JOURNAL OF
CONTEMPORARY MEDICINE

DOI:10.16899/jcm.1118956
J Contemp Med 2022;12(5):665-670

Original Article / Orijinal Araştırma

Comparative Study of Cyanoacrylate Glue and Endovenous Laser Ablation Techniques for the Treatment of Varicose Veins

Varisli Damarlarda Siyanoakrilat Tutkal ve Endovenöz Lazer Ablasyonunun Karşılaştırmalı Çalışması

Serpil Sahin[1], Yusuf Salim Urcun[2]

[1] Çanakkale Onsekiz Mart University, Faculty of Medicine, Deparment of Cardiovascular Surgery, Çanakkale, Turkey
[2]Adıyaman University, Faculty of Medicine, Deparment of Cardiovascular Surgery, Adıyaman, Turkey

Abstract

Aim: The aim of this study is to provide a comparison between two minimally invasive techniques; cyanoacrylate glue (CG) and endovenous laser ablation (EVLA) for the treatment of varicose veins.

Material and Method: This study was a retrospective study of patients with varicose veins who underwent EVLA or CG techniques between January 2018 and December 2021. The demographic characteristics of the patients, patient complaints and symptoms, postoperative 1st and 6th month Doppler-Ultrasound control results and preoperative-postoperative comparisons were made.

Results: A total of 200 adult patients were treated with CG (n=54) or EVLA (n=146) techniques. The doppler- ultrasound tests of the 1st and 6th months determined that the success rates of the EVLA and CG groups were 96.6% and 92.6%, respectively.

Conclusion: Statistically significant was observed in both groups when the results of the pre-postoperative Venous Clinical Severity Score of CG and EVLA patients were evaluated. From the data analysis, we have found that the duration of the procedure was significantly shorter in the CG group, the ecchymosis and erythema were observed significantly less in the CG group, and the return time to normal activity was shorter in the CG group.

Keywords: Laser ablation, minimally invasive surgical procedures, varicose veins, cyanoacrylate glue

Öz

Amaç: Bu çalışmanın amacı, varis tedavisi için iki minimal invaziv teknik olan siyanoakrilat yapıştırıcı (CG) ve endovenöz lazer ablasyon (EVLA) arasında bir karşılaştırma sağlamaktır.

Gereç ve Yöntem: Bu çalışma, Ocak 2018 ile Aralık 2021 arasında EVLA veya CG teknikleri uygulanan varisli hastaların dahil edildiği bir retrospektif çalışma idi. Hastaların demografik özellikleri, hasta şikayet ve semptomları, postoperatif 1. ve 6. ay doppler-ultrason kontrol sonuçları ve preoperatif-postoperatif karşılaştırmalar yapıldı.

Bulgular: Toplam 200 yetişkin hasta CG (n=54) veya EVLA (n=146) teknikleri ile tedavi edildi. 1. ve 6. aylarda yapılan doppler ultrason testlerinde EVLA ve CG gruplarının başarı oranları sırasıyla %96,6 ve %92,6 olarak belirlendi.

Sonuç: CG ve EVLA hastalarının ameliyat öncesi Venöz Klinik Şiddet Skoru sonuçları değerlendirildiğinde her iki grupta da istatistiksel olarak anlamlı iyileşmeler gözlendi. Veri analizinden CG grubunda işlem süresinin anlamlı olarak daha kısa olduğunu, CG grubunda ekimoz ve eritem belirgin olarak daha az görüldüğünü ve CG grubunda normal aktiviteye dönüş süresinin daha kısa olduğunu saptadık.

Anahtar Kelimeler: Lazer ablasyon, minimal invaziv cerrahi prosedürler, varisli damarlar, siyanoakrilat yapıştırıcı

Corresponding *(İletişim)*: Serpil Şahin, Çanakkale On sekiz Mart University faculty of Medicine of Deparment of Cardiovascular Surgery, Çanakkale, Turkey
E-mail *(E-posta)*: serpilsahin123490@gmail.com
Received *(Geliş Tarihi)*: 20.05.2022 **Accepted *(Kabul Tarihi)*:** 09.07.2022

INTRODUCTION

Varicose veins affect a lot of people, mostly women, in Turkey, and it remains the most common vascular problem requiring treatment. When intervention is chosen, three goals must be kept in mind when designing the treatment: permanent elimination of the varicosities that are the source of venous hypertension, as aesthetic a result as feasible, and finally, as few problems as possible.[1] Clinical trials have examined several treatment techniques, with varying results. As a result, minimally invasive endovenous methods for treating varicose veins have recently been introduced to reduce postoperative problems, expedite recovery, and increase patient satisfaction when compared to traditional surgery.[2,3] The purpose of this study was to make a comparison between the results of minimally invasive Endovenous laser ablation (EVLA) and cyanoacrylate glue (CG) techniques.

