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Retrospective Comparison of Clinical Outcomes between Endovenous Laser and Saphenous Vein-sparing Surgery for Treatment of Varicose Veins

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Abstract

Background The purpose of the present study was to compare management of varicose veins by endovenous laser ablation (EVL) and a vein-sparing procedure (CHIVA: Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire) for management of varicose veins.

Methods Data from 82 consecutive patients with great saphenous vein (GSV) reflux and primary varicose veins presenting to the vascular clinic at the Far Eastern Memorial Hospital between June and December 2005 were reviewed. Of these, 74 who met the inclusion criteria were included in this study. CHIVA was performed by a double division of the refluxing saphenous vein (i.e., proximal and distal ligation), and EVL was performed using 10–14 W beginning approximately 4 cm below the saphenofemoral junction to the level of the knee. Phlebectomy for significant branch varicose veins on the leg was routinely performed in all patients. Outcome measures included postoperative thrombophlebitis, bruising, pain, assessment of ultrasonographic and clinical symptoms (measured by the Venous Clinical Severity Score [VCSS]) and comparison of quality of life survey scores obtained preoperatively and postoperatively (measured by the Aberdeen Varicose Veins Score [AVVQ] and RAND-36). Patients were examined one week post-procedurally and again at 1, 3, 6, and 12 months.

Results Endovenous laser ablation and CHIVA were performed on 54 and 20 patients, respectively. The EVL patients had significantly higher pain scores and bruising than the CHIVA group ($p < 0.001$). The VCSS of varicose, edema, pigmentation, and inflammation were significantly reduced after both EVL and CHIVA; however, patients treated by EVL had significantly more pain postoperatively than those treated by CHIVA ($p = 0.003$). Twenty-two of 54 (40.7%) and 3 of 17 (17.6%) patients in the EVL and CHIVA groups, respectively, required sclerotherapy for residual varicosities ($p = 0.026$). Both groups benefited significantly from surgery in disease-specific perceptions.

Conclusions The CHIVA patients had less pain postoperatively and a significantly higher sclerotherapy-free period compared to patients in the EVL group. Further follow-up studies to compare long-term results of various approaches to surgically managing varicose veins are needed.

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Introduction

Varicose vein surgery is common, yet there is remarkable debate concerning the best approach and what experts consider the current standard of care [1]. Almeida and Raines (2006) claim that surgical high ligation and stripping are rapidly becoming "senescent," whereas radiofrequency ablation and endovenous laser (EVL) therapy, two

percutaneous vein-ablating techniques, are reportedly safe and effective with better cosmetic outcomes than stripping or ligation [2, 3]. Still, some investigators contest that high ligation and stripping of the great saphenous vein (GSV) remains the standard of care [4, 5].

Studies comparing EVL with stripping demonstrated that the results of EVL were comparable to those of conventional stripping techniques [6–8]; however, both methods destroy the GSV [9, 10]. Another option, CHIVA (Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire or Ambulatory Conservative Hemodynamic Management of Varicose Veins), is a minimally invasive surgical procedure that spares the superficial vein network while treating the varicose vein(s) [11–13]. It entails disrupting the hydrostatic pressure column by disconnecting venous shunts, resulting in a decrease in the diameter of the GSV and other veins [14].

A variety of studies have reported positive clinical outcomes for CHIVA [13, 15]. It should be noted, however, that the procedure is not universally embraced, largely owing to the lack of objective data [16]. To date, a comparison of the potential benefits and clinical outcomes of patients treated by the saphenous vein-sparing surgery CHIVA and EVL have yet to be reported. The purpose of the present study was to compare outcomes of patients undergoing either EVL or CHIVA for management of varicose veins, such as procedure-related complications, short-term clinical improvement, ultrasonographic findings, and quality of life.

