ORIGINAL ARTICLE

Day surgery varicose vein treatment using endovenous laser

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Objective To examine the safety and efficacy of endovenous laser obliteration to treat varicose vein in a day surgery setting, using sedation and local anaesthesia.

Design Prospective study.

Setting Day surgery centre in a regional hospital in Hong Kong.

Patients A total of 24 patients with duplex-confirmed long saphenous vein insufficiency underwent endovenous laser (940 nm) varicose vein treatment from July to November 2007 in a single day surgery centre. Adjuvant phlebectomy and injection sclerotherapy were performed in the same session if indicated. All patients had post-procedural venous duplex scan and clinic assessment on day 7 and day 10 respectively.

Main outcome measures Procedure success rate, unplanned hospital admissions and re-admissions, major complications, and long saphenous vein obliteration rate.

Results A total of 31 limbs of the 24 patients were treated with endovenous laser varicose vein treatment under local anaesthesia and sedation. The procedural success rate was 100%. All but two patients were admitted on the day of treatment and none were re-admitted. The patients' mean visual analogue pain score for the whole procedure was 2.3 (standard deviation, 1.5; range, 0-5). Post-procedural duplex scans showed 100% thrombosis of the treated long saphenous veins with no deep vein thrombosis. There were no skin burns or instances of thrombophlebitis. Induration of the treated long saphenous vein was relatively common (54%). The majority of the patients (54%) experienced mild discomfort in the early postoperative period.

Conclusion Endovenous laser varicose vein treatment performed under local anaesthesia and sedation in a day surgery setting is safe, and yields satisfactory clinical and duplex outcomes.

Key words
Ambulatory surgical procedures; Laser therapy; Saphenous vein; Varicose vein

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Introduction

Varicose veins constitute a common clinical problem, which may affect quality of life significantly. Most varicose veins are due to long saphenous vein incompetence, with or without incompetent perforators. Conventional treatment for long-saphenous-system varicose veins is the Trendelenburg operation (flush ligation over the sapheno-femoral [SF] junction and stripping of the long saphenous vein), which entails general or spinal anaesthesia. In many centres, patients undergoing this operation are hospitalised for 2 to 3 days. Endovenous obliteration of the long saphenous vein is an alternative procedure, which does not entail groin dissection and is therefore less traumatic. The procedure can be performed using laser or radiofrequency energy. A laser fibre or radiofrequency probe is inserted into the lumen of the long saphenous vein and the energy generated obliterates the long saphenous vein. Several randomised controlled trials[1-3] evaluating this method showed its effectiveness and complication rates were comparable to those of the conventional operation. The endovenous approach is less invasive, and therefore can be carried out as a day surgery procedure. This study aimed to evaluate its safety and efficacy using endovenous laser treatment (EVLT) in a day surgery setting.

Methods

Patients with documented long saphenous vein insufficiency and in CEAP (Clinical,

腔內激光治療靜脈曲張的日間手術

目的 探討使用鎮靜劑和局部麻醉進行腔內激光治療靜脈曲張的日間手術的安全性及成效。

設計 預後研究。

安排 香港一所地區醫院的日間外科中心。

患者 2007年7月至11月於一所日間外科中心內，共24名透過複式顯像掃描證實大隱靜脈功能不全的病人接受腔內激光治療靜脈曲張。有需要時會同時使用輔藥式靜脈切除術及靜脈注射。所有病人均於術後第7及第10日分別接受靜脈複式顯像掃描及臨床檢查。

主要結果測量 手術成功率、未經預約的入院及再入院的次數、嚴重併發症，以及大隱靜脈閉塞率。

結果 24名病人共31條肢體經局部麻醉及鎮靜接受腔內激光治療靜脈曲張。手術成功率為100%。除了兩名病人，所有病人均在手術當日入院，並無再入院紀錄。病人對於整項手術的平均疼痛指數為2.3（標準差1.5；介乎0-5）。術後複式顯像掃描顯示經治療的大隱靜脈有100%血栓形成，並無深靜脈血栓，沒有皮膚灼傷或血栓性靜脈炎。經治療的大隱靜脈硬結的情況頗為普遍（54%）。大部份病人（54%）於手術初期有輕微的疼痛感。

