Journal of Lasers in Medical Sciences

J Lasers Med Sci 2024;15:e2

Original Article

http://journals.sbmu.ac.ir/jlms

doi 10.34172/jlms.2024.02

Comparative Efficacy of Postoperative Compression Methods After EVLT for Great Saphenous Vein Insufficiency

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Received: November 5, 2023
Accepted: February 17, 2024
ePublished: February 28, 2024

Abstract

Introduction: The preference for endovascular techniques in treating varicose veins, particularly in the great saphenous vein (GSV), has increased due to their minimally invasive nature and reduced complications. Post-operative care, especially involving compression therapy, remains crucial to improve outcomes, prevent varicose vein recurrence, and enhance overall recovery. This study aimed to evaluate the efficacy of eccentric compression therapy compared to alternative post-operative care methods following endovenous laser treatment (EVLT) for GSV insufficiency.

Methods: This prospective randomized clinical trial encompassed 88 EVLT procedures for GSV insufficiency. The participants were divided into two groups, each receiving different postoperative compression methods, and were evaluated over a specified period. The primary outcome was the pain scale after EVLT; meanwhile, the secondary outcome measured in the present study was the rate of GSV occlusion after EVLT.

Results: Both groups underwent all EVLT procedures successfully without any complications. At the one-month duplex ultrasound (DUS) follow-up, the sapheno-femoral junction occlusion rates were 97% (43 out of 44) for group A (eccentric compression plus gradual compression stocking) and 95% (42 out of 44) for group B (only gradual compression stocking). Ecchymosis was observed in only 12 patients across both groups, accounting for an overall occurrence of 13.6%. Group A patients reported significantly lower analgesic usage (10%) compared to group B (18%), although this difference did not reach statistical significance. Analysis of postoperative pain data utilizing the visual analog scale (VAS) showed a median value of 5.5 in group B patients, which decreased to 3.1 with the application of eccentric compression. Moreover, there was less ecchymosis in group A observed by one week.

Conclusion: This study contributes to the ongoing discourse on the efficacy of postoperative compression in varicose vein treatment. It underscores the necessity for more comprehensive, well-designed studies to yield clearer conclusions and provide better guidance for post-procedure care.

Keywords: Compression stocking; Varicose vein; Endovenous laser treatment (EVLT); Pain; VAS; Eccentric compression therapy.

Introduction

The preferred choice for both vascular specialists and patients in treating great saphenous vein (GSV) varicosities is now the use of new endovascular techniques.[1,2] This shift from open surgery to less invasive approaches is due to the lower risk of complications associated with minimally invasive procedures for treating superficial truncal insufficiency. Consequently, there has been a transition away from conventional methods like high ligation and stripping towards less invasive techniques like radiofrequency ablation (RFA) and endovenous laser treatment (EVLT).[3]

Following a successful endovascular laser procedure, proper post-operative care is crucial to enhance patient outcomes, alleviate symptoms, and prevent the recurrence of varicose veins. The traditional consensus is that the

Please cite this article as follows: Tadayon N, Mousavizadeh M, Yousefimoghaddam F, Jadidian F, Mirhosseini M, Hadavand N. Comparative efficacy of postoperative compression methods after EVLT for great saphenous vein insufficiency. *J Lasers Med Sci*. 2024;15:e2. doi:10.34172/jlms.2024.02.

utilization of compression therapy is advantageous after any varicose vein treatment, as it improves patient comfort and reduces the risk of complications such as phlebitis.[4] Nevertheless, the efficacy of this strategy when compared to alternative compression techniques for varicose vein procedures has not been thoroughly investigated, and there is a lack of agreement regarding the most suitable degree of compression and duration of therapy.

Compression therapy following GSV sclerotherapy, surgery, and ablation encompasses a diverse range of approaches, spanning from minimal compression to two prevalent methods of compression therapy: compression stockings and bandages. These methods are typically employed for short-term purposes. Additional categories of compression therapy include adjustable Velcro devices, compression pumps, and hybrid devices.[5]

Eccentric bandages offer significant benefits when it comes to targeting specific anatomical regions. Their ability to provide customized compression levels on a particular area, such as the thigh's GSV, makes them highly advantageous.[6] Bandages and compression stockings are both effective in promoting proper blood circulation and preventing stasis. One significant benefit is the capability to customize the compression profile based on the patient's needs and apply precise pressure to specific areas.[7]