Materials and methods

Data from patients undergoing either EVL or CHIVA for management of GSV reflux and primary varicose veins presenting to the vascular clinic at the Far Eastern Memorial Hospital between June and December 2005 were retrospectively analyzed in this study. Patients were fully informed regarding the advantages and disadvantages of the two procedures and, depending on the preference of the surgeon and the preference of the family, either CHIVA or EVL was chosen. The ethical standards of the Helsinki Declaration (1975–2000) were followed in obtaining patients' informed consent (to have their medical records used in future studies) and in conducting the surgical procedures. This study was approved by the Far Eastern Memorial Hospital Research Ethics Committee.

All patients included in this retrospective study underwent venous duplex scanning and venous refill testing. Inclusion criteria were primary GSV dilatation (>5 mm) and reflux with primary varicose veins. Exclusion criteria were deep venous insufficiency or evidence of obstruction on duplex scan, active inflammation of varicose veins, recurrent varicose veins, and patients who received surgeries for both limbs. Disease severity was graded by clinical assessment, duplex ultrasound results, and venous refill testing according to the Committee of the American Venous Forum (Clinical, Etiology, Anatomy, and Pathophysiology—CEAP) classification [17] and the Venous Clinical Severity Score (VCSS) [18]. The perforator reflux in the thigh was assessed prior to operation in all patients, but to ensure meaningful comparisons between the two groups of patients, the perforator reflux was not used as a determinant of whether CHIVA would or would not be performed.

As indicated above, the goal of CHIVA is to relieve the hydrostatic pressure column by removing venovenous shunts while maintaining the saphenous vein [19]. In our hospital, CHIVA has been employed since 2003. It is performed by two divisions of the refluxing saphenous vein. The first division is performed below the saphenofemoral junction, and the second is performed approximately 5–10 cm above the knee but below Dodd's perforator. The result is the creation of a draining downward flow in the saphenous trunk that re-enters the deep circulation through the perforators.

The EVL procedure was performed as previously described [20]. Briefly, the laser power was 10–14 W and laser treatments typically began 4 cm below the saphenofemoral junction and stopped around the level of the knee and not >10 cm below the knee. Mueller's phlebectomy was performed if there were prominent branch varicosities. Laser delivery rates were 43.68 ± 27.28 J/cm with fluency of 18.47 ± 13.48 J/cm^2. The number of phlebectomies was not recorded.

In all patients included in this study, all surgeries were performed with intraoperative ultrasound guidance and tumescent anesthesia as outpatient procedures. To minimize thrombophlebitis from ablation, all patients were treated in the Trendelenburg position and epinephrine was included in the tumescent anesthesia. Negative pressure on the side port was not employed. All patients were instructed to mobilize the affected limb immediately postsurgically as described in a standardized leaflet containing detailed postoperative instructions that was provided to each patient at the time of surgery. To ensure meaningful comparisons between the two groups, phlebectomy for significant branch varicose veins on the leg was routinely performed in all patients. Small residual varicose veins and reticular veins noted at the time of follow-up were treated by sclerotherapy in both groups.

Follow-up evaluation during the first week postsurgically included a 10 cm visual analog pain scale rating (score 0–10) and a bruising score (score 0–9). The bruising score was determined based on the extent of bruising over the medial aspect of the thigh (along the course of the

treated saphenous vein) in 3 × 3 partitions, with one score devised for each area of involvement as assessed by one of us (Tzu-Chun Chen).

Serial follow-up examinations included clinical evaluations and duplex scans at 1, 3, 6, and 12 months. The 10-component VCSS was employed and the treated trunk duplex scans were used to develop an ultrasonographic saphenous summary score defined as the sum of two ultrasonographic characteristics: degree of thrombosis and degree of reflux. Degree of thrombosis was defined as grade 1 for limited thrombosis in a segment less than 10 cm, grade 2 for partial thrombosis greater than 10 cm, and grade 3 for whole-length thrombosis. Reflux was defined as the presence of reverse flow in the trunk greater than 0.5 s as determined via standing duplex and distal compression-releasing testing. Degree of reflux was defined as grade 1 for limited reflux, grade 2 for the presence of reflux in a segment greater than 10 cm, and grade 3 for the presence of reflux along the whole trunk.

