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Comparison of stripping/ligation and embolization with cyanoacrylate in venous insufficiency treatment

Venöz yetmezlik ve varis tedavisinde stripping/ligasyon ve siyanoakrilat ile embolizasyon yöntemlerinin karşılaştırılması

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Abstract

Aim: Stripping/ligation (S/L) is the gold standard method used in the treatment of varicose veins. Saphenous vein ablation with cyanoacrylate (CA) is a new minimally invasive treatment method that forces this throne. Our aim is to compare these two methods in terms of patient satisfaction.

Methods: In this cross-sectional study, voluntary patients who had superficial venous insufficiency and varicose vein were divided into two groups as S/L and CA. CEAP (Clinical-Etiologic-Anatomic-Pathophysiologic-clinical score) and VAS (Visual Analogue Scale) were evaluated on the 1st, 3rd, 7th, 14th, 30th postoperative days and at the outpatient follow-up visits 1 year later. SF-36 (Short Form -36) questionnaire was applied at the first month. VCSS (Venous Clinical Severity Score) of patients were compared at 6 months after surgery. Control, color doppler ultrasonography was performed on patients with recurrent varicose veins or those who were symptomatic. SPSS 22.0 program was used for data analysis.

Results: The preoperative and postoperative VCSS scores were lower in the CA group than in the S/L group (P<0.001). In both groups, postoperative VCSS score was lower compared to preoperative conditions (P<0.001). The VAS score of S/L group was higher than the CA group, during anesthesia, on the 1st, and 3rd postoperative days (P<0.001). However, during the procedure, on the 7th (P<0.001) and 14th days (P=0.033), VAS scores were lower in the S/L group than the CA group. In short form -36, viability score was better in the S/L group (P<0.001). CA group scored higher in the other parameters (such as physical functioning, role limitations, bodily pain, general mental health, social functioning, role limitations due to emotional problems and general health perceptions) (P<0.001 for all).

Conclusion: Although the S/L method is the gold standard for varicose vein treatment, saphenous vein ablation with CA scored higher in terms of patient satisfaction.

Keywords: Venous insufficiency, Stripping and ligation, Endovenous ablation with Cyanoacrylate, Short Form-36 quality of life questionnaire

Öz

Amaç: Sıyırma/ligasyon (S/L), varisli damarların tedavisinde kullanılan altın standart yöntemdir. Siyanoakrilat (CA) ile safen ven ablasyonu, bu tahtı zorlayan yeni minimal invaziv bir tedavi yöntemidir. Amacımız bu iki yöntemi hasta memnuniyeti noktasında karşılaştırmaktır.

Yöntemler: Bu makale kesitsel bir çalışma olarak tasarlandı. Gönüllü yüzeysel venöz yetmezliği ve varisi olan hastalar, S/L ve CA grubu şeklinde ikiye ayrıldı. CEAP (Klinik-Etiyolojik-Anatomik-Patofizyolojik-klinik skor) ve VAS (vizüel ağrı skalası) 1. gün, 3. gün, 7. gün, 14. gün, 30. gün ve poliklinik takip ziyaretlerinde 1 yıl sonra değerlendirildi. Bir ay sonra SF-36 (Kısa Form-36) anketi uygulandı. Hastaların ameliyat sonrasi 6. ayda VCSS (Venöz Klinik Şiddet Skor) karşılaştırıldı. Tekrarlayan varisli veya semptomatik hastalarda kontrol renkli doppler ultrasonografi yapıldı. Veri analizi için SPSS 22.0 programı kullanıldı.