The primary objective of post-procedure compression is to improve the closure of the lumen in the treated vein in order to prevent any negative effects, as well as recanalization and recurrence. The dosage and manner in which compression is applied are crucial factors in maintaining vein occlusion in various body positions. Techniques such as eccentric, eccentric concentric, or tangential compression may enhance the compression profile. By using specially designed pads, localized pressure can be applied to the treated vein. The use of compression therapy following treatments for GSV issues is well-known, but it can be challenging to achieve effective pressure on the inner thigh. According to Laplace's law, pressure at the thigh can be increased by reducing the curvature. One approach to achieving this is by using an eccentric compression device in addition to the standard concentric compression, such as a stocking or bandage. However, the concentric compression needs to be strong in order to activate the eccentric device, which then applies pressure to the inner thigh. Additionally, securing the eccentric compression device can be problematic, as finding the right position can be challenging and skin damage may occur from contact or the vacuum effect created around the device.

Recent studies have investigated the effectiveness of these specialized compression profiles after EVLT and have found that eccentric compression reduces the severity of post-operative pain. However, short-term follow-up did not reveal any differences in recurrence or recanalization rates.[8]

This study aimed to evaluate the efficacy of eccentric compression therapy in comparison to alternative post-operative care techniques in preventing varicose vein recurrence and managing postoperative pain after EVLT on GSV.

Methods

Study Population

This study was a prospective randomized clinical trial comprising two treatment groups, each with 44 limbs in 44 individuals. Conducted from September 2023 to November 2023, it included 88 consecutive EVLT procedures for GSV insufficiency (Figure 1: study process). Eligible participants were between 18 and 75 years old and in good general health, and they presented with superficial venous insufficiency classified as C2 to C5 according to the CEAP classification.

Prior to treatment, a duplex ultrasound (DUS) scan

Figure 1. Application of Eccentric Compression Using the Wool Roll

assessed reflux at the saphenofemoral junction (SFJ) during the Valsalva maneuver. Participants meeting specific criteria, including a GSV diameter of 5 to 15 mm at 3 cm from the SFJ in a standing position with truncal reflux exceeding 500 milliseconds, were enrolled for active intervention.

The patients could not join this trial if (1) they did not agree to attend scheduled follow-up visits on days 7 and 30, (2) they had a history of varicose vein treatment, (3) they were known cases of chronic liver or kidney disease, (4) they had a history of deep vein thrombosis, pulmonary embolism, or post-thrombotic changes observed during DUS examination, (5) they were pregnant, and (6) they were unwilling or unable to apply elastic compression.

Randomization

To mitigate potential selection bias, a telephone randomization service assigned patients to two study groups, ensuring blinded randomization. The attending surgeon remained unaware of the post-operative compression method until after conducting the EVLT procedure in the operating room. Group A received eccentric compression plus gradual elastic stocking, while group B received treatment solely with gradual elastic stocking. The method of analysis was intention-to-treat (ITT), so the analysis included all randomized participants, regardless of dropout status.

Statistical Analysis

Data analysis employed SPSS 13.01 software (SPSS Inc, Chicago, Ill). Results are presented as the mean and standard deviation. Group differences in nominal variables were assessed by using chi-square testing, while the t-test for independent samples compared linear variables following a normal distribution. All statistical tests were two-tailed, with the significance level set at $P < 0.05$. There was no difference in baseline characteristics between groups, so we did not perform multivariable analysis. The study sample size was calculated with two comparison groups and equal sample size using the following formula for a continuous primary outcome. The significance level and the power of the study were defined as 0.05 and 0.8, respectively ($n=2(\sigma^2)Z_{1-\alpha/2} / \sigma^2$).

EVLT Technique

Skin preparation and draping preceded percutaneous cannulation of the GSV, with the patient in reverse Trendelenburg. A 6 French sheath (Arrow® Percutaneous Sheath) was inserted into the GSV using the Seldinger technique. A 6 French straight catheter was then advanced to the SFJ over a hydrophilic J-tipped 0.035-inch wire. A 600-micrometer laser fiber was introduced through the catheter, positioned 10 mm distal to the SFJ under ultrasound guidance. A local anesthetic solution (2% lidocaine with 1:200 000 adrenaline) was infiltrated around the GSV. Endovenous laser ablation employed a 1470-nm diode laser (LASEmaR® 1500 Eufoton) generator at 8 W, using a continuous emission pullback technique at 1 cm every six seconds. The 3-centimeter segment near the SFJ was treated twice if deemed necessary.