Additional data collected included a disease-specific quality of life (DSQOL) questionnaire and a generic health-related quality of life (HRQOL) questionnaire completed presurgically and again at 6 months postoperatively. Disease-specific quality of life was assessed with the Aberdeen Varicose Veins Questionnaire (AVVQ), which consists of questions relating to all aspects of varicose veins, scored from 0 to 100 with good validity [21]. Zero is reserved for patients with no evidence of varicose veins and 100 for patients ticking the most severe response to each question. Generic HRQOL was measured with the 36-item RAND health survey (RAND Health Communications, Santa Monica, CA), which assesses eight concepts: physical functioning, social functioning, role limitations due to physical problems (role-physical), role limitations due to emotional problems (role-emotional), mental health, vitality, bodily pain, and general health perception, as well as an aggregated physical component summary (PCS) and mental component summary (MCS). For each subscale, scores are transformed to a scale from 0 (worst health) to 100 (best health). The RAND-36 has good reliability and validity [22, 23].

Statistical analysis

Data were expressed as either mean ± standard deviation or number (percent). The Fisher's exact and chi-square tests were used to compare categorical variables. For ordinary data, Mann-Whitney *U*-tests were carried out for comparison of the two groups, and Wilcoxon signed ranks tests were performed to determine the difference between preassessment and postassessment of intervention. Paired *t*-tests were used to compare pre- and post-treatment DSQOL-AVVQ and HRQOL-RAND-36 scores. Independent two-sample *t*-tests were used to compare continuous data. Associations between pain scores and bruising score were calculated using Pearson's correlation coefficient. Repeated measures with linear mixed models were used to compare between-group differences over time on total VCS and GSV scores. Kaplan–Meier curves with a log rank test were used to calculate the sclerotherapy-free survival for the two groups. All statistical assessments were two-sided and evaluated at the 0.05 level of significant difference. Statistical analyses were performed with the SPSS 15.0 statistics software (SPSS Inc, Chicago, IL)

Results

Data from 82 consecutive patients with GSV reflux and primary varicose veins presenting to the vascular clinic at the Far Eastern Memorial Hospital between June and December 2005 were reviewed, and 74 of those 82 patients met the inclusion criteria and were included in this study. Records from 21 men and 53 women with a mean age of 51.0 ± 13.67 years (range: 26–77 years) were reviewed. As summarized in Table 1, all patients presented with visible branch varicose veins on the diseased lower legs before treatment (CEAP clinical class C_2 or greater). Endovenous laser ablation was performed on 54 patients (73%) and CHIVA was performed on 20 (27%) patients. No significant differences in age, gender, or pretreatment disease severity were noted ($p > 0.05$).

At the first post-surgical follow-up evaluation one week post-procedurally, EVL patients had significantly higher pain scores (4.71 ± 2.0) than the CHIVA group (0.50 ± 0.76; $p < 0.001$) and significantly more thigh bruising (3.25 ± 1.86) than the CHIVA group (0.16 ± 0.37; $p < 0.001$). The bruising score was significantly associated with postoperative pain (Pearson's correlation coefficient, = 0.846; $p < 0.001$).

The number of patients available for follow-up dramatically dropped during the one year follow-up period. Follow-up was available on 74, 58, 44, and 24 patients at 1, 3, 6, and 12 months, respectively (Fig. 1). As described in Table 2, VCSS of pain and edema significantly reduced in both the EVL group and the CHIVA group between before and 12 months after treatment ($p < 0.05$). There were no significant differences in any subscale of VCSS at 12 months after treatment between the EVL and CHIVA groups ($p > 0.05$). There was no significant difference in the total VCSS between the two groups before treatment (Table 1); however, linear mixed model analysis demonstrated a significant difference in total VCSS over time (Fig. 2; $p = 0.019$). That is, patients in the ELV group had higher total VCSS than those in the CHIVA group (2.21 ± 2.07 versus 0.38 ± 0.74, determined at 12 months