Bulgular: CA grubunda ameliyat öncesi ve ameliyat sonrası VCSS, S/L grubuna göre anlamlı olarak düşüktü (P<0,001). S/L grubunun VAS skoru anestezi sırasında, 1. ve 3. günlerde CA grubundan daha yüksekti (P<0,001). Ancak işlem sırasında, 7. günde (P<0,001) ve 14. günde (P=0,033) VAS skoru S/L grubunda CA grubuna göre daha düşüktü. S/L grubunda Kısa Form-36 canlılık skoru anlamlı olarak daha iyi bulundu (P<0,001). Diğer parametrelerde (fiziksel işlevsellik, rol kısıtlamaları, bedensel ağrı, genel ruh sağlığı, sosyal işlevsellik, duygusal sorunlara bağlı rol kısıtlamaları ve genel sağlık algıları gibi) CA grubu üstündü (P<0,001).

Sonuç: Varis tedavisinde S/L yöntemi altın standart olmasına rağmen, CA ile safen ven ablasyonu hasta memnuniyeti açısından daha üstün bulunmuştur.

Anahtar kelimeler: Venöz yetmezlik, Sıyırma ve ligasyon, Siyanoakrilat ile endovenöz ablasyon, Kısa Form-36 yaşam kalitesi ölçeği

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Introduction

Chronic venous insufficiency (CVI) is a common disease that affects almost half of the population with its high prevalence [1,2]. Various risk factors such as pregnancy, age, positive family history and high-risk occupations (such as long-standing barbers, butchers, and surgeons) trigger varicose veins [3,4].

Varicose patients are usually asymptomatic. They mostly consult a doctor for cosmetic anxiety. Symptomatic patients may have pain, feeling of weight, especially ankle edema, skin discoloration, and ultimately, venous leg ulcers [5]. The presence of reflux in the saphenofemoral junction and large saphenous vein due to valve failure is a crucial factor in the formation of varicose veins [5].

Ligation of the large saphenous vein from the saphenofemoral junction and stripping of the large saphenous vein is considered the gold standard in the treatment of varicose veins. However, minimally invasive methods such as endovenous laser ablation and radiofrequency, which developed within the last two decades, have become an alternative to surgical treatment. In both methods, multiple perivenous injections such as tumescent anesthesia and thermal complications led surgeons to search for new methods. Especially in the last decade, saphenous vein embolization with cyanoacrylate (CA) has become a rapidly shining star. Since there is no heat in this method, there are no thermal complications. Learning curve is not long, unlike tumescent anesthesia, which is a complicated method. This procedure is performed under local anesthesia. It takes about 10 minutes and return to work is fast [6].

The main purpose of our study is to compare the S/L and CA methods used in the treatment of varicose veins in the one-year follow-up period in terms of quality of life, satisfaction, pain scores and complications.

Materials and methods

Informed consent was obtained from the individuals participating in the study and the ethics committee approval was received from Adiyaman University Non-Interventional Clinical Research Ethics Committee on 16.04.2019 with the number 2019/3-8. Patients with varicose veins (related chronic venous disease) of the lower extremity who were evaluated in the Cardiovascular Surgery Policlinic of Adıyaman University Faculty of Medicine Training and Research Hospital between January 2015 and June 2019 were included in this prospective cohort-questionnaire study. The inclusion criteria in both groups were being between 18-65 years of age, reflux of more than 0.5 seconds in color doppler ultrasonography (CDUSG) and ≥C2 symptomatic varices in CEAP-clinical classification. Patients with a history of active deep venous thrombosis (DVT), pregnancy, peripheral arterial disease, arteriovenous malformation, active infection or a history of hepatitis and allergy were excluded. Patients with a saphenous diameter of over 15 mm, severely convoluting saphenous veins and obese patients were also not considered eligible for CA. A total of 856 subjects who met the criteria were included in the study on a voluntary basis. The primary endpoint was quality of life and postoperative pain after one year of follow-up. The secondary endpoint was recurrent varicose veins and complications. VCSS was applied to all patients. Venous structures were evaluated by CDUSG by a specialist radiologist. The patients were divided into two groups as S/L and CA. Decisions on the operation technique were based on physical examination findings, patient symptoms with VCSS, and 2 CDUSG findings performed by the same radiologist at 6-month intervals. Then, the treatment method was determined with the consensus of the surgeon and the patient.