Compression Methods

In this study, protective adhesive gauze was used to cover the skin at the location where the GSV was punctured. Group A patients received eccentric cylindrical compression along the GSV, extending from the knee to the groin, following the method described by Lugli et al.[9] Conversely, patients in group B did not undergo this eccentric compression procedure. Additionally, all treated limbs in both groups were fitted with 20-30-mm Hg elastic stockings (SIGVARIS® open Toe Thigh-Highs w/ Grip-Top 20-30 mm Hg).

Outcome Measurement

The Primary outcome of the present study was the scale of pain after EVLT. After each procedure, the patient's pain level during surgery was assessed by using a visual analog scale (VAS) consisting of a 10 cm horizontal line. The scale ranged from zero, indicating no pain, to ten, indicating the worst pain ever experienced. This assessment was conducted by a nurse not involved in the surgical team. All the patients, regardless of their assigned group, were instructed to resume walking immediately after the operation and were discharged within three hours. While analgesics were not routinely prescribed, the patients were advised to take 500 mg of Acetaminophen if they experienced intolerable pain. The patients were also instructed to keep a record of their pill intake. Follow-up appointments were arranged for one week and one month after the surgery. At these appointments, the elastic stockings and eccentric compression were taken off, the VAS was administered, and the relevant data were documented. The patients were requested to provide information about the highest level of pain they had experienced in the days or weeks following the operation. To evaluate and compare the secondary outcome, we conducted a routine postoperative duplex scanning one month after EVLT to verify the successful obliteration. This was confirmed by the presence of a noncompressible GSV with thickened walls and no flow observed during the color DUS examination.

Results

Between September and November 2023, a total of 88 participants (54 women and 34 men) aged between 21 and 72 were enrolled, with 44 individuals allocated to Group A (receiving eccentric compression plus progressive compression) and 44 individuals to Group B (using progressive compression stockings exclusively). All the patients randomized to each group attended follow-up

visits, so there was not any dropout from the study. The two groups were largely similar in most aspects, although there was a notable age difference, with Group A showing a statistically significant older average age compared to Group B. The right limb was affected in approximately 66% of the patients. The average diameter of the treated GSV measured 7.8 mm in a standing position. Notably, there were no substantial differences between the two groups in terms of CEAP classification (see Table 1). The mean CEAP clinical grade was 2.6 in Group A and 2.7 in Group B, showing minimal variance between the groups. Both groups successfully underwent EVLT procedures during the day without any complications (Pulmonary thromboembolism [PTE] and deep venous thrombosis [DVT]). The SFJ occlusion rates at a one-month DUS follow-up were 97% (43 out of 44) for group A and 95% (42 out of 44) for group B.

No participants dropped out of the study. The evaluation of pain during surgery indicated a median value of 0.8 (ranging from 0 to 7), and no sedation was required for any of the subjects. There were no significant complications such as deep vein thrombosis, pulmonary embolism, hematomas, skin burns, or tingling sensations. Only 12 patients in both groups exhibited bruising, with an overall incidence of 13.6%. There were no cases of superficial venous thrombosis in either group. Group A patients used significantly fewer pain relievers (10% reported their use) compared to group B (18%), although this difference was not statistically significant. The analysis of postoperative pain data using VAS revealed a median value of 5.5 in group B patients, which decreased to 3.1 with the application of eccentric compression. The compression group exhibited a notably lower median pain score on day 7 in comparison to the group solely relying on stockings. However, there was no noteworthy disparity in the pain score on day 30. Patients who underwent concurrent phlebectomies and wore compression stockings displayed identical pain scores as the other patients in group A, but they experienced more severe pain scores than the other patients in group B, both on days 7 and 30. Moreover, group A exhibited less bruising on day 7. It is important to note that none of the patients complained of excessive heat production due to the compression, and no cases of eczema developed on the skin as a result of the compression.Both treated groups exhibited similar characteristics across various parameters, ensuring comparability between them. These included median linear energy density (LEED), the total energy applied for GSV ablation, the length of GSV ablated during the procedure, and the median dosage of locally administered anesthetic, as detailed in Table 2.

