Single-visit endovenous laser treatment and tributary procedures for symptomatic great saphenous varicose veins

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ABSTRACT

INTRODUCTION Endovenous ablation of saphenous varicose veins has decreased morbidity and recovery time compared with open surgery. This study assessed the outcome and mid-term patient satisfaction of single-visit endovenous laser treatment (EVLT) alone, EVLT combined with phlebectomies and endovenous chemical ablation.

METHODS A retrospective review was conducted of all patients ($n=91$) in 2008–2009 who underwent single-visit day-case EVLT using local anaesthesia under a single surgeon. Postoperative venous ultrasonography at 2 and 14 months was reviewed. A telephone questionnaire was carried out to assess recurrence of symptoms and quality of life at 42 months.

RESULTS Overall, 124 limbs underwent day-case EVLT under local anaesthesia using an 810nm diode laser at a continuous setting of 14W. Forty-eight of these underwent EVLT alone while fifty underwent EVLT with phlebectomies and twenty-six underwent EVLT with endovenous chemical ablation. Ninety-one per cent of limbs underwent two-month postoperative imaging. All had satisfactory great saphenous vein (GSV) ablation (anterior thigh vein patency: $n=1$). The majority (84%) of limbs underwent 14-month imaging with a 98% GSV ablation rate. Three per cent had anterior thigh vein and saphenofemoral junction incompetence. Recurrence of GSV patency and reflux was <1%. The response rate to the questionnaire was 60%: 95% of respondents confirmed improvement following treatment, 62% remained symptom free at 42 months while 65% of patients with a return of symptoms deemed them mild. The questionnaire was scored out of 56 for symptoms and quality of life. Those with symptoms scored significantly higher.

CONCLUSIONS At 42 months, the majority of limbs remained asymptomatic. The short-term GSV ablation rates were excellent. Overall mid-term review of patients has shown a well received single-visit service with concomitant phlebectomy or endovenous ablation, and good ablation and patient satisfaction rates.

KEYWORDS

Venous insufficiency – Varicose veins – Minimally invasive

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Varicose veins affect 15–40% of people.^{1,2} The majority arise from the great saphenous vein (GSV) and saphenofemoral junction (SFJ).³ Minimally invasive ablation such as endovenous laser treatment (EVLT) is an increasingly popular treatment for symptomatic SFJ reflux with or without GSV incompetence.^{2,4} When compared with open varicose vein surgery, EVLT results in decreased pain, earlier return to work,⁵ improved patient satisfaction and improved quality of life.^{6,7} Single-visit EVLT and phlebectomy procedures have shown reduced need for secondary procedures and improved short-term results.⁸ Outpatient radiofrequency ablation (ClosureFast; Covidien, Dublin, Ireland) and EVLT are under investigation.^{8,9}

EVLT delivers energy directly to the endothelial lumen, resulting in non-thrombotic vein occlusion as a result of collagen contraction, denudation of endothelium, vein wall

thickening, microperforation and eventual luminal contraction and fibrosis.^{1,5} This is aided by tumescent anaesthesia providing a heat sink and compression of the vein against the laser fibre.⁵

There is an increasing amount of data for recanalisation following endovenous ablation but extensive long-term results are pending.⁶ Three-month occlusion rates vary between 87% and 100%.⁴ The aim of this study was to assess the outcome and mid-term patient satisfaction of single-visit EVLT with phlebectomies or with endovenous chemical ablation.

Methods

All consecutive patients who underwent EVLT between January 2008 and December 2009 under one consultant

(MAR) at a single centre were included in the study. Patients were initially identified for EVLT following pre-operative venous duplex ultrasonography demonstrating GSV reflux and SFJ incompetence. Those with suitable veins were offered EVLT with or without further tributary procedures depending on disease distribution and patient preference. Where possible, patients were consented for both phlebectomy and chemical endovenous ablation. For the purpose of this study, operative data were collected prospectively and reviewed retrospectively. Routine follow-up venous duplex imaging at a median of 2 and 14 months was reviewed. All follow-up duplex imaging was performed by a vascular ultrasonographer. Patients received a postoperative clinic appointment at six weeks but after one year, further follow-up visits were patient and clinician dependent.