MATERIAL AND METHOD

The study was carried out with the permission of Çanakkale Onsekiz March University Ethics Committee (Date: 05.01.2022, Decision No: 2022-01). This retrospective study includes patients with varicose veins who underwent EVLA and CG techniques between January 2018 and December 2021. Preoperative, postoperative 1st month, and 6th-month doppler- ultrasound tests results, preoperative the Venous Clinical Severity Score (VCSS), and postoperative 1st month and 6th-month VCSS values were determined. Records related to operation time, return time to normal activity, and complication developments were also added to the database.

To get a clearer and better representation of the data, the VCSS was used as an evaluating tool (**Table 1**). The VCSS is a standard scoring system and is very valuable, especially in severe chronic venous diseases. The VCSS makes it possible for evaluations to be made in a serial manner, which provides a better assessment of the treatment strategy. Before surgery and at follow-up visits, patients' symptoms, health-related quality of life, and postoperative complications were evaluated using the VCSS.[4] The success of the surgical procedures is defined as complete occlusion, and failure is defined as partial or complete recanalization; this was assessed by doppler ultrasound (USG) at 1st and 6th months postoperatively. In addition, patients were questioned at post-operative examinations for other success indicators such as daily activity increase, satisfaction, absence of pain, night cramps, and other complaints.

Patient Selection

Patient selection was based on inclusion and exclusion criteria. The inclusion criteria were normal great saphenous vein (GSV) diameter over 5.5 mm, concomitant grade 2 or higher venous reflux, obvious complaints, and symptoms of the patients (pain, cramps, swelling in the legs, etc.), and palpable varicose veins. Patients with a preexisting history of deep venous thrombosis (DVT), coagulopathy, immobilization, pregnancy, and severe venous insufficiency were excluded from the study.

In this study, the laser device used in EVLA was Biolas® laser surgery systems, EVLAS Circular Fiber; 360˚ circular shooting, 400-600 m core, 7F introducer sheath, 0.018"-0.035" guidewire, and 18G–21G percutaneous entry needle. The CG device used was Vein Sealing Systems by Biolas, with a working length of 150 cm and a guidewire diameter of 0.035".

The first step of the procedure was the marking of the superficial varicose veins with the patient standing. Because sight of varicose tributaries may be impossible once the patient has been prepared and the leg has been raised, such marking is necessary. Immediately after the ablation of the great saphenous veins (GSV) (CG or EVLA), a small incision (approximately 2–5 mm) was made on the pre-marked varicose vein site. The target varicosity mass was removed, divided, and dissected through the minimal incision. Adjacent varicosities were also removed from the same incision site with the help of hemostatic forceps advanced through the subcutaneous level. The posterolateral tributary vein, anterolateral superficial thigh vein, small saphenous vein, and posteromedial superficial thigh vein were among the varicose veins removed. The incisions were made large enough (2 to 5 mm) to allow the opening of the hemostatic forceps, in such a way to prevent skin necrosis from stretching the skin when the instrument's mouth was opened. Some of these skin incisions were closed with SteriStrip closure (3M, St. Paul, MN, USA) and partly with 4/0 prolene. This allowed the incisions to heal with minimal scarring.

Table 1. Venous Clinical Severity Scoring

Attribute	Absent (0)	Mild (1)	Moderate (2)	Severe (3)
Pain (ie, aching, fatigue, heaviness, soreness)	None	Occasional	Daily (ie, interfering with but not preventing regular daily activities)	Daily (ie, limits most regular daily activities)
Varicouse veins (≥5.5 mm in diameter in our patients)	None	Few	Multiple, confined to calf or thigh	Extensive, involves calf and thigh
Venous edema	None	Limited to foot and ankle	Extends above ankle but below knee	Extends to knee and above
Skin pigmentation	None	Limited to perimalleolar area	Diffuse over lower third of calf	Wider distribution above lower third of calf
Inflammation	None	Limited to perimalleolar area	Diffuse over lower third of calf	Wider distribution above lower third of calf
Induration (ie, chronic edema with fibrosis, hypodermitis)	None	Limited to perimalleolar area	Diffuse over lower third of calf	Wider distribution above lower third of calf
Number of active ulcers	None	1	2	≥3
Active ulcer size	None	<2 cm	2-6 cm	>6 cm
Ulcer duration	None	<3 months	3-12 months	>1 year
Compression therapy	None	Intermittent	Most days	Full compliance: stockings

