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SURGICAL MEDICAL SCIENCES / CERRAHİ TIP BİLİMLERİ

Comparison of Long-Term Results of Endovenous Ablation Techniques and Classical Stripping Operations in the Treatment of Venous Insufficiency

Venöz Yetmezlik Tedavisinde Endovenöz Obliterasyon Teknikleri Uygulanan ve Klasik Stripping Operasyonu Yapılan Hastaların Uzun-Dönem Sonuçlarının Karşılaştırılması

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Abstract

Objectives: Chronic venous insufficiency affects approximately 25% of the population and is primarily associated with reflux in the great saphenous vein. Traditional treatments like high ligation and stripping have been effective but are burdened with complications such as postoperative pain, wound infections, and nerve damage, alongside high recurrence rates. In contrast, minimally invasive endovenous techniques, including radiofrequency ablation, endovenous laser ablation (EVLA), and ultrasound-guided foam sclerotherapy, have gained popularity due to their lower complication rates and efficacy demonstrated in short- and medium-term studies. This study synthesizes existing literature comparing these treatment modalities and aims to evaluate the effectiveness of classical stripping and endovenous ablation techniques in the treatment of venous insufficiency.

Materials and Methods: Between October 2011 and January 2016, 832 patients underwent different procedures at Ankara University Faculty of Medicine, Department of Cardiovascular Surgery, with a total of 1,390 lower extremities treated. The study assessed patient demographics, procedural outcomes, complications, and quality of life (QoL) improvements following each intervention. Statistical analyses, including t-tests, Mann-Whitney U tests, and logistic regression, were employed to compare outcomes and identify influencing factors.

Results: The findings underscored high procedural success across all methods and significant QoL improvements post-treatment. However, no statistically significant differences were observed in QoL outcomes between treatment modalities. Complication rates varied, with EVLA showing higher rates of postoperative ecchymosis and classical stripping associated with increased wound infection incidence. Factors influencing outcomes included body mass index, bilaterality of treatment, and use of venoactive drugs.

Conclusion: The study concluded with recommendations for further randomized controlled trials to refine treatment protocols and elucidate long-term efficacy.

Keywords: Venous insufficiency, classical stripping, endovenous laser ablation, radiofrequency ablation, quality of life, complications

Öz

Amaç: Kronik venöz yetmezlik nüfusun yaklaşık %25'ini etkilemektedir ve temel olarak büyük safen vende reflü ile ilişkilidir. Yüksek ligasyon ve stripping gibi geleneksel tedaviler etkili olmuştur ancak yüksek nüks oranlarının yanı sıra postoperatif ağrı, yara enfeksiyonları ve sinir hasarı gibi komplikasyonlarla ilişkilendirilmişlerdir. Buna karşılık, radyofrekans ablasyon, endovenöz lazer ablasyon (EVLA) ve ultrason kılavuzluğunda köpük skleroterapi gibi minimal invaziv endovenöz teknikler, daha düşük komplikasyon oranları ve kısa ve orta vadeli çalışmalarda gösterilen etkinlikleri nedeniyle popülerlik kazanmıştır. Bu çalışma, bu tedavi yöntemlerini karşılaştıran mevcut literatürü sentezlemekte ve venöz yetmezlik tedavisinde klasik stripping ve endovenöz ablasyon tekniklerinin etkinliğini değerlendirmeyi amaçlamaktadır.

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Gereç ve Yöntem: Ekim 2011 ile Ocak 2016 tarihleri arasında Ankara Üniversitesi Tıp Fakültesi, Kalp ve Damar Cerrahisi bölümümüzde 832 hastaya farklı prosedürler uygulanmıştır ve toplam 1.390 alt ekstremite tedavi edilmiştir. Çalışmada hasta demografisi, prosedürel sonuçlar, komplikasyonlar ve her bir müdahalenin ardından yaşam kalitesindeki (YK) gelişmeler değerlendirilmiştir. Sonuçları karşılaştırmak ve etkileyen faktörleri belirlemek için t-testleri, Mann-Whitney U testleri ve lojistik regresyon dahil olmak üzere istatistiksel analizler kullanılmıştır.