After 42 months, a telephone questionnaire was conducted to assess recurrence of symptoms and quality of life. The questions were adapted from validated questions in the SF-36[®] questionnaire and the Aberdeen Varicose Vein Questionnaire (AVVQ). Patients were contacted by telephone and a questionnaire score out of 56 was recorded.

Endovenous laser treatment procedural materials

The day surgery was performed under local tumescent anaesthesia (median of 300ml of 0.5% lidocaine per limb). All patients received preoperative intravenous paracetamol (1g) and prophylactic tinzaparin (3,500–4,500 units). Portable ultrasonography with a linear vascular probe (SonoSite, London, UK) was used to identify the GSV. The vessel was routinely cannulated below or above the knee using up to 10ml of 0.5% bupivacaine. An 810nm diode laser (Delta; AngioDynamics, Cambridge, UK) with a 14W continuous setting was used, delivering 70–90J/cm of energy. Patients with significant tributary disease were marked preoperatively for foam sclerotherapy or multiple phlebectomy. Aftercare included adhesive strips and Panelast[®] stockings (Lohmann and Rauscher, Neuwied, Germany) for one week. Ambulation and activities could continue immediately following surgery.

Results

Between January 2008 and December 2009, 91 patients underwent single-visit GSV EVLT, totalling 124 procedures (58 unilateral, 66 bilateral). The median age was 51 years (interquartile range: 31–64 years), with a male-to-female ratio of 60:64. Access to the GSV was percutaneous in 89 cases (72%) and open in 36 cases (28%).

The ASA (American Society of Anesthesiologists) grade ranged from 1 to 4 (mode: 1). The majority (72%) were ASA grade 1 or 2 while the remaining 28% had a higher ASA grade. The CEAP (Clinical, aEtiology, Anatomy, Pathophysiology) clinical classification was as follows: 60% of limbs were C2 (varicose veins), 30% of limbs were C4 (pigmentation, eczema, lipodermatosclerosis, atrophie blanche), 8% of limbs were C5 (healed venous ulcer) and 2% of limbs were C6 (active venous ulcer). Those patients with ASA grade 4 had the procedure if symptoms were

deemed significant enough by the patients. All of these veins were CEAP C4–6.

Local tumescent anaesthesia

The mean length of vein ablated was 28.3cm (SD: 8.2cm). The mean total of 0.5% lidocaine tumescent anaesthesia used was 310ml (SD: 103ml), equating to 11ml/cm (SD: 3ml/cm) of vein of ablated.

Laser settings and energy used

The laser was used at 14W continuous power for 121 limbs. Three limbs had 12W pulsed power. The mean total energy used was 2,305J (SD: 764J). This equated to a mean total of 80.6J/cm (SD: 9.7J/cm) of vein ablated.

Tributary procedures

Of the 124 limbs in the study, 51 (41%) had a phlebectomy and 25 (21%) had foam sclerotherapy while 48 (39%) had no tributary procedures. The decision regarding the tributary procedure was based on local anaesthesia demands and tributary vein size. There was no statistical difference in initial symptom improvement in those who had tributary procedures and those who did not ($p=0.25$, chi-squared test). Phlebectomy was more likely to produce an initial improvement than chemical ablation ($p=0.004$, chi-squared test).

Procedural results

At two months, 92% of EVLT procedures (114/124) had follow-up venous duplex ultrasonography, with 99% (113/114) having a successful GSV ablation. Seven per cent of EVLT procedures (9/124) had no follow-up imaging owing to clinic non-attendance or unknown reasons.

At 14 months, there was an 86% attendance rate (102/114) for venous duplex ultrasonography, with a 97% (99/102) successful GSV ablation rate. There was 1% GSV patency and incompetence, and 2% SFJ incompetence arising from perforating thigh veins. Four patients were documented as not having attended clinic follow-up appointments, for seven patients there was no trace of clinic appointments or imaging records and there were two patient mortalities from unrelated causes.