Perioperative and postoperative VAS pain scale was applied to the patients. The patients were evaluated with VAS scale during anesthesia, during the procedure and on postoperative days 1, 3, 7, 14 and 30. Quality of life was evaluated by SF-36 questionnaire which included 36 questions and 8 sub-parameters. Voluntary patients who accepted to participate in this study were compared with SF-36 questionnaire in the first postoperative month in terms of quality of life. In addition, patients were evaluated with VCSS and CEAP scores in the preoperative period and the first year following the operation.

Procedural operation

S/L

All patients underwent spinal anesthesia and sedation. The saphenous vein was found distally with a 1 cm incision, made approximately 4 cm proximally to the ankle-medial malleolus and proximally with an incision of approximately 2-4 cm in the groin area. All its branches were ligated. The great saphenous vein was then ligated and divided from where it joined the main femoral vein. Then, stripping was performed with a stripper wire advanced distally. Existing packs were excised individually by miniflebectomy. After the procedure, an elastic bandage was applied for about 48 hours. The patients were hospitalized for one night, then mobilized and discharged with compression stockings to be used for at least 2 months.

Ablation with CA

Guided by CDUSG, the saphenous vein was punctured above the knee with the Seldinger technique under local anesthesia. The sheath was placed, the catheter delivered through the guide was advanced about 2-3 cm distal to the saphenofemoral junction. CA was administered with an automatic gun by applying compression to the saphenous line using the CDUSG probe. Delivery catheter was pulled 2 cm in each press. In the system we used, 0.03 cc polymer was given each time the trigger was pressed. Control CDUSG performed at the table after the procedure revealed that the saphenous vein had closed in all patients. The procedure took about 10-15 minutes. All patients were discharged with compression stockings and prophylactic LMWH to be used for one week after 2 hours of observation.

Statistical analysis

Mean, median, lowest, highest and ratio values were used to present the descriptive statistics. Categorical variables were given as frequency and percentage, and continuous variables as mean (standard deviation [SD]). The distribution of variables was measured by the Kolmogorov-Smirnov test. Mann-Whitney U test was used for the analysis of quantitative independent data. Wilcoxon test was to analyze dependent quantitative data, and chi-square test to analyze qualitative

independent data. SPSS 22.0 program was utilized for all analyses. *P*-value <0.05 was considered statistically significant.

Results

There was a total of 314 patients in the S/L group, 211 (67.2%) of which were males, and 103 (32.8%) of which were females. The mean age of the patients was 39.5 (12.1) years. Five patients had previously undergone saphenous embolization of the same leg with CA. At least one subfascial perforating vein ligation was performed in 91 patients with femoral vein valve reconstruction and 91 patients with perforator vein insufficiency who underwent CDUSG. Seven of 111 patients with Vena Saphena Parva failure underwent stripping and 104 patients underwent ligation in the same session. Patients were followed up at 2 weeks postoperatively, 297 patients had ecchymosis, 79 had superficial thrombophlebitis, 98 had transient paresthesia, and 1 had DVT. All these adverse effects were cured within a brief time with medical treatment. Preoperative demographic data and postoperative general characteristics of the patients in this group are summarized in Table 1.

There were 542 patients in CA group, 209 (38.6%) of which were males, and 333 (61.4%) of which were females. The mean age was 43,1 (12.8) years in this group. Saphenous vein embolization was performed to 250 right legs and 292 left legs by CA. The mean saphenous diameter and mean saphenous segment length were 7.5 (1.6) cm, and 29.9 (5.7) cm, respectively. In the CEAP clinical classification, 350 patients were C2, 184 patients were C3 and 8 patients were C4a in the preoperative period. Two weeks after the procedure, 69 patients had ecchymoses, 5 had superficial thrombophlebitis, 3 had transient paresthesia, and 1 had DVT. All these adverse effects were cured in a brief time with medical treatment. In the CA group, the saphenous veins were totally recanalized in 13 patients, and partially recanalized in 8 patients at the 6th postoperative month. S/L was performed in 5 of the total recanalization patients, and 3 underwent miniflebectomy in another session (Table 2).