Cyanoacrylate glue occlusion procedure: All of our patients underwent surgery under spinal anesthesia because of the requirement for excision of multiple superficial varicose veins. By using doppler USG guidance, an introducer sheath was inserted into the great saphenous vein around the knee level. A delivery catheter was inserted right before the saphenofemoral junction (about 2-3 centimeters proximally). The ultrasonic probe compressed the proximal vein, and a measured dosage of cyanoacrylate glue was administered through the catheter tip to seal the vein. The catheter was pulled downward slowly as the cyanoacrylate glue was applied. In addition to the safenofemoral junction compression, the assistant doctor simultaneously applied external compression to the area where the glue was being applied. Compression at the saphenofemoral junction by the ultrasonic probe was maintained for about 20 seconds after the catheter was completely removed. As I waited with the probe at the compression time, the leg was rubbed in a downward direction. The procedure was continued for the distal segments of the great saphenous vein. After the procedure, the occlusion of the saphenofemoral junction and the deep venous system's permeability were controlled by USG. After this procedure, the marked superficial varicose veins were excised. The entire process was completed in about 9.8±2.1 (10, 6–15) minutes.

EVLA procedure: All patients treated were under spinal anesthesia. Under USG guidance, the saphenous vein was percutaneously accessed at the knee level and the catheter was advanced cephalad toward the Sapheno-Femoral Junction (SFJ). The catheter was fixed 2-3 cm below the SFJ. After that, the catheter was immobilized, and tumescent anesthesia was applied under USG guidance. Then the laser ablation was carried out. After the ablation procedure, the marked superficial varicose veins were excised by the same above-mentioned method. The entire process was completed in about 18.5±2.7 (20, 10–25) minutes.

Tumescent anesthesia: The GSV in the thigh is surrounded by a fascial envelope for most of its length, allowing a little infusion of tumescent anesthetic (200 to 600 mL) to surround the saphenous vein. In the tumescent mixture, we employed a combination of 40 mL of 1 percent lidocaine without epinephrine, 10 mL of sodium bicarbonate, and 500 mL of normal saline, which was delivered under duplex scanning using an infusion pump. Epinephrine was not added to the tumescent mixture because it may be contraindicated in patients with glaucoma, diabetes mellitus (DM), cardiac dysrhythmias, hypertension, coronary heart disease, hyperthyroidism, and peripheral arterial disease. The application of tumescent anesthesia into the correct area (into the fascia surrounding the GSV) and complete application prevents thermal injury of the surrounding tissues by the laser, reduces pain after the procedure, and increases the chance of success by compressing the GSV. So, we paid utmost attention to our patients while applying tumescent anesthesia.

Statistical Analysis

In this study, two treatment groups (CG and EVLA groups) were compared. Mean standard deviation (median, minimum-maximum) for continuous variables and frequency (percentage) for categorical variables were noted while reporting the data in each study group. To evaluate the normality and variance homogeneity assumptions, the Shapiro-Wilk and Levene tests were used. Due to the failure to meet these two assumptions, the Mann-Whitney U test was utilized to compare the two research groups in terms of continuous variables. When there were enough observations in the cross-table cells, the Pearson chi-square test was employed to compare two research groups in terms of categorical variables. On the other hand, we applied Fisher's exact test. Also, while analyzing the difference between pre-operation and post-operation in each study group, we used the Wilcoxon signed-rank test with Bonferroni correction.

We applied IBM SPSS Statistics for Windows v.23.0 (IBM Corp., Armonk, NY) to perform all analyses. We applied IBM SPSS Statistics for Windows v.23.0 (IBM Corp., Armonk, NY) to perform all analyses. A two-tailed p value of <0.05 was accepted for statistical significance.

RESULTS

The study enlisted the participation of 200 patients. These patients were divided into 2 groups: EVLA (n=146) and CG (n=54). The patients' average age was 49.0±11.2 years in group 1 and 53.7±9.1 years in group 2. In terms of statistical significance, there was no difference for gender, diabetes mellitus (DM) presence, smoking history, GSV diameters, and reflux grades in either group (**Table 2**).