Questionnaire results

There was a 60% response rate from patients (55/91) following 3 separate attempts at contact for the 42-month questionnaire. The questionnaire used a Likert-type score to rate symptoms and baseline general health as well as quality of life and activities of daily living prior to and following EVLT. The questions used were from validated questionnaires. Questions regarding initial improvement visually and symptomatically per limb (pain, swelling, itching, eczema, ulceration or skin discoloration) were compared if there were any recurrent or persisting symptoms.

The vast majority (95%, 52/55) confirmed some improvement in varicose veins following treatment. Symptoms were scored (mean score: 1.7), with asymptomatic patients scoring a mean of 0.07 and those with a return of symptoms scoring a mean of 1.7 ($p=0.0002$, Student's *t*-test).

Only 38% (23/52) had some return of symptoms: 65% (15/23) described them as mild (occasional visual, pain, swelling, itching), 30% (7/23) deemed them moderate and only one patient experienced a return of severe symptoms to one leg after a bilateral procedure. Eleven per cent (6/55) of patients continued to wear compression stockings and fifteen per cent (8/55) continued to take analgesia for symptoms. There was no statistically significant difference between those who rated themselves with return symptoms and whether or not they required a tributary procedure (Table 1.)

Almost three-quarters (73%, 40/55) of patients would recommend the procedure to a relative or friend while only 13% (7/55) would definitely not recommend the procedure to a friend. Thirteen per cent (7/55) of patients found the procedure more painful than expected. This was related to infiltration of tumescent anaesthesia or tributary phlebectomy.

Of the 23 patients who experienced a return of symptoms, only 9% (2/23) had evidence of active venous reflux on ultrasonography at 1 year (Table 2).

There were four patient deaths from unrelated causes during the 42-month period. Two of the four patients had completed 14-month follow-up imaging while the other two had only had their initial postoperative imaging (sepsis and heart failure).

Four patients (4%) had other complications in this cohort including one case of paraesthesia, following which nerve conduction studies did not reveal significant sural,

saphenous or peroneal nerve damage. There were also two patients with persistent postoperative leg swelling who were admitted for investigation. Doppler ultrasonography detected no deep vein thrombosis. The fourth patient had potential pulsatile flow from the superficial femoral artery. This was checked again at the one-year imaging but no further flow was seen.

Discussion

Recurrence in open varicose vein surgery has been reported as high as 40% in two years and 66% over ten years.¹¹ In 70% of cases, this has been due to groin neo-vascularisation, secondary to angiogenesis of the postoperative reparation following groin dissection.^{11,12} Recurrence rates at two years in endovenous ablation remain under 7% at present.¹⁵ Untreated refluxing tributaries (accessory saphenous vein or duplex saphenous system) and refluxing perforators increase the risk of recurrence but are uncommon (<5%).¹⁴ In our study, the incidence of subsequent thigh vein perforators that were varicose at 14 months was under 2% and only one of them was present on initial ultrasonography. However, non-refluxing tributaries can remain untreated¹⁴ and can be reassessed if the patient develops further reflux.

The majority of recurrences occur within 18 months.¹⁷ Our recurrence rate was 3% at 14 months. Postoperative ultrasonography surveillance enables further assessment of patency and treatment for tributaries, accessory saphenous

Table 1 Rating for general health and quality of life before and after endovenous laser treatment (EVLT)				
Question	Rating	Asymptomatic	Symptomatic	p-value*
How do you rate your general health?	Poor	0 (0%)	0 (0%)	0.12
	Below average	2 (6.1%)	0 (0%)	
	Average	4 (12.1%)	6 (27.3%)	
	Above average	15 (45.5%)	11 (50.0%)	
	Excellent	12 (36.4%)	5 (22.7%)	
How do you rate your varicose vein prior to EVLT?	Poor	2 (6.1%)	2 (9.1%)	0.18
	Below average	7 (21.2%)	1 (4.5%)	
	Average	10 (30.3%)	6 (27.3%)	
	Above average	10 (30.3%)	11 (50.0%)	
	Excellent	4 (12.1%)	2 (9.1%)	
How do you rate your varicose vein following EVLT?	Poor	0 (0%)	0 (0%)	0.004
	Below average	7 (21.2%)	0 (0%)	
	Average	0 (0%)	6 (27.3%)	
	Above average	10 (30.3%)	11 (50.0%)	
	Excellent	4 (12.1%)	5 (22.7%)	
*chi-squared test				