Table 1 Comparison of pretreatment clinical assessments and severity scores for patients undergoing endovenous laser ablation (EVL) and (Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire [Ambulatory Conservative Hemodynamic Management of Varicose Veins] (CHIVA)

Variables	Overall ($n = 74$)	EVL ($n = 54$)	CHIVA ($n = 20$)	p Value
Gender[a]				0.851
Male	21 (28.4%)	15 (27.8%)	6 (30.0%)	
Female	53 (71.6%)	39 (72.2%)	14 (70.0%)	
Age, years[b]	51.00 ± 13.67	52.28 ± 13.07	47.55 ± 14.99	0.188
ACP classification[c]				0.328
$C_{2,s}$, E_p, A_s, P_r: varicose veins	25 (33.8%)	21 (38.9%)	4 (20.0%)	
$C_{3,s}$, E_p, A_s, P_r: edema	19 (25.7%)	14 (25.9%)	5 (25.0%)	
$C_{4,s}$, E_p, A_s, P_r: skin changes without Ulcer	24 (32.4%)	14 (25.9%)	10 (50.0%)	
$C_{5,s}$, E_p, A_s, P_r: skin changes with healed ulcer	1 (1.4%)	1 (1.9%)	0 (0.0%)	
$C_{6,s}$, E_p, A_s, P_r: active ulcer	5 (6.8%)	4 (7.4%)	1 (5.0%)	
Diameter of GSV, mm[b]	7.75 ± 1.93	7.65 ± 1.92	7.96 ± 1.98	0.571
VCSS[d]	6.85 ± 4.35	6.82 ± 4.65	6.95 ± 3.50	0.416
AVVQ score[b]	43.27 ± 15.22	44.29 ± 16.27	40.93 ± 12.69	0.482

Data are presented as mean ± standard deviation or number (percentage)

Values were based on:

[a] Chi-square

[b] Independent two-sample -*t*-test

[c] Fisher's exact test

[d] Mann-Whitney *U*-test

ACP American College of Phlebology; *GVS* great saphenous vein; *AVVQ* Aberdeen Varicose Vein Questionnaire; *VCSS* venous clinical severity score

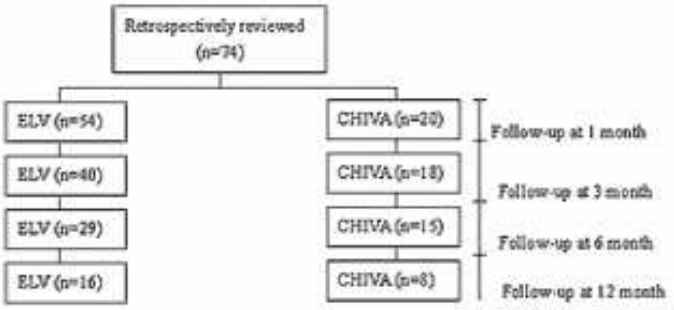

Fig. 1 Number of patients available at each follow-up evaluation

following treatment). While differences in the distribution of C_2–C_6 were noted, the differences were not significant ($p = 0.328$).

Figure 3 describes freedom from follow-up sclerotherapy between the two groups. Twenty-two of 54 (40.7%) patients in the EVL group and 3 of 17 (17.6%) patients in the CHIVA group required sclerotherapy within 6 months of the original surgery for the management of residual varicosities. Significantly more EVL patients than CHIVA patients required follow-up sclerotherapy ($p = 0.026$).

Not surprisingly, patients in the EVL group had significantly more thrombosis than those in the CHIVA group. Linear mixed model analysis demonstrated a significant difference in subtotal saphenous status scores over time between the treatment groups (Fig. 4; $p < 0.001$).