Table 2. Characteristics of groups

Variable	Group 1 (EVLA, n=146)	Group 2 (CG, n=54)	p value
Age (years)	49.0±11.2 (48, 21- 71)	53.7±9.1 (55, 31- 67)	0.005[a]
Sex			
Male	94 (64.4%)	28 (51.9%)	0.107[b]
Female	52 (35.6%)	26 (48.1%)	
DM			
Yes	14 (9.6%)	2 (3.7%)	0.244[c]
No	132 (90.4%)	52 (96.3%)	
Smoking			
Yes	25 (17.1%)	6 (11.1%)	0.297[b]
No	121 (82.9%)	48 (88.9%)	
GSV diameter (mm)	8.3±1.9 (8.5-15)	8.7±2.2 (8.25-16)	0.429[a]
Reflux grade			
Grade 2	61 (41.8%)	18 (33.3%)	0.182[b]
Grade 3	69 (47.2%)	33 (61.1%)	
Grade 4	16 (11.0%)	3 (5.6%)	

Note: For continuous data, the results are presented as mean standard deviation (median, min-max), and for categorical variables, frequency (%). a, b, c: p-values are obtained via Mann-Whitney U test, Pearson Chi-square test, Fisher exact test, respectively.

The duration of the procedure was significantly longer in the EVLA group (18.5±2.7 minutes in group 1, 9.8±2.1 minutes in group 2, p<0.001). Besides, the rates of postoperative erythema (32.2% in group 1, 5.6% in group 2, p<0.001), ecchymosis (53.4% in group 1, 13.0% in group 2, p<0.001) and return to normal activity (3.0±2.8 days in group 1, 1.7±0.9 days in group 2, p<0.001) were significantly higher in the EVLA group (**Table 3**).

There was no difference between the two groups regarding postoperative hematoma, infection, pain, paresthesia, DVT, or edema development. Doppler USG made in the 1st and the 6th months postoperatively showed no statistically significant difference between the two groups in terms of recurrence of the disease (3.4% in Group 1 and 7.4% in Group 2). Also, there was no statistically significant difference between the two groups when we compared preoperative and postoperative VCSS scoring (7.8±3.1 in group 1, 7.9±2.2 in group 2) differences (**Table 3**).

Table 3. Operative and postoperative comparison of groups

Variable	Group 1 (EVLA, n=146)	Group 2 (CG, n=54)	p value
Duration of procedure (min)	18.5±2.7 (20, 10-25)	9.8±2.1 (10, 6-15)	<0.001[a]
Erythema			
Yes	47 (32.2%)	3 (5.6%)	<0.001[b]
No	99 (67.8%)	51 (94.4%)	
Ecchymosis			
Yes	78 (53.4%)	7 (13.0%)	<0.001[b]
No	68 (46.6%)	47 (87.0%)	
Hematoma			
Yes	6 (4.1%)	1 (1.9%)	0.677[c]
No	140 (95.9%)	53 (98.1%)	
Infection			
Yes	8 (5.5%)	1 (1.9%)	0.449[c]
No	138 (94.5%)	53 (98.1%)	
Pain			
Yes	26 (17.8%)	3 (5.6%)	0.029[b]
No	120 (82.2%)	51 (94.4%)	
Paresthesia			
Yes	4 (2.7%)	0 (0.0%)	0.576[c]
No	142 (97.3%)	54 (100.0%)	
DVT			
Yes	7 (4.8%)	1 (1.9%)	0.685[c]
No	139 (95.2%)	53 (98.1%)	
Edema			
Yes	13 (8.9%)	3 (5.6%)	0.565[c]
No	133 (91.1%)	51 (94.4%)	
RNA* (day)	3.0±2.8 (2, 1-15)	1.7±0.9 (1.5, 1-4)	<0.001[a]
Postop. 1st month doppler			
Total occlusion	141 (96.6%)	50 (92.6%)	0.256[c]
Partial recanalization	5 (3.4%)	4 (7.4%)	
Postop 6th month doppler			
Total occlusion	141 (96.6%)	50 (92.6%)	0.256[c]
Partial recanalization	5 (3.4%)	4 (7.4%)	
Difference-VCSS	7.8±3.1 (8, 2-19)	7.9±2.2 (8, 3-13)	0.429[a]

*RNA: return to normal activity Note: For continuous data, the results are presented as mean standard deviation (median, min-max), and for categorical variables, frequency (%). a, b, c : p-values are obtained via Mann-Whitney U test, Pearson Chi-square test, Fisher exact test, respectively.