In the CA group, age and female ratio were higher than the S/L group (P<0.001). The saphenous diameter in the CA group was lower than the S/L group (P<0.001), (Table 3).

The VAS score of S/L group was higher than the CA group on the 1st and 3rd postoperative days and during anesthesia (P<0.001). During the procedure, on the 7th (P<0.001) and 14th days (P=0.033), VAS score was significantly lower in the S/L group (P<0.001). S/L group described more pain in polyclinic controls on days 1 and 3 but interestingly, patients in the CA group had more pain on days 7 (P<0.001) and 14 (P<0.033) (Figure 1). In terms of pain, no difference was found between the groups at the end of the first month (P=0.395) (Table 3).

In SF-36 quality of life questionnaire, physical function score, pain score, general mental health score, social function score, emotional role score and general health score were higher in the CA group (P<0.001), while SF-36 vitality score (P<0.001) was lower, and time to starting daily activities, returning to work and starting active exercise were shorter.

CEAP clinical scoring showed significant improvement in both groups. The preoperative and postoperative VCSS scores were lower in the CA group than in the S/L group (P<0.001). In both groups, postoperative VCSS score was lower (P<0.001) compared to preoperative conditions (Table 3, Figure 2). Preoperative C2 was higher in CA group, while C4a was higher in S/L group. In postoperative CEAP classification, C0 (P<0.001) and C3 (P=0.01) were higher in CA group (Table 4).

Table 1: Demographic and general characteristics of S/L patients

	mean (SD) n (%)
Age(year)	39.77 (12.29)
Sex	
Female	103
Male	211
Family History	
Positive	147
Negative	167
Occupational risk factors	
Positive	181
Negative	133
Hypertension	
Positive	59
Negative	255
Body Mass Index	
Female	29.1 (4.3)
Male	28.7 (6.2)
Target leg	
Right	142
Left	172
VSM Diameter (mm)	10.1 (3.2)
CEAP Classification Clinic Category	
C2	71 (4.8%)
C3	217 (71.3%)
C4a	22 (16.6%)
C4b	4 (7.3%)
Pre-op VCSS	7.5 (2.1)
Patients who had undergone endovenous ablation with CA before	5
Post-operative	
Ecchymosis	297
Thrombophlebitis	79
Transient paresthesia	98
DVT	1
CFV insufficiency	53
CFV reconstruction performed patients	3
VSP insufficiency	111
Stripping performed in the same session patients	7
Ligation performed in the same session patients	104
Perforating Vein insufficiency (ligation)	91

S/L: Stripping/ligation, VSP: Vena Saphena Parva, VSM: Vena Saphena Magna, CEAP: Clinical- Etiologic-Anatomic-Pathophysiologic, VCSS: Venous Clinical Severity Score, CA: Cyanoacrylate, DVT: Deep Venous Thrombosis, CFV: Common Femoral Vein

Table 2: Demographic and general characteristics of CA patients

	Mean (SD) n (%)
Age (year)	43.1 (12.8)
Sex (n)	
Female	333 (61.4%)
Male	209 (38.6%)
Family History	
Positive	267
Negative	275
Occupational risk factors	
Positive	309
Negative	233
Hypertension	
Positive	112
Negative	430
Body Mass Index	
Female	28.7 (5.7)
Male	27.3 (3.9)
Target Leg:	
Right	250
Left	292
VSM Diameter (mm)	7.5 (1.6)
Treated saphenous vein length(cm)	29.9 (5.7)
CEAP Clinic Category	
C2	350
C3	184
C4a	8
Preoperative VCSS	6.0 (1.4)
Post-operative adverse events	
-In the first 2 weeks	
Ecchymosis	69 (12.7%)
Thrombophlebitis	5 (0.01%)
Transient paresthesia	3 (0.006%)
DVT	2 (0.004%)
-In the first 6 months	
Totally Re-canalized patients	13 (2.4%)
Partial Re-canalized patients	8 (1.5%)
Stripping performed in a different session	5 (0.01%)
Mini phlebectomy performed patients	3 (0.055%)