Table 1. Baseline Data Comparing Two Groups

	Group A[a]		Group B[b]		*P* Value
Patients	44		44		0.045
Age	52	SD 14	49	SD 11	
Men/Women	18/26		16/28		N.S.
Height (cm)	163	SD 6.8	165	SD 6.6	N.S.
Weight (kg)	69	SD 12	72	SD 13	N.S.
BMI	26	SD 4.5	27	SD 4.2	N.S.
Right lower limb	30		28		
Left lower limb	14		16		
GSV diameter (mm)	7.7	SD 0.7	7.9	SD 0.6	N.S.
CEAP[c]	2.6	SD 0.12	2.7	SD 0.15	N.S.

BMI, body mass index; GSV, Great saphenous vein; SD, standard deviation
[a] Eccentric plus gradual compression stocking; [b] Only gradual compression stocking; [c] CEAP stands for clinical manifestations (C), etiologic factors (E), anatomic distribution of disease (A), and underlying pathophysiologic (P).

Discussion

Building upon the existing role of compression therapy in enhancing results following varicose vein treatment,[4] our investigation seeks to analyze the distinct effectiveness of eccentric compression therapy in comparison to alternative post-operative approaches after EVLT for GSV insufficiency.

Compression stockings, also known as support stockings or gradient stockings, are legwear designed to apply pressure to the lower extremities. The pressure is highest at the ankle and gradually decreases as it moves up the thigh. This pressure gradient helps improve blood flow and reduce swelling by aiding in the upward movement of blood against gravity.[10] The ease of putting on and taking off these stockings encourages patient compliance, and their subtle appearance makes them suitable for daily wear. Additionally, there are various compression levels available, allowing medical professionals to

Table 2. Procedure data

	Group A[a]			Group B[b]			
	Minimum	Maximum	Mean	Minimum	Maximum	Mean	*P* Value
LEED (J/cm)	42	56	48	42	56	49	0.08
Total energy	920	2193	1438	660	2240	1471	0.89
Ablated saphenous length (cm)	15	45	30	14	46	30.3	0.12
Power (W)	7	8	7.75	7	8	7.7	0.21
Anesthetic solution (cc)	200	450	344	300	450	359	0.33

LEED, Linear energy density.
[a] Eccentric plus gradual compression stocking; [b] Only gradual compression stocking.

tailor treatment to individual patients. However, some drawbacks exist. Correct sizing and application can be challenging, they may be uncomfortable and could potentially cause allergies or skin irritations.

Compression wraps come in diverse materials and weaves, each with its unique elastic properties.[11] These wraps, applied at varying pressures, might yield a compression pattern distinct from that of stockings. Moreover, in cases involving unconventional limb shapes or specific wound care needs, wraps are often preferred. However, the downside lies in the time-consuming application of wraps, requiring proper training for medical practitioners to ensure consistent compression. For patients seeking a discreet treatment option, the bulkiness of wraps might pose an issue. The spectrum of compression devices spans from rigid, non-elastic wraps exerting pressures exceeding 50 mmHg to elastic stockings with barely measurable pressures.[12]

The primary goal of employing compression therapy after superficial vein treatments is to maintain the occlusion of the treated vein, thereby preventing potential bleeding and recanalization. Achieving this necessitates applying external pressure that surpasses the internal pressure of the treated vein. Magnetic resonance imaging has confirmed that a pressure below 10 mm Hg is adequate for occluding the GSV in the supine position. However, when in a sitting or standing position, significantly higher pressure is required to effectively restrict the veins. Observations from Magnetic resonance imaging and DUS reveal that, while standing, compression pressure needs to exceed 50 mm Hg on the lower leg and reach a pressure greater than 30-40 mm Hg at the thigh level for optimal occlusion.[13,14]

Currently, there is still a lack of agreement regarding the most effective intensity or duration of compression administered after particular therapies.[15] At present, compression therapy encompasses five categories: compression bandages, compression stockings, adjustable Velcro devices, compression pumps, and hybrid devices. Out of these, compression stockings and bandages are frequently employed for temporary use after varicose vein treatment. It is believed that compression therapy helps relieve symptoms associated with GSV sclerotherapy and surgery.[16] However, the effectiveness of this approach following intervention, particularly after EVLT, has not been extensively detailed. In order to effectively narrow down or obstruct the venous lumen, the applied compression pressure must surpass, or at the very least closely align with the intravenous pressure.[6]