The mean preoperative VCSS was 11.4±5.0, which improved to 3.5±2.7 in group 1, and also the mean preoperative VCSS was 10.0±2.8, which improved to 2.1±1.0 in group 2 at postoperative control (p<0.001) (**Table 4**).

Table 4. Preoperative and postoperative Venous Clinical Severity Score of patients in two groups

Study groups	Preop VCSS	Postop VCSS	p-values
Group 1 (EVLA)	11.4±5.0 (10, 4-27)	3.5±2.7 (2, 1-18)	<0.001
Group 2 (CG)	10.0±2.8 (10, 6-16)	2.1±1.0 (2, 1-5)	<0.001

Note: Results are demonstrated as mean±standard deviation (median, min-max) for continuous variables. P-values are obtained by making adjustment for multiple comparison with Bonferroni correction after Wilcoxon signed rank test.

DISCUSSION

Today's treatment choices for varicose veins with advancing technology have been improved from traditional stripping techniques to a wide range of treatment modalities such as radiofrequency ablation (RFA), EVLA, and CG methods. These advancing technological methods excite the patients' and vascular surgeons' anticipations too. CG, the state-of-the-art technology, and EVLA, a more traditional technique.[5] In our study, we evaluated these two minimally invasive techniques (EVLA and CG methods).

Although CG has become a popular technique, it has advantages as well as disadvantages. According to the findings, when CG comes into touch with intravascular tissue, it undergoes a fast polymerization reaction and begins to harden.[6] This polimerization creates an inflammatory effect on the vein wall.[7] And this inflammatory effect initiates a process that quickly occludes the vein. In the histopathological studies performed by Wang and colleagues,[8] cyanoacrylate mixed with lipiodol showed rapid obliteration in the rabbit veins. This study indicated that the effect appeared very quickly. In the same study, the glue essentially disappeared in 2-3 months, replaced by fibrotic tissue.[8] In our CG-treated patients, we detected by doppler USG that the vein was obliterated immediately after the glue application, and we also noticed that in the 1st postoperative month control examination, our patients did not show any hardness during palpation of the GSV site.

Almeida and colleagues[9] reported that occlusion rates were 92% with CG on 24-month follow-up in their 38 patient series. In our study, the results were similar; the occlusion rates were 96.6% for EVLA and 92.6% for the CG group. According to Merchant et al.[10] body mass index (BMI) and RFA pull-back speed were found to be risk factors for occlusion failure. However, contrary to this, Jin and his colleagues[11] found that there was no significant difference in occlusion rates for different BMI and pull back speeds during the RFA procedure. In our observations, we think that extensive vein and pullback speed may be risk factors for the development of recanalization, but we did not put particular emphasis on it because the recanalization rate in our patients was low and therefore it was statistically insignificant.

Almeida and colleagues[9] reported that VCSS scoring improved from 6.1±2.7 to 2.7±2.5 at 24 months of follow-up. In our patient group, the preoperative VCSS values of the patients were much higher than those of Almeida's patient group. At the 6-month follow-up, the EVLA group showed a great improvement from 11.4±5.0 to 3.5±2.7 and the CG group from 10.0±2.8 to 2.1±2.0. The recovery rates of the two groups were not significantly different.

Even though new techniques are emerging, the EVLA still maintains its place in application fields. Ablation of the GSV directly reduces axial reflux and therefore results in the preponderance of hemodynamic benefits in most vein operations. One of the disadvantages of EVLA is the requirement for tumescent anesthesia, which is a source of discomfort for the patient and causes hematoma and ecchymosis. Moreover, applying tumescent anesthesia is another difficult part of the procedure and requires additional time. Some of our EVLA patients felt uncomfortable from the needle injections in the areas where we performed tumescent anesthesia on the 1st postoperative day. In addition, erythema and ecchymosis were statistically more frequent in this group, and the duration of the procedure was significantly higher. As a result, their return to normal activity was later than it was in the other group.