Table 2 Positive findings on follow-up imaging tabulated against return of symptoms			
Case	Doppler ultrasonography at 6 weeks	Duplex ultrasonography at 1 year	Return of symptoms?
Case 11	Varicosities arising below segment of ablated above-knee GSV	No reflux at GSV	Yes
Case 22	Varicose anterior thigh vein tributary	No reflux at GSV	Yes
Case 29	Portions of right GSV open but no reflux demonstrated	No reflux at GSV	Yes
Case 89	Patent GSV with apparent pulsatile flow	No 1-year imaging	NA
Case 24	No reflux to GSV/SFJ	No reflux at GSV, SSV incompetence	Yes
Case 57	No reflux to GSV/SFJ right	Incompetence and patent GSV right only	No
Case 58	No reflux to GSV/SFJ left	Minor reflux left	No
Case 65	No reflux to GSV/SFJ	Anterior thigh vein varicosity with SFJ incompetence	WN
Case 73	No reflux to GSV/SFJ	Anterior thigh vein reflux	NA
Case 78	No reflux to GSV/SFJ left	GSV ablated varicosities draining to anterior thigh vein	Yes
Case 81	No reflux to GSV/SFJ right	GSV ablated, SFV and popliteal vein incompetence right	No – physiotherapy for swelling to right leg
Case 85	No reflux to GSV/SFJ	GSV occluded to knee, distal reflux at below-knee GSV	NA
GSV = great saphenous vein; NA = no answer on three separate occasions; SFJ = saphenofemoral junction; SFV = superficial femoral vein; SSV = small saphenous vein; WN = wrong number (no up-to-date contact details available to hospital)			

systems or the lesser saphenous system, which may go on to cause further symptoms in the mid-term interval, thereby reducing satisfaction and perceived success of the procedure.

Varicose veins are a common problem in a relatively young and fit population, and the subjective improvement and experience is therefore very important. As seen in this study, a large proportion have mild C2 venous insufficiency.

Following the development of endovenous ablation either by laser or radiofrequency energy, there has been an increase in methods to reduce treatment times and improve quality such as single-visit surgery, whereby the varicose vein and its tributaries are treated together.

Carradice *et al* compared both sequential and concomitant phlebectomy with varicose tributaries.¹⁵ They found that AVVQ scores were significantly lower at six weeks in the concomitant group before and after the procedure. Further studies have shown that concomitant procedures have increasing evidence of being successful, safe and effective.⁸ Moreover, there is increased development in the use of endovenous ablation and tributary procedures in outpatient settings.⁹ At our centre, we aim to perform all the tributary procedures required in a single visit. Further procedures are necessary for the anterior thigh vein or short saphenous system varicosities.

Although we have demonstrated a good patient centred outcome in the medium term following EVLT, the results are limited (like all patient centred studies) by patient subjectivity and lack of an objective mid-term clinician-based assessment in return of symptoms specific to venous

disease. The operative data were collected prospectively but the subsequent follow-up data were reviewed retrospectively. This limited the ability to delineate clinician-made decisions on tributary treatment. Ultrasonography studies were not reported routinely with vessel diameter but it is the departmental practice to ensure the veins are suitable for endovenous ablation. Furthermore, although convenient for the patient, telephone review does restrict clinical assessment and concessions must be made to adapt validated questions for telephone interview.

Conclusions

The majority of limbs remain asymptomatic. Patients who develop a return of symptoms experience only minimal symptoms. The short-term ablation rates for the GSV vein are excellent. Overall, mid-term review of patients has shown a good single-visit service with a good ablation rate at 14 months and good patient satisfaction up to four years after treatment.

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