In a study conducted by Mosti et al,[17] 54 patients who underwent flush ligation and stripping were divided into three groups receiving different types of compression. The first group received a single elastic stocking applying very light pressure of approximately 10 mm Hg on the thigh. The second group applied an identical stocking over a sturdy rubber foam pad that was firmly attached to the skin along the vein track using adhesive plasters. This resulted in a local pressure of over 60 mm Hg. The third group utilized a stiff, non-elastic adhesive bandage exerting pressure around 40 mm Hg. The study found that outcomes related to pain, hemorrhage, and bleeding significantly favored patients treated with either the stocking atop the rigid device or the inelastic adhesive bandage, compared to those using elastic stockings alone. In Lugli and colleagues' study,[18] 200 patients undergoing EVLT were randomly assigned to two groups: one receiving a single elastic stocking applying 35 mm Hg pressure at the ankle, and the other group using the same stocking combined with a self-made cotton roll firmly affixed to the skin along the vein track using plasters to locally increase pressure. The primary focus of the study was post-procedure pain, which was notably lower in the group receiving the cotton roll beneath the stocking. Bradbury et al[18] utilized rolls of orthopedic wool placed over the trunk and main tributaries following ultrasound-guided foam sclerotherapy. These rolls were secured with non-stretch bandages. Subsequently, a class II stocking was fitted, and patients were instructed to walk for 15 minutes before leaving. Patients were advised to wear the bandage and stocking for either 5 or 7 days. During a one-month follow-up, 1056 patients (84.4%) experienced no complications or side effects.

However, the efficacy of employing intense compression pressure has been contested by various publications. Some suggest that strong elastic stockings might exhibit similar or greater efficacy compared to light elastic stockings or bandages. Moreover, it is proposed that compression therapy might be less effective post-EVLA compared to other treatments due to the occluded saphenous vein necessitating higher compression levels. Additionally, achieving effective compression on the inner aspect of the thigh poses challenges, making additional eccentric compression necessary to augment pressure in this region.

Conclusion

The study findings propose that adding eccentric compression to class 2 high thigh stockings in cases involving GSV insufficiency, alongside treatments like endovenous thermal ablation, sclerotherapy, and/or phlebectomy, may initially reduce post-procedural pain. However, at one-week follow-up, pain levels between the groups become similar. Further research is needed to assess the long-term effectiveness and patient satisfaction of these combined treatment methods.

These results suggest that utilizing compression stockings after endothermal ablation and concurrent phlebectomy and/or sclerotherapy can minimize ecchymosis and early post-treatment pain. Nevertheless, by day 30, pain outcomes equalize between the groups. Notably, a subset of patients undergoing phlebectomy

appears to derive the most benefit from this combined treatment. Additional research is required to assess the long-term effectiveness and patient satisfaction associated with these approaches.

Authors' Contribution

Conceptualization: Niki Tadayon.
Data curation: Mostafa Mousavizadeh, Fateme Yousefimoghaddam, Mohammadmoein Mirhosseini.
Formal analysis: Fateme Yousefimoghaddam, Faezeh Jadidian.
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Project administration: Niki Tadayon.
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Writing–original draft: Niki Tadayon, Mostafa Mousavizadeh, Fateme Yousefimoghaddam.
Writing–review & editing: Niki Tadayon, Naser Hadavand.

Competing Interests

This article is based on the research and findings from Mostafa Mousavizadeh M.D.'s dissertation for completion of vascular and endovascular surgery fellowship. The data and analysis presented in this article build upon the research conducted in the thesis. Otherwise, authors declare no conflict of interest regarding the submitted article.

Ethical Approval

The study received approval from the ethical committee of Laser Application in Medical Sciences at Shahid Beheshti University of Medical Sciences (43007135). All participants provided informed consent for the evaluation and anonymous publication of their medical and demographic data for scientific purposes. The study protocol has been registered and approved in the Iranian Registry of Clinical Trials (identifier: IRCT20170614034531N1).