VSM: Vena Saphena Magna, CEAP: Clinical- Etiologic-Anatomic-Pathophysiologic, VCSS: Venous Clinical Severity Score, CA: Cyanoacrylate, DVT: Deep Venous Thrombosis

Table 3: Intraoperative and postoperative Quality of Life-VAS-VCSS and vitality

	S/L Mean (SD) n (%)	Median	CA Mean (SD) n (%)	Median	*P*-value	
Age (year)	39.5 (12.1)	39.0	43.1 (12,8)	43.0	<0.001	m
VSM diameter (mm)	10.1 (3.2)	9.0	7.5 (1.6)	7.0	<0.001	m
Sex Female	103 (32.8%)		333 (61.4%)		<0.001	X²
Male	211 (67.2%)		209 (38.6%)			
Limb Right	142 (45.2%)		250 (46.1%)		0.798	X²
Left	172 (54.8%)		292 (53.9%)			
SF-36 (postoperative 1st month)						
*Physical functioning	79.5 (8.1)	80.0	83.8 (7.2)	85.0	<0.001	m
*Role limitations	53.6 (32.1)	50.0	55.2 (25.8)	50.0	0.127	m
*Bodily pain	54.1 (9.1)	55.0	72.8 (11.9)	77.5	<0.001	m
*General mental health	64.3 (10.0)	65.0	78.1 (8.1)	80.0	<0.001	m
*Vitality. energy or fatigue	69.6 (8.2)	70.0	56.8 (6.7)	55.0	<0.001	m
*Social functioning	76.6 (9.9)	75.0	85.1 (9.6)	87.5	<0.001	m
*Role limitations due to emotional problems	53.0 (31.7)	66.7	68.7 (23.0)	66.7	<0.001	m
*General health perceptions	73.5 (6.9)	76.0	77.6 (7.1)	80.0	<0.001	m
VCSS (postoperative 6st month)						
Pre-operative	7.5 (2.1)	7.0	6.0 (1.4)	6.0	<0.001	m
Post-operative	2.2 (1.4)	2.0	1.5 (1.1)	1.0	<0.001	m
Intra group difference p VAS	0.000 w		0.000 w			
During Anesthesia Procedure	1.68 (0.91)	1.00	1.09 (0.29)	1.0	<0.001	m
During Procedure	0.26 (0.44)	0.00	2.15 (0.49)	2.0	<0.001	m
1.Day	4.10 (1.25)	4.00	2.26 (0.65)	2.0	<0.001	m
3.Day	3.12 (0.87)	3.00	2.36 (0.70)	2.0	<0.001	m
7.Day	1.72 (0.75)	2.00	2.97 (1.13)	2.0	<0.001	m
14.Day	0.60 (0.53)	1.00	0.68 (0.52)	1.0	0.033	m
1. Month	0.22 (0.41)	0.00	0.25 (0.43)	0.0	0.395	m
Start date of daily activities (days)	3.7 (1.0)	4.0	0.5 (0.5)	0.0	<0.001	m
Start date of Work (days)	4.9 (1.1)	5.0	1.2 (0.5)	1.0	<0.001	m
Start date of sports activity (days)	9.9 (2.9)	9.0	4.7 (2.4)	4.0	<0.001	m

m: Mann-Whitney u test, X²: Chi-square test, w: Wilcoxon test, VSM: Vena Saphena Magna, SF-36: Short Form-36, VCSS: Venous Clinical Severity Score, VAS: Visual Analogue Scale, S/L: Stripping/ ligation, CA: Cyanoacrylate