Bulgular: Bulgular, tüm yöntemlerde yüksek prosedürel başarının ve tedavi sonrası YK'de önemli iyileşmelerin altını çizmiştir. Bununla birlikte, tedavi yöntemleri arasında YK sonuçlarında istatistiksel olarak anlamlı bir fark gözlenmemiştir. Komplikasyon oranları değişkenlik göstermiş, EVLA daha yüksek postoperatif ekimoz oranları göstermiş ve klasik stripping operasyonu daha yüksek yara enfeksiyonu insidansı ile ilişkilendirilmiştir. Sonuçları etkileyen faktörler arasında vücut kitle indeksi, tedavinin iki taraflı olması ve venoaktif ilaç kullanımı yer almıştır.

Sonuç: Çalışma, tedavi protokollerinin iyileştirilmesi ve uzun vadeli etkinliğin aydınlatılması için daha fazla randomize kontrollü çalışma yapılması önerisiyle sonlandırılmıştır.

Anahtar Kelimeler: Venöz yetmezlik, klasik stripping, endovenöz lazer ablasyon, radyofrekans ablasyon, yaşam kalitesi, komplikasyonlar

Introduction

Chronic venous insufficiency (CVI) is a prevalent condition characterized by inadequate venous return leading to venous hypertension and associated symptoms such as leg edema, pain, and skin changes. The primary pathology often involves incompetence of venous valves, particularly in the great saphenous vein, resulting in reflux and venous stasis. CVI affects approximately 25% of adults worldwide and poses significant healthcare challenges due to its chronic nature and potential for complications such as venous ulcers.

Surgical interventions such as classical stripping, endovenous laser ablation (EVLA), and radiofrequency ablation (RFA) have emerged as effective treatments to alleviate symptoms and improve patient outcomes. While these methods have demonstrated high technical success rates, comparative studies evaluating their efficacy across various parameters remain essential for optimizing clinical decision-making. This study aims to contribute to the existing literature by comprehensively evaluating outcomes following different treatment modalities for venous insufficiency.

Materials and Methods

This retrospective study is formed according to the ethical guidelines of the 1975 Declaration of Helsinki and approved by the the Human Research Ethics Committee of Ankara University Faculty of Medicine (approval no.: İ02-154-24, date: 06.03.2024). All the patients were consented about the study.

This study enrolled 832 patients meeting predefined inclusion criteria. Patient demographics, including age, gender distribution, and body mass index (BMI), were recorded. Treatment methods included classical stripping, EVLA, and RFA, with detailed procedural descriptions provided for each. Outcome measures encompassed postoperative pain levels [assessed using a visual analogue scale (VAS)], incidence of complications (e.g., wound infection, ecchymosis), and improvements in quality of life (QoL) using Short Form-36 (SF-36) surveys. Statistical analyses were conducted using SPSS software, employing t-tests, Mann-Whitney U tests, and logistic regression to evaluate differences in outcomes and identify predictive factors.

Inclusion Criteria

Venous insufficiency [Saphenofemoral incompetence, reflux detected for more than 0.5 seconds in Sapheno-Femoral Junction (SFJ) with Doppler ultrasound, vibrating sample magnetometer (VSM) diameter (mm) equal to or greater than 0.5 cm above knee level].

- Symptoms due to incompetence.
- Age between 18 and 80.
- Good performance status.

Exclusion Criteria

- Previous treatment of ipsilateral VSM.
- Deep venous insufficiency or thrombosis.
- Acute deep venous thrombosis or post-thrombotic syndrome.
- Use of anticoagulation.
- Agenesis of deep venous system.
- Pregnancy.
- Heart failure.
- Having a condition that contraindicates any of the treatments to be applied (e.g., allergy to aetoxysclerol or lidocaine).
- Immobilization.
- Peripheral artery disease (Ankle brachial index <0.6).
- Age under 18.
- Inability to give informed consent.