Table 3 shows the comparisons of DSQOL-AVVQ and HRQOL-RAND-36 scores between baseline and 6-month follow-up stratified by method of treatment. Patients in both treatment groups benefited significantly from surgery in disease-specific perceptions noted by pre- and post-treatment comparison with the paired *t*-test (both $p < 0.001$). At 6 months postoperatively, CHIVA patients had a significantly lower DSQOL-AVVQ score than EVL patients (7.57 ± 11.61 versus 20.09 ± 15.24; $p = 0.008$). There were significant improvements of HRQOL-RAND-36 in energy, bodily pain, and physical component summary in patients treated by EVL ($p < 0.05$). Significant improvements of HRQOL-RAND-36 in physical functioning, role-physical, energy, bodily pain, and physical component summary in patients treated by CHIVA were also found ($p < 0.05$). At the 6-month follow-up examination, post-treatment HRQOL-RAND-36 was equally improved in CHIVA and EVL patients in all domains except bodily pain.

Table 2 Comparison of pre- and post-surgical (12 months after treatment) VCSS between patients treated by either EVL or CHIVA

VCSS	EVL	CHIVA	*p* Value[a]
Pain			
Before treatment	1 (0, 3)	1 (0, 2)	0.413
After treatment	0 (0, 1)[b]	0 (0, 0)[b]	0.242
Varicose			
Before treatment	2 (1, 3)	2 (1, 3)	0.891
After treatment	0 (0, 2)	0 (0, 0)	0.052
Edema			
Before treatment	1 (0, 3)	2 (0, 3)	0.258
After treatment	0 (0, 1)[b]	0 (0, 0)[b]	0.168
Pigmentation			
Before treatment	0 (0, 3)	0 (0, 2)	0.978
After treatment	0 (0, 2)[b]	0 (0, 1)	0.350
Inflammation			
Before treatment	0 (0, 3)	0 (0, 1)	0.937
After treatment	0 (0, 1)	0 (0, 0)	0.077
Induration			
Before treatment	0 (0, 3)	0 (0, 1)	0.442
After treatment	0 (0, 2)	0 (0, 1)	0.297

Data are displayed as median (range)

[a] No signficant difference in any subscale was noted between the EVL group and the CHIVA group with the Mann–Whitney *U*-test

[b] A significant difference was noted between before and 12 months after treatment when the Wilcoxon signed ranks test was used

Specifically, CHIVA patients reported a higher degree of improvement in bodily pain than EVL patients did (87.5 ± 15.98 versus 70.21 ± 19.8; $p = 0.007$).

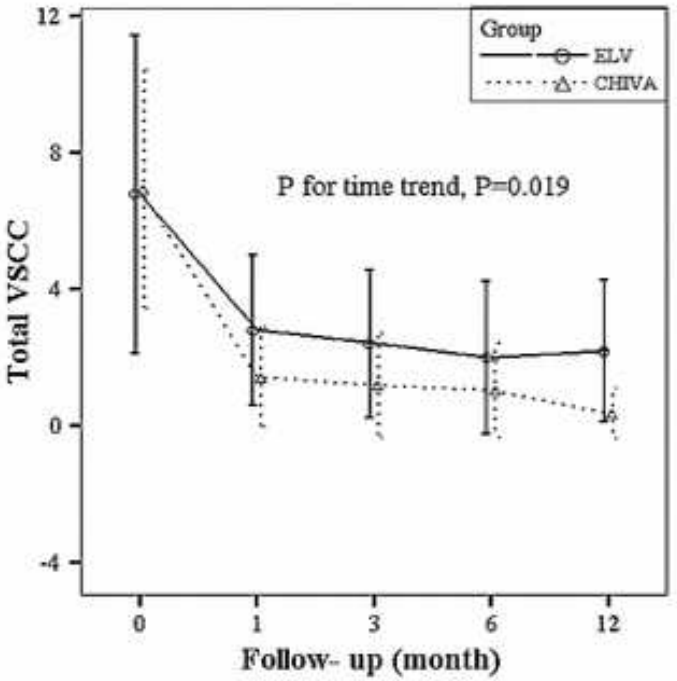

Fig. 2 Comparison of VCSS during the one-year follow-up period between patients treated with endovascular laser ablation (EVL) and those treated with saphenous vein-sparing surgery (Conservatrice et Hémodynamique de l'Insuffisance Veineuse en Ambulatoire [Ambulatory Conservative Hemodynamic Management of Varicose Veins]: CHIVA)