Table 4: CEAP classification before and one year after the operation

	Preoperative CEAP			X^2-test	CEAP at the first postoperative year			X^2-test
	S/L	CA	Total	*P*-value	S/L	CA	Total	*P*-value
	314	542	856	<0.001	303	523	826	<0.001
C0.n(%)	0	0	0	*	83 (27.4)	229 (43.7)	312 (37.7)	<0.001
C1.n(%)	0	0	0	*	97 (32)	117 (22.4)	214 (25.9)	0.172
C2.n(%)	71 (22.6)	350 (64.6)	421 (49.2)	<0.001	45 (149)	60 (11.5)	105 (12.7)	0.143
C3.n(%)	217 (6..1)	184 (33.9)	401 (46.8)	0.099	61 (20.1)	93 (17.8)	154 (18.6)	0.01
C4a.n(%)	22 (7.0)	8 (1.5)	30 (3.5)	0.011	14 (4.6)	24 (4.6)	38 (4.6)	0.105
C4b.n(%)	4 (1.3)	0	4 (0.5)	*	3(1)	0	3 (0.4)	*

* Chi square test cannot be performed, CEAP: Clinical- Etiologic-Anatomic-Pathophysiologic, S/L: Stripping and ligation, CA: Cyanoacrylate

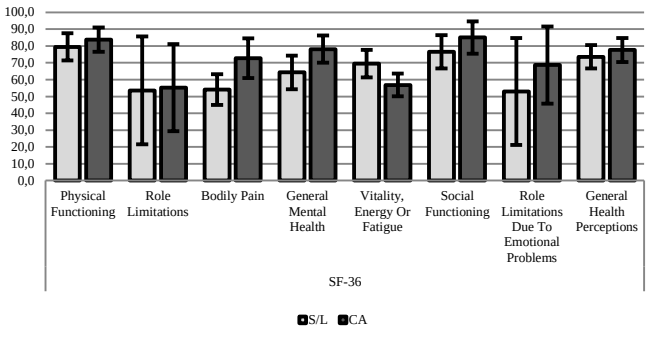

Figure 1: Comparison of SF-36 (SF-36: Short Form 36, S/L: Stripping/Ligation, CA: Cyanoacrylate)

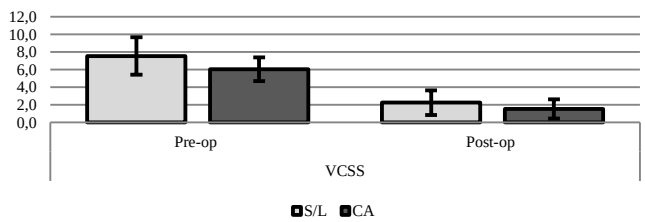

Figure 2: Preoperative and postoperative VCSS (1. Year) (VCSS: Venous Clinical Severity Score, S/L: Stripping/Ligation, CA: Cyanoacrylate)

Discussion

Because of its high prevalence, chronic venous insufficiency (CVI) causes great socioeconomic effects [6]. In recent years, minimally invasive procedures have become popular in CVI treatment for reasons such as shorter hospital stays, faster mobilization and faster return to work [7].

Although conventional or spinal anesthesia is not required as in traditional surgery, the use of thermal anesthesia in minimally invasive procedures requires preservation of perivascular tissues and skin from high temperatures [7]. However, as it is known, multiple perivascular injections related to tumescent anesthesia are difficult to apply, prolong the operation and cause possible local complications such as ecchymosis, arteriovenous fistula, pseudoaneurysm formation and paresthesia. However, as non-thermal endovenous treatment does not require an integrated anesthesia, there are no disadvantages [8,9].