Demographic data of patients, including age, gender, BMI, bilateral lower extremity treatment, VSM mm measured in SFJ, amount of energy given for EVLA procedure (980 nm or 1470 nm), recurrence, use of venoactive drugs, use of compression

therapy, postoperative pain VAS, paresthesia and ecchymosis status, time to return to normal life after the procedure, postoperative hyperpigmentation, wound infection, presence of endovenous heat-induced thrombosis (EHIT), presence of pulmonary thromboembolism, pre- and post-treatment QoL. QoL was determined with SF-36 forms. CEAP (Clinical-Etiology-Anatomy-Pathophysiology) classification before and after treatment, presence of reflux in Doppler ultrasonography, and reoperation conditions were recorded (Table 1).

Statistical Analysis

We analysed our study data using the SPSS for Mac OS X version 20.0 (IBM Corp., Armonk, New York). Demographics of patients were presented as percentage and mean ± standard deviation (SD) in the case of normal distribution. Comparisons of basic data made by the chi-squared test and Student's test. If the results found significant, Mann-Whitney U test was used. $P<0.05$ was considered statistically significant.

Results

The study included 832 patients who underwent classical stripping, EVLA, and RFA treatment for venous insufficiency between October 2011 and January 2016. The total number of lower extremities treated was 1,390. The mean age of the patients was 43.86±10.6 years, ranging from 18 to 78. There were 347 male (41.7%) and 485 female (58.3%) patients in the study.

Table 1: Patient demographics and clinical characteristics	
Age (mean ± SD)	43.8±10.6
Male gender, n (%)	347 (41.7%)
BMI	26.18±3.49
Right lower extremity (%)	458 (52%)
Left lower extremity (%)	832 (94.4%)
Bilaterality (%)	141 (16.9%)
VSM diameter measured at SFJ (mm) (mean ± SD)	7.24±1.26
QoL (SF-36) (1-100)	
PCS (preprocedural)	35.18±3.6
MCS (preprocedural)	37.76±1.9
CEAP classification (%) (preprocedural)	
C2	362 (43.5%)
C3	182 (21.9%)
C4	216 (26%)
C5	68 (8.2%)
C6	4 (0.5%)

SD: Standard deviation, BMI: Body mass index, VSM: Vena Saphena Magna, QoL: Quality of life, SF-36: Short Form-36, SFJ: Safenofemoral junction, PCS: Physical Summary Scores, MCS: Mental Summary Scores, CEAP: Clinical-Etiology-Anatomy-Pathophysiology

Demographic data of patients, including age, gender, BMI, bilateral lower extremity treatment, VSM mm measured in SFJ, amount of energy given for EVLA procedure (980 nm or 1470 nm), recurrence, use of venoactive drugs, use of compression therapy, postoperative pain VAS, paresthesia and ecchymosis status, time to return to normal life after the procedure, postoperative hyperpigmentation, wound infection, presence of EHIT, presence of pulmonary thromboembolism, pre- and post-treatment QoL. QoL was determined with SF-36 forms (Figure 1). CEAP classification before and after treatment, presence of reflux in Doppler ultrasonography, and reoperation conditions were recorded (Figure 2).

Table 1 presents the demographic and clinical characteristics of the patient cohort. The average age is approximately 44 years, with a slight male predominance (41.7%). The majority of treatments involved the left lower extremity (94.4%), and a significant portion of patients (16.9%) had bilateral involvement. The VSM mm averaged 7.24 mm. Preprocedural QoL scores (Physical Summary Scores and Mental Summary Scores) are relatively low, indicating a substantial impact on physical and mental health due to their conditions. The CEAP classification shows a diverse distribution, with the majority in classes C2 to C4, reflecting varying degrees of chronic venous disorders (Table 1).