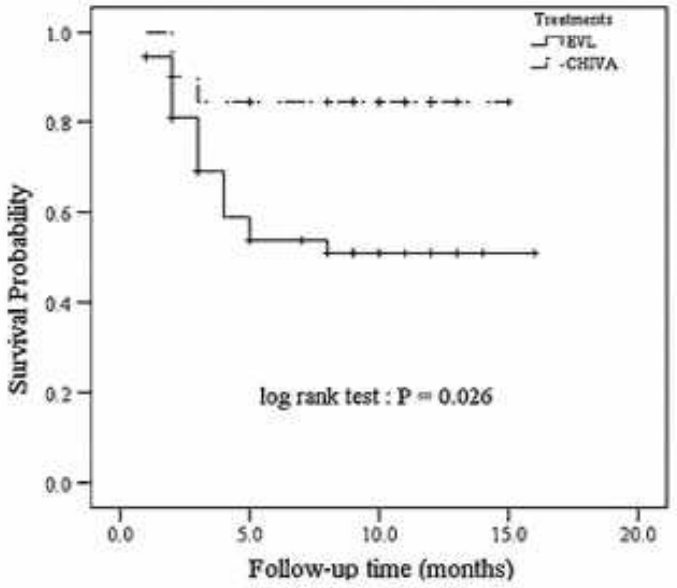

Fig. 3 Kaplan-Meier curves for sclerotherapy-free survival in patients treated by either EVL or CHIVA

Discussion

Endovenous laser ablation is one of the most widely accepted treatment options for an incompetent GSV [24] due to its simplicity [25, 26], efficacy [27, 28], and safety, with few major or minor postprocedural complications [29]. Nonetheless, vein-sparing procedures such as CHIVA are advantageous [11]. Until now, no comparisons between EVL and the GSV-sparing CHIVA technique have been reported. Key findings of this small, retrospective study were that CHIVA patients had less pain postoperatively, and a significantly higher sclerotherapy-free period was anticipated in CHIVA patients compared to the EVL group.

Endovenous laser ablation of the GSV produced thrombophlebitis and bruising that were significantly associated with postoperative pain. This is consistent with the mechanism of EVL ablation—thermal injury and thrombotic occlusion of the GSV that usually accompanies perforations [3, 30, 31]. Endovenous laser therapy patients had postoperative thigh pain different from their preoperative leg pain, described as burning pain, tender, or cord-like tightness on the thigh.

Patients treated for varicose veins had improved quality of life measures in both groups. This is compatible with a recent report that varicose vein surgery per se improved quality of life as measured with HRQOL questionnaire [8,

Table 3 Comparisons of pre- and postoperative (6 months) specific and generic quality of life scores between patients treated with EVL and CHIVA

Variables	EVL ($n = 54$)	CHIVA ($n = 20$)	p Value
DSQOL-AVVQ score			
Pre-treatment	44.29 ± 16.28	40.93 ± 12.69	0.482
Post-treatment	20.09 ± 15.24[b]	7.57 ± 11.61[b]	0.008[a]
HRQOL-RAND-36			
Physical functioning			
Pre-treatment	79.48 ± 18.00	78.21 ± 18.15	0.830
Post-treatment	80.52 ± 15.49	87.86 ± 14.77[b]	0.147
Role-physical			
Pre-treatment	68.97 ± 32.50	67.86 ± 30.11	0.915
Post-treatment	75.00 ± 29.12	85.71 ± 28.95[b]	0.264
Role-emotional			
Pre-treatment	94.31 ± 12.69	92.93 ± 14.05	0.748
Post-treatment	93.17 ± 13.60	92.86 ± 19.34	0.951
Energy/fatigue			
Pre-treatment	62.76 ± 10.49	65.00 ± 11.09	0.523
Post-treatment	66.55 ± 10.27[b]	68.93 ± 7.64[b]	0.447
Emotional well-being			
Pre-treatment	72.83 ± 11.83	73.71 ± 6.41	0.795
Post-treatment	74.48 ± 10.17	74.57 ± 5.79	0.971
Social functioning			
Pre-treatment	80.41 ± 12.81	81.50 ± 15.30	0.808
Post-treatment	79.14 ± 11.67	81.50 ± 15.30	0.578
Bodily pain			
Pre-treatment	61.34 ± 15.49	64.57 ± 16.41	0.533
Post-treatment	70.21 ± 19.80[b]	87.50 ± 15.98[b]	0.007[a]
General health			
Pre-treatment	55.55 ± 16.55	51.43 ± 17.48	0.456
Post-treatment	57.59 ± 13.47	57.86 ± 12.36	0.950
Physical component summary			
Pre-treatment	65.56 ± 13.00	65.36 ± 14.60	0.963
Post-treatment	69.91 ± 13.26[b]	77.54 ± 13.47[b]	0.086
Mental component summary			
Pre-treatment	73.11 ± 8.47	72.84 ± 9.88	0.927
Post-treatment	74.11 ± 7.82	75.09 ± 9.96	0.727