Closure of the GSV is confined to within 2-3 cm distal to the SFJ in procedures such as EVLA to protect the CFV from treatment effects and leave a residual untreated proximal GSV stump.[12] This stump was originally assumed to allow proper drainage of SFJ tributaries and prevent recurrence of venous disease associated with these veins, as seen after standard ligation and crossectomy venous surgery.[13] The effect of therapies on the status of the valves within the residual stump has received little study. The objective is to preserve the valves with little surgery that preserves the SFJ complex. Endovenous treatments have a less apparent effect on these valves. The distance between devices and delicate valves varies depending on their position. Whether or not the valves remain functioning may have an impact on outcomes, such as stump thrombosis and the recurrence patterns. In our study, we preserved all the terminal valves near SFJ, and when feasible, we preserved preterminal valves, too.

Proebstle reported that 21% of patients who were given CG had thrombus extension proximally aimed at the SFJ. They managed to prevent this complication by making injections 5 cm away from the SFJ.[14] In the EVLA group, we started to procedure 2-3 cm away from the SFJ by taking care to preserve the terminal valve. In the CG patients, we applied firm pressure at the SFJ level with the USG probe. Also, the pressure was applied to the areas where the glue was being administered. And finally, a downward extruding pressure was administered, so total occlusion of the vein was achieved.

DVT developed in only one patient (1.9%) of the CG group and 7 patients (4.8%) of the EVLA group. We think that DVT is independent of the technique (CG/EVLA), as all the patients who developed DVT, had a history of phlebitis and/or venous ulcers, and also, they had been treated for phlebitis and/or venous ulcers before the operation. Only two of them had too many huge varicose veins, and we think that DVT developed due to deep excision of the veins of these patients. Anticoagulant therapy was started for these patients, and we never observed pulmonary embolism. Patients with extensive and ulcerative wounds were treated with a 2-week oral zinc tablet, an anti-inflammatory drug, antibiotics if the infection was present, and a silver-coated supportive Tripple-band bandage (30-40 mmHg pressure) before surgery to minimize or heal the ulcer. After healing, we proceeded with the surgery. With this approach, we aimed to prevent the spread of a possible infection during or after surgery, and we did not observe postoperative infections or wound recurrences in these patients. During the study period, postoperative infection occurred in 8 patients from both groups. All of them were mild infections due to poor personal hygiene, mostly in the tumescent application areas, and were treated without problems.

After the CG or EVLA procedure, pre-marked varicose veins were removed with small surgical incisions (approximately 2-5 mm). However, if the remaining superficial varicosities are left untreated, they will drain through different routes and may remain painful and unsightly. Previously, these tributary varicose were treated by making numerous major incisions, often leaving dramatic transverse scars. With the efficient removal of tributary varices using small (1-to 3-mm) stab incisions, method refinements have resulted in enhanced cosmetic results.[15,16] Effective use of these minimally invasive techniques requires planning, experience, and patience.

Our patients were mobilized within a few hours after the operation. We recommended compression bandages for one week, until the wound suture was removed. After that, medium-pressure compression class 2 (CCL-2) stockings were worn for at least 6 months after the operation.

Bozkurt and colleagues[17] reported a 4.9% rate of neuropathy or paresthesia in patients treated with EVLA and none in the CG group. Our results were similar, with a 2.7% rate of parasthesia in the EVLA group and none in the CG group. All the patients who suffered from paresthesia completely recovered.

Limitations: This study was a single-center retrospective study. The primary limitation of this study was the need for longer follow-up and a large number of patients. The high cost of the CG procedure led us to conduct this study on a limited number of patients.

CONCLUSION

The advantages of applying cyanoacrylate glue include applicability with local anesthesia; no need for tumescent anesthesia; a very quick result; not causing any warming or skin damage as a result; and patient satisfaction as its result is immediate. The disadvantage is the risk of thrombosis and embolism. If the deep venous system is not properly compressed at the safenofemoral junction region, it may become a serious complication. This procedure requires a very careful determination of the proximal injection level and very tight compression of the SFJ. With concerns about this possible complication, some surgeons start the application from a region far from the SFJ, which reduces the success of the procedure and increases the likelihood of recanalization. Another drawback is that if the glue is not applied in sufficient quantity, there may be partial recanalisations. A third drawback is its high cost (about three times more expensive than EVLA). And also, the glue can coagulate immediately at the first blood contact, the catheter tip can get ocluded and become unusable, so another catheter and glue may be needed. Considering EVLA, if you are going to apply laser to more than one vein (such as a dual varicose vein), you have the opportunity to use the same catheter in both regions by attaching two sheaths. The disadvantages of laser are the necessity of tumescent anesthesia injection, spinal anesthesia or sedation, skin rash or postoperative skin sensitivity and inflammation in high-dose or close-to-skin saphenous laser applications. In addition, the duration of the procedure is longer and it is somewhat more complicated.

