2006.01), A61P 17/02 (2006.01). Patent for utility model № 117797. byul. № 18/2018. Ukrainian.
10. Vasseur PB, Paul HA, Dybdal N, Crumley L. Effects of local anesthetics on healing of abdominal wounds in rabbits. Am J Vet Res. 1984;45: 2385-8.
11. Woo MS, Park J, Ok SH, Park M, Sohn JT, Cho MS, ... & Kim YA. The proper concentrations of dextrose and lidocaine in regenerative injection therapy: in vitro study. The Korean Journal of Pain, 2021;34(1): 19-26.

Отримано 26.01.2024

Електронна адреса для листування: vascularkolomiiets@gmail.com

О. В. КОЛОМІЄЦЬ[1], А. І. СУХОДОЛЯ[2]

КНП "Хмельницька обласна клінічна лікарня" Хмельницької обласної ради[1], Хмельницький, Україна
Вінницький національний медичний університет імені М. І. Пирогова, Вінниця, Україна

ПОРІВНЯННЯ РЕЗУЛЬТАТІВ ЕНДОВАСКУЛЯРНИХ ТА КЛАСИЧНИХ МЕТОДІВ СТРИПІНГУ В ПОЄДНАННІ З ПРОДОВЖЕНОЮ ВНУТРІШНЬОВЕННОЮ ІНФУЗІЙНОЮ ТЕРАПІЄЮ ЛІДОКАЇНОМ В ЛІКУВАННІ ХРОНІЧНОЇ ВЕНОЗНОЇ НЕДОСТАТНОСТІ ВЕН НИЖНІХ КІНЦІВОК

Мета роботи: порівняти результати застосування ендоваскулярних і класичних методів стрипінгу в поєднанні з внутрішньовенним введенням розчину лідокаїну для лікування хронічних захворювань вен у стадії трофічних ран.
Матеріали і методи. Проведено оцінку результатів лікування 78 хворих на хронічну венозну недостатність у стадії С6 і С6r. Пацієнти були поділені на дві клінічні групи: 1 група – ендовенозна лазерна абляція (n=31) і 2 група (n=47) – класичне хірургічне втручання (висока перев'язка + видалення великої підшкірної вени). В обох групах застосовували метод пролонгованого внутрішньовенного введення 2 % розчину лідокаїну за власною методикою. Післяопераційний моніторинг проводили через 1, 3, 6 місяців та 1 рік після хірургічного лікування. Результат оцінювали при порівнянні зі шкалами VCSS, VDS, VSDS.
Результати. Динаміка больового синдрому при оцінці через 1, 3, 6 місяців в основному показала його швидкий регрес у пацієнтів обох груп. В обох дослідних групах середнє значення "кількості активних виразок" до хірургічного лікування становило відповідно (1,89 ± 0,06) бала у проспективній групі та (1,92 ± 0,08) бала у ретроспективній групі, що свідчило про наявність в середньому майже 2 активних виразок в одного пацієнта. Після лікування в 1 групі спостерігали швидку динаміку загоєння ранових поверхонь вже через 1-3 місяці післяопераційного лікування. У 2 групі через 6 місяців спостерігали дещо сповільнену динаміку. У цій же групі через рік після лікування відзначено наявність рецидивів активних трофічних виразок у 10 % хворих. Встановлено, що поєднання міні-інвазивних методів лікування варикозної хвороби з ендовенозною лазерною коагуляцією в поєднанні з тривалим прийманням розчину лідокаїну значно прискорює загоєння трофічних ран. Аналізуючи показники шкал VCSS, VDS, VSDS, встановлено достовірно кращі клінічні показники за терміном спостереження до 1 року в пацієнтів 1 групи.

Ключові слова: VCSS, VDS, VSDS, варикозне розширення вен, активні трофічні виразки.