Data are presented as mean ± standard deviation

[a] A significant difference was noted between the two groups when the independent two-sample t-test was used

[b] A significant difference was noted between pre-treatment and post-treatment in each group with the paired t-test

DSQOL disease-specific quality of life questionnaire; *HRQOL-AVVQ* health-related quality of life–Aberdeen Varicose Veins questionnaire

32]. When we stratified the quality-of-life results in the two groups at the 6 month follow-up time point, CHIVA patients had a significantly better outcome than EVL patients in the disease-specific AVVQ score and bodily pain domain of RAND-36. These findings suggest that

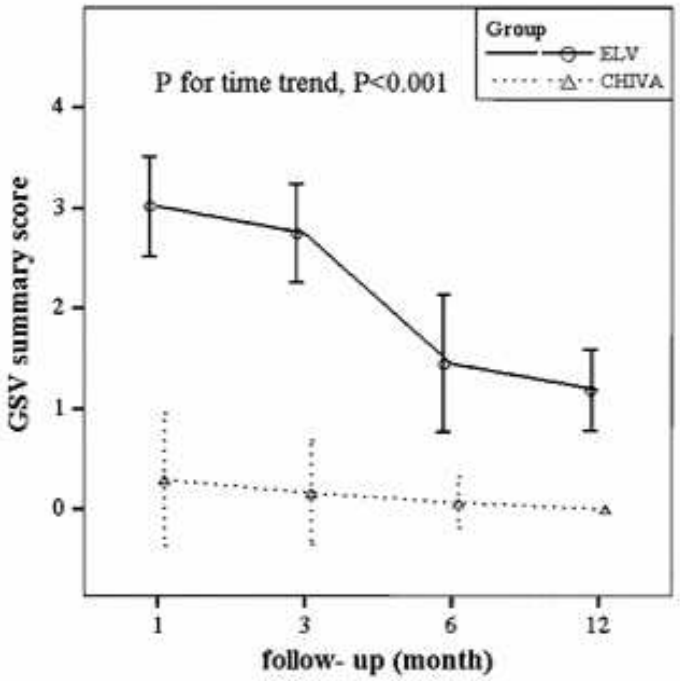

Fig. 4 Changes in great saphenous vein (GSV) summary score over the one-year follow-up period for patients treated with either ELV or CHIVA

patients with preserved drainage of the saphenous trunk have a greater improvement in life quality.

Despite the limitations and differences in reporting ultrasonographic findings, these results demonstrate that GSV patency does not promote recurrent reflux or varicose veins [13, 33]. CHIVA leaves most of the saphenous trunk patent, allowing the GSV to receive tributary flow from soft tissue and to drain blood into distal communicating or perforating veins, which subsequently relieves venous hypertension and symptoms associated with varicose veins [13]. Ultrasound follow-up examinations also indicate that EVL interruption leads to thrombotic occlusion of the treated trunk and subsequent fibrosis. Not surprisingly, EVL patients had significantly more limb thrombosis than patients in the CHIVA group (59 of 60 patients at the one-month follow-up examination). Significant differences in ultrasonographic scores for thrombosis were also found between the two groups at 3, 6, and 12 months.