References

1. Whing J, Nandhra S, Nesbitt C, Stansby G. Interventions for great saphenous vein incompetence. Cochrane Database Syst Rev. 2021;8(8):CD005624. doi: 10.1002/14651858.CD005624.pub4.
2. Gao RD, Qian SY, Wang HH, Liu YS, Ren SY. Strategies and challenges in treatment of varicose veins and venous insufficiency. World J Clin Cases. 2022;10(18):5946-56. doi: 10.12998/wjcc.v10.i18.5946.
3. O'Flynn N, Vaughan M, Kelley K. Diagnosis and management of varicose veins in the legs: NICE guideline. Br J Gen Pract. 2014;64(623):314-5. doi: 10.3399/bjgp14X680329.
4. Mosti G. Postinterventional compression in phlebology: evidence and empirical observations. Phlebolymphology. 2015;22(1):12-7.
5. El-Sheikha J, Carradice D, Nandhra S, Leung C, Smith GE, Campbell B, et al. Systematic review of compression following treatment for varicose veins. Br J Surg. 2015;102(7):719-25. doi: 10.1002/bjs.9788.
6. Lurie F, Lal BK, Antignani PL, Blebea J, Bush R, Caprini J, et al. Compression therapy after invasive treatment of superficial veins of the lower extremities: Clinical practice guidelines of the American Venous Forum, Society for Vascular Surgery, American College of Phlebology, Society for Vascular Medicine, and International Union of Phlebology. J Vasc Surg Venous Lymphat Disord. 2019;7(1):17-28. doi: 10.1016/j.jvsv.2018.10.002.
7. Ye K, Wang R, Qin J, Yang X, Yin M, Liu X, et al. Post-operative benefit of compression therapy after endovenous laser ablation for uncomplicated varicose veins: a randomized clinical trial. Eur J Vasc Endovasc Surg. 2016;52(6):847-53. doi: 10.1016/j.ejvs.2016.09.005.
8. Yie K, Jeong EH, Hwang EJ, Shin AR. Stocking-only versus additional eccentric compression after below-the-knee truncal vein sclerotherapy: a SOVAECS prospective randomized within-person trial. J Vasc Surg Venous Lymphat Disord. 2023;11(6):1122-9.e3. doi: 10.1016/j.jvsv.2023.07.009.
9. Lugli M, Cogo A, Guerzoni S, Petti A, Maleti O. Effects of eccentric compression by a crossed-tape technique after endovenous laser ablation of the great saphenous vein: a randomized study. Phlebology. 2009;24(4):151-6. doi: 10.1258/phleb.2008.008045.
10. Hirai M, Iwata H, Hayakawa N. Effect of elastic compression stockings in patients with varicose veins and healthy controls measured by strain gauge plethysmography. Skin Res Technol. 2002;8(4):236-9. doi: 10.1034/j.1600-0846.2001.80401.x.
11. Partsch H, Clark M, Mosti G, Steinlechner E, Schuren J, Abel M, et al. Classification of compression bandages: practical aspects. Dermatol Surg. 2008;34(5):600-9. doi: 10.1111/j.1524-4725.2007.34116.x.
12. Meissner MH. Lower extremity venous anatomy. Semin Intervent Radiol. 2005;22(3):147-56. doi: 10.1055/s-2005-921948.
13. Kakkos SK, Timpilis M, Patrinos P, Nikolakopoulos KM, Papageorgopoulou CP, Kouri AK, et al. Acute effects of graduated elastic compression stockings in patients with symptomatic varicose veins: a randomized, double-blind, placebo-controlled trial. Eur J Vasc Endovasc Surg. 2018;55(1):118-25. doi: 10.1016/j.ejvs.2017.10.004.
14. Partsch H. Compression therapy: clinical and experimental evidence. Ann Vasc Dis. 2012;5(4):416-22. doi: 10.3400/avd.ra.12.00068.
15. Houtermans-Auckel JP, van Rossum E, Teijink JA, Dahlmans AA, Eussen EF, Nicolaï SP, et al. To wear or not to wear compression stockings after varicose vein stripping: a randomized controlled trial. Eur J Vasc Endovasc Surg. 2009;38(3):387-91. doi: 10.1016/j.ejvs.2009.05.025.
16. Szewczyk MT, Jawień A, Cierzniakowska K, Cwajda-Białasik J, Mościcka P. Comparison of the effectiveness of compression stockings and layer compression systems in venous ulceration treatment. Arch Med Sci. 2010;6(5):793-9. doi: 10.5114/aoms.2010.17097.
17. Mosti G. Post-treatment compression: duration and techniques. Phlebology. 2013;28 Suppl 1:21-4. doi: 10.1177/0268355513475955.
18. Bradbury AW, Bate G, Pang K, Darvall KA, Adam DJ. Ultrasound-guided foam sclerotherapy is a safe and clinically effective treatment for superficial venous reflux. J Vasc Surg. 2010;52(4):939-45. doi: 10.1016/j.jvs.2010.04.077.