結論 於日間外科中心內經局部麻醉及鎮靜接受腔內激光治療靜脈曲張是安全的，且有滿意的臨床及複式顯像掃描結果。

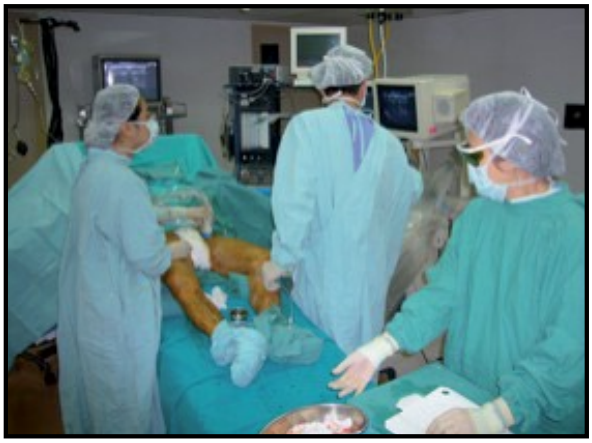

FIG. Operating theatre setting for endovenous laser varicose vein treatment. The position of the laser fibre tip inside the long saphenous vein was assessed by real-time ultrasound

Etiology, Anatomical and Pathology) clinical class II or above, who consented to the endovenous laser obliteration procedure between July and November 2007, were studied. Tortuosity of the varicosed long saphenous vein over the thigh region and extensive varicosities over the leg region are not exclusion criteria for EVLT. Patients having short saphenous system–related varicose veins were excluded. Demographic information, clinical data, procedural data, and outcomes of the patients undergoing EVLT were recorded prospectively.

Duplex venous examination was performed for all patients as a pre-procedural assessment. All duplex scans were performed by an experienced sonographer using the Acuson 120XP10 (Aspen, CA, US) device in the Vascular Laboratory. Both the superficial and the deep systems were evaluated. Long saphenous vein incompetence was defined by the presence of retrograde flow detected in the duplex scan over the SF junction or the long saphenous vein, with the patient examined in the standing position. The competence of the leg perforators was also assessed during the examination.

Procedure

All the EVLT procedures were performed in the Day Surgery Centre of a regional hospital. An introductory pamphlet was given to the patient during preoperative clinic assessment. Nursing staff of the centre contacted the patient by phone 1 day before the procedure to clarify the admission time, pre-treatment preparations, and to answer any queries. Each patient was admitted 2 hours before the scheduled treatment. The surgeon in-charge explained the procedure, marked the varicose vein, and applied local anaesthetic EMLA cream (AstraZenaca AB, Sodertalje, Sweden). The cream was applied to the medial thigh and leg regions and was kept under a wrap for 45 to 60 minutes.

The procedure (EVLT) was performed under intravenous sedation (2-5 mg midazolam, according to the patient's body weight and duration of the procedure) and local anaesthesia. The long saphenous vein was accessed either at the above-knee or below-knee level by direct puncture under duplex guidance or via a small cut down. A 0.035" glidewire (Terumo Medical Corporation, Tokyo, Japan) was then passed up inside the long saphenous vein followed by a straight flush catheter (Cordis Corporation, Miami [FL], US). A Male Touhy Borst connector (TotalVein Systems, Houston [TX], US) was used to mark a position on the 940 nm laser fibre (Dornier MedTech, Kennesaw [GA], US) so that when connected, the laser fibre tip would protrude from the distal end of the straight flush catheter by 1 cm. The glidewire was then exchanged with a laser fibre. The laser fibre tip was adjusted under duplex guidance (Aloka SSD-2000, Aloka, Tokyo, Japan) to a position 1.5 cm away from the SF junction. Tumescent solution (500 mL normal saline plus 15 mL 8.5% sodium bicarbonate solution and 30 mL 2% lignocaine with adrenaline) kept inside a pressure bag (300-350 mm Hg) was connected to a 20G Disp chiba biopsy needle (Cook, Bloomington [IN], US) [Fig]. A total of 250 to 400 mL tumescent

solution was injected around the long saphenous vein. Endovenous obliteration of the long saphenous vein was performed using a Dornier MediLas D Litebeam + Diode Laser (Dornier MedTech, Kennesaw [GA], US). The pulse mode was set at 15 W or less with a pull back rate of 0.2 to 0.5 cm per second, up to a position 2 cm proximal to the access site. The patency and absence of thrombus in the deep femoral vein was then checked using the duplex scan. Avulsion phlebectomy under local anaesthesia or injection sclerotherapy over the leg and ankle regions was performed, if indicated. A pressure stocking was applied immediately after the procedure.