Just like stripping, EVL and CHIVA both prevent GSV trunk reflux. The primary failure rate appears equivalent between EVL and CHIVA in terms of obliterating trunk reflux; however, recanalization and recurrence of reflux occurs with EVL [9, 34, 35]. At 3, 6, and 12-months postoperatively, 14, 19, and 18% of EVL limbs had recurrent reflux, respectively. Thirty-two of the 60 limbs had both 3- and 6-month duplex scan data available. Of these, one patient changed from a reflux-free status at 3 months to having evidence of reflux at 6 months, and a second patient progressed from mild reflux to "closed"

Table 4 Comparison of postoperative ultrasonographic assessment of saphenous veins treated by either EVL or CHIVA

Ultrasonographic outcomes	EVL	CHIVA	*p* Value
Follow-up at 1 month	$n = 54$	$n = 20$	
GSV thrombosis	2.80 ± 0.68	0.10 ± 0.31	<0.001[a]
GSV reflux	0.22 ± 0.72	0.20 ± 0.62	0.962
Follow-up at 3 months	$n = 40$	$n = 18$	
GSV thrombosis	2.45 ± 0.75	0.06 ± 0.24	<0.001[a]
GSV reflux	0.30 ± 0.76	0.11 ± 0.47	0.312
Follow-up at 6 months	$n = 29$	$n = 15$	
GSV thrombosis	1.17 ± 0.38	0	<0.001[a]
GSV reflux	0.28 ± 0.59	0.01 ± 0.26	0.220
Follow-up at 12 months	$n = 16$	$n = 8$	
GSV thrombosis	1.00 ± 0.37	0	<0.001[a]
GSV reflux	0.19 ± 0.40	0	0.200

Data are presented as mean ± standard deviation

[a] A significant difference was noted between the EVL group and the CHIVA group with the Mann–Whitney *U*-test

with follow-up sclerotherapy. These rates seem high compared to other published reports, and they are likely a reflection of the small number of patients included in the present study. It should also be noted that, although a repeat phlebectomy is an option for treating residual varicose veins, we chose sclerotherapy as the only option for a meaningful comparison between groups.

The limitations of this report, as with many reports of single-center data, include the small numbers of cases (particularly at the latter follow-up examinations), a retrospective study design, absence of blinded outcomes assessment, and variability in patient follow-up. We did not stratify the CHIVA limbs into drainage and non-drainage results [19], and we were not able to identify neoformation of vessels by ultrasound mapping over the one year of follow-up in our patients. Having the patient assist in choosing one procedure from two options reduced selection bias. Comparisons between the two groups with adequate statistics demonstrated significant differences in a few variables, even with the small number of cases. Another limitation of this study was the small number of patients available at each follow-up point (described in Table 4). In addition, the number of phlebectomies performed prior to CHIVA or EVL was not recorded. Finally, the energy used in this study could be perceived as another limitation. The authors of this study began treating patients with EVL in 2003. The selected technique conformed to the instruction and recommendation available at that time [20, 25, 27].

Dosing influences efficacy, as addressed in a few articles [20]. A mean of 43.68 J/cm were delivered in this study, which may seem low compared to other reports, but the reported range in the literature does vary. It is possible that a higher energy could reduce recurrent reflux, and therefore further studies using higher energy, 80–100 J/cm might be worthwhile. Additional studies involving a larger number of patients with a longer follow-up period would be beneficial.

In conclusion, newer technologies or minimally invasive methods that reduce postoperative pain and bruising are of benefit to patients, particularly when the procedure is, as in most cases, elective. Key findings of this small, retrospective study were that CHIVA patients had less pain postoperatively and that a significantly higher sclerotherapy-free period was anticipated in CHIVA patients than in EVL patients. Further follow-up studies to compare long-term results of various approaches to surgically managing varicose veins are needed.

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