N-Butyl Cyanoacrilate, which meets blood and plasma during endovenous administration in the ablation procedure, is one of the non-thermal, non-quantitative ablation methods. It rapidly solidifies and produces a rapid polymerization reaction, thus leading to ablation by the inflammatory effect on the target vessel wall [10].

Early complications (Phlebitis-Ecchymosis-Paresthesia)

In the study of Bozkurt et al., among 154 patients who underwent CA ablation, 14.2% had ecchymosis on the 3rd postoperative day, while they detected phlebitis in 7 patients. They reported that none of the patients had transient or permanent paresthesia [10].

Similar or better results were obtained in our study. Postoperative 3rd day physical examinations of 542 limbs which underwent VSM embolization with CA revealed ecchymosis in 69 (12.7%) patients, phlebitis in 5 (6.2%) patients and DVT in 1 patient. In these patients, medical treatment yielded satisfactory results at the first month visits. In 26 (4.7%) patients, transient paresthesia was detected at the first control on the 3rd day. There was no patient with complaints of paresthesia at postoperative 1st month visit. Two patients had DVT at the policlinic control at 2 weeks. Clinical findings disappeared after 3 months of warfarin treatment and recanalization occurred in CDUSG.

In our study, in line with the VSM and S/L group, ecchymosis in the first postoperative visit was observed in 297 of 314 patients who underwent the procedure and phlebitis was detected in 45 (14.3%). While 78 patients had transient paresthesia, 13 patients had permanent paresthesia at 1 month and 6 months. When the CA group in our study is examined, it is seen that thrombophlebitis rates are quite low compared to the literature [11,12]. We attribute this to the one-week LMWH we use for this group of patients. As with all minimally invasive methods, it is possible that some instrumental devices sent directly into the vessel may cause endothelial damage and that stasis in the ablated saphenous vein branches may trigger venous thromboembolism. In the literature review, LMWH was not routinely recommended or reported to be avoided to prevent post-operative complications. However, the frequency of such superficial venous thrombosis was detected between 4-5% and it was successfully treated with LMWH [12-14].

The rates of transient or permanent paresthesia secondary to nerve injury reported in S/L patient groups vary widely [15,16]. This is, of course, directly related to the technique of stripping (complete-partial, olive-olive free). Given the fact that post-operative adverse events, especially neurological damage, adversely affect the quality of life of patients, the superiority of CA ablation in this study cannot be denied.

Pain

Procedural and postoperative pain status of the patients were measured by visual analog scale (VAS). This test has been proven for a long time and is accepted in the literature. Between the two ends of a 100 mm line, the patient is asked to select the point that suits his or her condition. This test is calculated as 0 (zero): I have no pain, 10: I have the worst pain possible [17,18]. The VAS scale applied to our patients revealed less pain in the CA group during local anesthesia. This showed that spinal anesthesia caused more pain in patients than local anesthesia. During the procedure, more severe pain was detected in the CA group. We think that compression and shimic effect of cyanoacrylate during CDUSG probe use caused this pain during cyanoacrylate injection.

Discharge and return times

Ran et al. [19] reported the average discharge time of the L / S group as 3 days and the average return to work as 1 week. Chang et al. [20] reported that all patients undergoing CA were discharged on the same day of operation. Median time to return to work was 1 day (range 1-16 days). VCSS, SF-36 physical and mental scores changed from a mean of 6.91, 44.24, 54.26 at baseline to 2.43, 43.85, 52.50, respectively, at the first postoperative month. In our study, all patients who underwent CA ablation were discharged on the same day after the procedure and the mean return to work was 1.2 (0.5) days. Patients in the S/L group were discharged later. The mean time to return to work in this patient group was 4.9 (1.1) days. In addition, maintenance varicose stockings were not administered to patients in the CA group. These results were compatible with the literature.