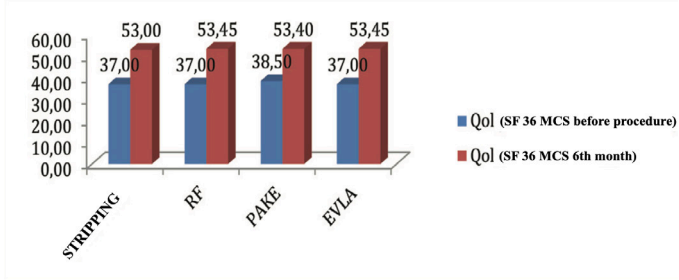

Figure 1: Graph of change in patients who underwent SF-36 quality of life survey before and after the procedure

SF-36: Short Form-36, RF: Radiofrequency, EVLA: Endovenous laser ablation, QoL: Quality of life, MCS: Mental Summary Scores

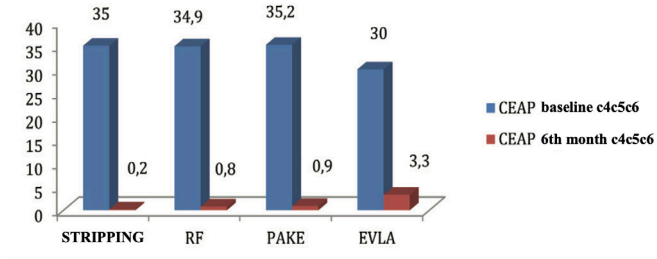

Figure 2: Graph of change in patients who underwent CEAP classification before and after the procedure

RF: Radiofrequency, EVLA: Endovenous laser ablation, CEAP: Clinical-Etiology-Anatomy-Pathophysiology

Table 2: Treatment modalities and postoperative outcomes	
Classical stripping, n (%)	358 (43%)
RFA, n (%)	62 (7.5%)
EVLA, 980 nm, n (%)	354 (42.5%)
EVLA, 1470 nm, n (%)	349 (41.9%)
Venoactive drug, n (%)	668 (80.3%)
Compression therapy, n (%)	656 (78.8%)
Postoperative ecchymosis, n (%)	245 (29.4%)
Postoperative pain (VAS 1-10)	3.75±2.1
Return to normal life (days)	3.12±1.2
Postoperative paresthesia, n (%)	125 (15%)
Postoperative hyperpigmentation, n (%)	131 (15.7%)
Wound infection, n (%)	28 (3.4%)
EHIT, n (%)	5 (0.6%)
PTE, n (%)	2 (0.2%)
QoL (SF-36) (1-100)	
PCS (6 mo after procedure)	48.06±0.93
MCS (6 mo after procedure)	53.93±1.91

QoL: Quality of life, SF-36: Short Form-36, SFJ: Safenofemoral junction, PCS: Physical Summary Scores, MCS: Mental Summary Scores, EVLA: Endovenous laser ablation, VAS: Visual analogue scale, RFA: Radiofrequency ablation, EHIT: Endovenous heat-induced thrombosis

Table 2 highlights the various treatment modalities and postoperative outcomes. EVLA was the most common procedure (85%), followed by classical stripping (43%). The use of venoactive drugs and compression therapy was prevalent (80.3% and 78.8%, respectively). Postoperative complications included ecchymosis (29.4%), paresthesia (15%), hyperpigmentation (15.7%), and a low incidence of wound infection (3.4%), EHIT (0.6%), and PTE (0.2%). Pain levels were moderate (VAS 3.75), and patients typically returned to normal activities within approximately 3 days. QoL scores showed significant improvement 6 months post-procedure (Table 2).

The study found no significant differences in QoL improvements among treatment modalities, with all methods showing substantial post-treatment enhancements. However, EVLA demonstrated a higher incidence of postoperative ecchymosis compared to classical stripping (p=0.001), while wound infections were more prevalent in classical stripping cases (85.7%, p=0.001). Factors influencing outcomes included BMI (p=0.004), bilaterality of treatment (p<0.05), and use of venoactive drugs (p<0.05). Postoperative ultrasound detected reflux in 4.9% of patients with associated implications for recurrence rates and reoperation probabilities.