There is no difference in results when a decision as to which procedure is to be performed. Both endovenous laser ablation and cyanoacrylate glue occlusion therapy may be considered for minimally invasive treatment of varicose veins. Patients' expectations, socioeconomic status, and choice of the surgeon with each procedure should be taken into account in deciding the treatment strategy.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Çanakkale Onsekiz March University Ethics Committee (Date: 05.01.2022, Decision No: 2022-01).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

REFERENCES

1. Bergan JJ: Surgical procedures for varicose veins: Axial stripping and stab avulsion. In Bergan JJ, Kistner RL (eds): Atlas of venous Surgery. Philadelphia, WB Saunders, 1992.
2. Luebke T, Brunkwall J. Systematic review and meta-analysis of endovenous radiofrequency obliteration, endovenous laser therapy, and foam sclerotherapy for primary varicosis. J Cardiovasc Surg 2008;49:213-33.
3. Brar R,and, Nordon IM, Hinchliffe RJ,et al, Thompson MM. Surgical management of varicose veins: meta-analysis. Vascular 2010;18:205-20.
4. Rutherford RB, Padberg Jr FT, Comerota AJ, et al. Kistner RL, Meisner MH, Moneta GL. Venous severity scoring: an adjunct to venous outcome assessment. J Vasc Surg 2000;31:1307-12.
5. Passman MA, McLafferty RB, Lentz MF, et al. Validation of Venous Clinical Severity Score (VCSS) with other venous severity assessment tools from the American Venous Forum, National Venous Screening Program. J Vasc Surg 2011;54:2S-9S.
6. Rasmussen L, Lawaetz M, Bjoern L, et al. Randomized clinical trial comparing endovenous laser ablation and stripping of the great saphenous vein with clinical and duplex outcome after 5 years. J vasc Surg 2013;58:421-6.
7. Koramaz İ, Kılıç HE, Gökalp F, et al. Ablation of the great saphenous vein with nontumescent n-butyl cyanoacrylate versus endovenous laser therapy. J Vasc Surg, Venous and Lymphatic Disorders 2017;5:210-5.
8. Wang YM, Cheng LF, Li N, et al. Histopathological study of vascular changes after intra-arterial and intravenous injection of N-butyl-2-cyanoacrylate. Chin J Dig Dis 2006;7:175-9.
9. Almeida JI, Javier JJ, Mackay EG, et al. Two-year follow-up of first human use of cyanoacrylate adhesive for treatment of saphenous vein incompetence. Phlebology 2015;30:397-404.
10. Robert F, Merchant RF, Pichot O. Closure Study Group. Long-term outcomes of endovenous radiofrequency obliteration of saphenous reflux as a treatment for superficial venous insufficiency. J Vasc Surg 2005;42:502-9.
11. Jin HY, Ohe HJ, Hwang JK, et al. Radiofrequency ablation of varicose veins improves venous clinical severity score despite failure of complete closure of the saphenous vein after 1 year. Asian J Surg 2017;40:48-54.
12. Pleister I, Evans J, Vaccaro PS, et al. Natural history of the great saphenous vein stump following endovenous laser therapy. Vasc Endovascular Surg 2008;42:348-51.
13. AM van Rij, GT Jones, BG Hill. Mechanical inhibition of angiogenesis at the saphenofemoral junction in the surgical treatment of varicose veins: early results of a blinded randomized controlled trial. Circulation 2008;118:66-74.
14. Proebstle T. Status of cyanoacrylate glue for saphenous ablation. In: Presented at the 10th International Vein Congress, Miami, Florida, USA, 31 May-3 June 2012.
15. Goren G, Yellin AE. Ambulatory stab evulsion phlebectomy for truncal varicose veins. Am J Surg 1991;162:166-74.
16. Ricci S, Georgiev M, Goldman MP, et al: AmbulatoryPhlebectomy, ed 2, Boca Raton, Fl, 2005, Taylor and Francis.[https://dokumen.tips/documents/ambulatory-phlebectomy.html]
17. Bozkurt AK, Yılmaz MF. A prospective comparison of a new cyanoacrylate glue and laser ablation for the treatment of venous insufficiency. Phlebology 2016;31:106-13.