Late complication, recanalization, efficacy, safety, and patient satisfaction:

In choosing the method, the most crucial point affecting our preferences is undoubtedly late results, as well as early results after surgery. Post-operative late-term outcomes are a particularly important indicator of the treatment efficacy. In this evaluation, re-canalization for CA ablation group and follow-up of varicose vein (vascular remodeling or neo-angiogenesis) or defective/inadequate surgical intervention are of foremost importance for the VSM S/L group. Therefore, we evaluated our patients with Venous CDUSG at their first postoperative year. We also compared pre- and post-operative VCSS values. In addition, we evaluated the satisfaction analyses of patients' quality of life with the SF-36 satisfaction questionnaire we conducted in the first month outpatient controls.

In the study of Almeida et al. [21] on long-term follow-up results of CA ablation patients in 2015, the occlusion rate was reportedly 92.0% at the 24th month follow-up. A statistically significant improvement in VCSS was reported in all patients at 24 months.

Lurie et al. [22] reported that neovascularization was observed in 4 patients during the 2-year follow-up of 36 patients who underwent S/L. In addition, cumulative rates of recurrent varicose veins were 20.9% at 1 and 2-year follow-ups. In a study by Jones et al. [23] this rate was 32%, while Creton et al. [24] reported a 12-year recurrence rate of 50%.

In our study, recurrent (neovascularization) varicose veins were found on 71(22.6%) patients in the S/L group. While 68 (95.8%) of these patients developed insufficiency in the perforated veins, 3 (4.2%) had dilatation and insufficiency in accessory saphenous veins. Among 542 patients who underwent saphenous vein ablation with CA, total and partial recanalization were observed in 13 (2.4%) and 8 (1.5%) patients, respectively. The pre-operative VCSS was 6.0 (1.4), while the post-op value reduced to 1.5 (1.1). SF-36 questionnaire form showed significant well-being in all parameters. In the S/L group, while the pre-op VCSS was 7.5 (2.1), post-op values decreased significantly to 2.2 (1.4). When both groups were evaluated in terms of VCSS, it was observed that there was statistically significant improvement in the CA group. SF-36 physical function score, pain score, general health score, social function score, emotional role score and general health score were higher in the CA group than the S/L group in the first month post-satisfaction survey. Interestingly, in the CA group, the vitality score, which was an objective assessment of vitality, energy, and fatigue, was lower than the S/L group. This showed that the patients in the S/L group felt more energetic and fuller of life, less worn, exhausted, and tired. Our results in this study were consistent and better when the literature was scanned. The following ways were followed to achieve these results: In the first policlinic examinations of the patient groups in our study, three factors were considered before choosing the method. Patient's symptoms, a detailed physical examination and detailed CDUSG findings performed by a qualified radiologist at 6-month intervals. The aim of the 6-month follow-up period was to minimize doppler examination errors, to see changes in saphenous diameter, and to encourage overweight patients to lose weight. It is evident that the weakening of the patients who are overweight, especially for S/L, will increase the comfort of the surgeon and allow a more effective S/L and a more suitable mini-phlebectomy. Patients in the CA group consisted of selected patients with lower preoperative VCSS, no dense packs, and more flat saphenous veins. The patients in the S/L group consisted of patients with dense packs, medial or lateral (sometimes both) accessory saphenous veins, and those with convoluted main saphenous veins.

Limitations

Since the aim of our study was to compare the postoperative outcomes of the patients, preoperative satisfaction surveys were not performed. In addition, although it was accepted that the patients who participated in the study voluntarily answered the questionnaire forms, we think that the answers they gave to the questionnaire forms were affected by their emotional state and physical fatigue.

Conclusion

Many factors are effective in the choice of treatment in CVI. Which method to choose in terms of patient satisfaction depends on the patient, the severity of the disease and experience

of the surgeon. Although S/L is accepted as the gold standard, minimally invasive methods seem to detract from S/L at the point of patient satisfaction, especially in patients selected for saphenous vein ablation, with non-thermal, non-tumescent CA. However, S/L + miniflebectomy remains important for patients with dense packs, tortuous, and severely extensive saphenous veins.

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