Table 3 provides a comparative analysis of various treatment modalities, including classical stripping, EVLA, RFA, and pack excision.

Table 3: Comparative analysis of treatment modalities				
	Classical stripping	EVLA	RFA	Pack excision
Age (mean ± SD)	43.4±10 (p=0.53)	44.19±10.9 (p=0.1)	43.46±8.1 (p=0.71)	43.3±9.8 (p=0.6)
Gender (M) (%)	42.7 (p=0.6)	41.3 (p=0.55)	46.8 (p=0.40)	40.4 (p=0.68)
BMI	26.2±3.4 (p=0.84)	26.17±3.46 (p=0.98)	26.3±3.56 (p=0.82)	26.8±3.57 (p=0.004)
VSM diameter (mm)	7.25±1.26 (p=0.72)	7.24±1.25 (p=0.81)	7.13±1.19 (p=0.54)	7.20±1.2 (p=0.77)
Reoperation (%)	0.6 (p=0.7)	0.7 (p=1)	16.7 (p=0.37)	66.7 (p=0.018)
Recurrence (%)	36.4 (p=0.52)	86.4 (p=1)	9.1 (p=0.67)	27.3 (p=0.42)
Venoactive drugs (%)	43.3 (p=0.78)	85 (p=0.36)	7 (p=0.35)	83 (p=0.31)
Compression therapy (%)	43.1 (p=0.9)	86 (p=0.52)	6.7 (p=0.11)	21.3 (p=0.38)
Postoperative ecchymosis (%)	37.6 (p=0.03)	72.7 (p=0.001)	6.9 (p=0.71)	59.2 (p=0.001)
Postoperative pain (VAS 1-10)	3.58±2.12 (p=0.05)	3.6±2.1 (p=0.001)	3.6±2.2 (p=0.52)	6.2±1.8 (p=0.001)
Postoperative parestesia (%)	45.6 (p=0.52)	73.6 (p=0.001)	6.4 (p=0.62)	52.8 (p=0.001)
Return to normal life (days)	3.13±1.14 (p=0.16)	3.11±1.12 (p=0.001)	3.77±1.7 (p=0.003)	4.04±1.42 (p=0.001)
Hyperpigmentation (%)	17.6 (p=0.001)	85.5 (p=0.97)	12.2 (p=0.02)	87.8 (p=0.001)
Wound infection (%)	85.7 (p=0.001)	35.7 (p=0.001)	0 (p=0.25)	7.1 (p=0.07)
EHIT (%)	20 (p=0.39)	80 (p=0.54)	20 (p=0.32)	100 (p=0.001)
QoL PCS (Difference between before and after treatment)	13±3.5 (p=0.26)	12.7±3.7 (p=0.065)	13.3±3.6 (p=0.28)	12.9±3.9 (p=0.84)
QoL MCS (Difference between before and after treatment)	16.05±2.7 (p=0.17)	16.6±2.6 (p=0.06)	16.2±2.8 (p=0.92)	16.2±2.8 (p=0.44)
Reoperation (%)	0.6 (p=0.7)	0.7 (p=1)	1.6 (p=0.37)	2.3 (p=0.018)

SD: Standard deviation, M: Male, EVLA: Endovenous laser ablation, RFA: Radiofrequency ablation, BMI: Body mass index, VSM: Vena Saphena Magna, VAS: Visual analogue scale, EHIT: Endovenous heat-induced thrombosis, QoL: Quality of life, PCS: Physical Summary Scores, MCS: Mental Summary Scores

This table compares key demographic and clinical parameters among different treatment modalities for CVI. The treatments evaluated include classical stripping, EVLA, RFA, and pack excision. Each row represents a specific parameter, and columns depict the mean values or percentages for each treatment group, along with the p values indicating statistical significance.

Age (mean ± SD): The mean ages across treatment groups-classical stripping (43.4 years), EVLA (44.19 years), RFA (43.46 years), and pack excision (43.3 years-show no statistically significant differences (p values ranging from 0.1 to 0.71).

Gender (%): The percentage of male patients in each group-classical stripping (42.7%), EVLA (41.3%), RFA (46.8%), and pack excision (40.4%) indicates no significant gender distribution differences (p values ranging from 0.4 to 0.68).

BMI values are similar across groups: Classical stripping (26.2), EVLA (26.17), RFA (26.3), and pack excision (26.8). Only the comparison with pack excision shows a significant difference (p=0.004), suggesting higher BMI in this group.

VSM mm: Mean mm's of the VSM at the SFJ are comparable across all groups-classical stripping (7.25 mm), EVLA (7.24 mm), RFA (7.13 mm), and pack excision (7.20 mm) with no statistically significant differences (p values ranging from 0.54 to 0.81).

Reoperation (%): Reoperation rates are notably higher in the pack excision group (66.7%) compared to classical stripping (0.6%), EVLA (0.7%), and RFA (16.7%). The difference is statistically significant (p values ranging from 0.018 to 1).

Recurrence (%): Recurrence rates vary among groups-classical stripping (36.4%), EVLA (86.4%), RFA (9.1%), and pack excision (27.3%) with no statistically significant differences observed (p values ranging from 0.42 to 1).

Venoactive drugs (%): Usage of venoactive drugs differs across groups-classical stripping (43.3%), EVLA (85%), RFA (7%), and pack excision (83%) with statistically significant differences noted (p values ranging from 0.31 to 0.78), particularly notable between RFA and EVLA.

Compression therapy (%): Rates of compression therapy show slight variations across groups-classical stripping (43.1%), EVLA (85.4%), RFA (7.4%), and pack excision (83.3%) with significant differences between RFA and EVLA (p=0.01) (Table 3).

Early technical success was 100% in patients in all groups. When compared according to gender and BMI, no statistically significant differences were found in terms of success between methods and the percentage of application.

Discussion

This study evaluated the efficacy and safety of classical stripping, EVLA, and RFA in the treatment of venous insufficiency. Our findings indicate that all methods provide significant symptom relief and improvements in QoL. However, the choice of treatment should consider individual patient factors, including BMI, the extent of venous disease, and patient preferences regarding recovery time and potential complications (1,2).

EVLA and RFA offer the advantages of minimally invasive techniques, with faster recovery times and fewer complications compared to classical stripping. The higher incidence of postoperative ecchymosis with EVLA and wound infections with classical stripping highlight the need for careful postoperative management and patient education to mitigate these risks (3,4).

The study's findings underscore the effectiveness of classical stripping, EVLA, and RFA in treating venous insufficiency, highlighting their impact on patient QoL and complication rates. While each method demonstrated high procedural success, differences in complication profiles warrant consideration in clinical practice. EVLA's higher ecchymosis rates and classical stripping's elevated infection risks necessitate tailored patient counseling and management strategies. Moreover, the study's identification of BMI and treatment bilaterality as predictive factors for outcomes emphasizes the importance of individualized treatment approaches based on patient characteristics.

Current guidelines recommend endovenous techniques as first-line treatments due to their efficacy, safety profile, and faster recovery times compared to surgical stripping. Studies have shown that EVLA and RFA achieve high rates of vein closure and symptom relief comparable to traditional surgery but with fewer postoperative complications. Moreover, advancements in techniques and equipment have further improved outcomes and patient satisfaction (6).

Pathophysiology of CVI

CVI typically results from venous valvular incompetence, which impairs the normal flow of blood toward the heart, leading to venous hypertension. Chronic venous hypertension causes venous dilatation, capillary leakage, and eventual tissue damage, manifesting clinically as edema, skin pigmentation, and in severe cases, venous ulceration. The pathophysiology involves a complex interplay of venous valve dysfunction, venous wall remodeling, and inflammatory processes within the venous wall and surrounding tissues (7).

Understanding the pathogenesis and predisposing factors of CVI, such as venous stasis, hypertension, and genetic predisposition, is crucial in tailoring treatment approaches. Diagnostic methods, including Doppler ultrasonography, remain integral for assessing disease severity and guiding treatment decisions. The CEAP classification system facilitates standardized evaluation, aiding in treatment planning and outcome assessment (8).

Comparative Analysis of Treatment Modalities

Recent advancements in endovenous techniques have revolutionized the treatment landscape for CVI. RFA, EVLA, and ultrasound-guided foam sclerotherapy (UGFS) offer targeted, minimally invasive approaches to ablate diseased veins while preserving surrounding tissues and minimizing patient discomfort. These techniques utilize thermal or chemical energy to achieve vein closure, thereby redirecting blood flow to healthier veins and alleviating symptoms associated with venous reflux (9-15).

Traditional surgical treatment options for CVI, such as high ligation and stripping (HL/S), aim to eliminate reflux by physically removing or ligating the diseased veins. However, HL/S is associated with considerable postoperative pain, longer recovery times, and high recurrence rates due to neovascularization and residual tributary varicosities. These limitations have prompted the development and widespread adoption of minimally invasive endovenous techniques, including RFA, EVLA, and UGFS (16-19).

RFA

RFA involves the percutaneous delivery of radiofrequency energy through a catheter inserted into the diseased vein under ultrasound guidance. The thermal energy heats the venous wall, causing collagen denaturation and subsequent vein contraction and fibrosis. RFA is effective in treating both saphenous and perforator veins and has demonstrated high success rates in achieving vein closure and symptom relief. The procedure is typically performed under local anesthesia, and patients can resume normal activities within a few days (20-24).

EVLA

EVLA employs laser energy to achieve vein closure through a similar mechanism of thermal injury to the venous wall. Laser fibers are inserted into the vein under ultrasound guidance, and laser energy is delivered to cause vein contraction and fibrosis. EVLA is effective in treating saphenous veins and has shown comparable success rates to RFA. The choice of laser wavelength (980 nm versus 1470 nm) can influence outcomes, with studies suggesting lower wavelengths may result in less postoperative pain and ecchymosis (20-25).

UGFS

UGFS involves the injection of a sclerosant foam into the diseased vein under ultrasound guidance, causing endothelial damage and subsequent vein fibrosis. UGFS is effective in treating both superficial and perforator veins and can be used as an adjunctive treatment following endovenous procedures. The technique is minimally invasive and can be performed in an outpatient setting. However, UGFS may require multiple treatment sessions to achieve optimal results (26-28).

Comparative Outcomes

Studies comparing the efficacy of endovenous techniques versus HL/S have demonstrated superior outcomes with endovenous procedures in terms of reduced postoperative pain, faster recovery times, and lower complication rates. Endovenous techniques also offer the advantage of treating tributary veins and perforators simultaneously, reducing the risk of recurrence. Long-term follow-up studies have shown sustained symptom relief and high patient satisfaction rates with endovenous treatments (29).

Conclusion

The study highlights the efficacy and safety of minimally invasive endovenous techniques in treating CVI, underscoring their role as first-line treatments. While classical stripping remains an effective option, its higher complication rates warrant careful patient selection and postoperative management. Further research through randomized controlled trials is essential to refine treatment protocols and establish long-term outcomes for endovenous procedures.

Ethics

Ethics Committee Approval: This retrospective study is formed according to the ethical guidelines of the 1975 Declaration of Helsinki and approved by the the Human Research Ethics Committee of Ankara University Faculty of Medicine (approval no.: İ02-154-24, date: 06.03.2024).

Informed Consent: All the patients were consented about the study.

Authorship Contributions

Surgical and Medical Practices: N.D., B.K., Concept: N.D., B.K., Design: N.D., B.K., Data Collection and/or Processing: N.D., Analysis and/or Interpretation: N.D., Literature Search: N.D., Writing: N.D.

Conflict of Interest: According to the authors, there are no conflicts of interest related to this study.

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