Discharge and follow-up

All patients rested in the recovery room for at least 2 hours after the treatment, during which time nursing staff explained post-procedural care to the patient and the accompanying person. The severity of pain experienced during EVLT was assessed using a visual analogue pain scale. All patients were requested to have a person accompanying them during discharge and watching over them overnight for any problem. After final assessment by the surgeon, the patients were discharged taking oral analgesia in the form of sustained release diclofenac (Voltaren SR) 100 mg daily for 3 days, followed by Paracetamol 1 g 4 times a day on demand. A 24-hour hotline was set up to deal with any problems arising after discharge. Nursing staff made a follow-up call to each patient 2 days after the procedure. Post-treatment duplex venous examination was performed for all patients on day 7. Patency of the deep veins, and reflux at the SF junction, the long saphenous vein and leg perforators were assessed. Successful obliteration of the long saphenous vein was defined as less than 5 cm being patent beyond the SF junction. All patients were assessed in the specialist out-patient clinic on day 10. Further assessment was arranged after the procedure at 8 weeks and then half yearly. During the first clinic assessment, the clinical condition of the treated limb, severity of discomfort, extent of pain present during the first 5 postoperative days, the time to resume daily activities (cooking and dining, household cleaning, shopping, and going to market) as well as the time to resume work were assessed.

Results

During the study period, 31 limbs from 24 patients (9 males and 15 females) aged 41 to 78 (median, 59) years were treated with EVLT. Twenty of them had primary varicose veins and four had recurrences (after a previous SF ligation). The clinical presentations of these patients are summarised in Table 1. Duplex assessment showed that 29 (94%) of the limbs had SF junction reflux as well as reflux in the long saphenous vein. Two had reflux in the long saphenous vein only (without SF junction incompetence). Sixteen (52%) of the limbs revealed the presence of incompetent calf perforators.

TABLE 1. Clinical presentations of the patients

Presentation	No. (%) of patients
CEAP* clinical class	
II	12 (50)
III	4 (17)
IV	7 (29)
V	1 (4)
Varicose vein	
Few	3 (13)
Calf	18 (75)
Calf and thigh	3 (13)
Pain	
Occasional	8 (33)
Daily	3 (13)
Oedema	7 (29)
Pigmentation	
Small area	6 (25)
Large area	2 (8)
Inflammation	1 (4)
Ulcer	1 (4)
Bleeding	4 (17)
Thrombophlebitis	1 (4)

* CEAP denotes Clinical, Etiology, Anatomical and Pathology

The procedural success rate was 100%. The mean operating time was 110 (standard deviation [SD], 43; range, 45-210) minutes. No deep vein thrombosis or skin burn was noted immediately after the procedure. The mean visual analogue pain score for the procedure was 2.3 (SD, 1.5; range, 0-5). All but two (92%) of the patients were admitted to the ward on the same day, making the day surgery failure rate of 8%. One of the failed patients was admitted to the ward for observation of a haematoma under an avulsion phlebectomy wound. The other had to stay in hospital overnight due to typhoon. No patient required re-admission after discharge.

All the patients attended for post-procedural duplex examination and clinic follow-ups; no deep vein thrombosis was detected. The obliteration rate of the treated long saphenous vein was 100%. Postoperative pain was classified into three categories (no/minimal, moderate, and severe). Fourteen (58%) of the patients reported no or minimal pain during the first 5 post-treatment days. Eight (33%) of them experienced moderate pain and two (8%) severe pain. During the first clinic follow-up, none had any skin burns or nerve injury. Three (13%) of the patients had significant skin bruising, two of whom were taking long-term aspirin. All the bruises resolved by 8 weeks and no additional treatment was offered. No patients suffered overt thrombophlebitis, although induration over the long saphenous vein was noted in 13 (54%). Minimal residual varicosities (all asymptomatic) were

TABLE 2. Clinical symptoms recorded 8 weeks and 6 months post-procedure

Clinical symptoms	No. (%) of patients	
	At 8 weeks	At 6 months
Residual varicose vein	6 (25)	4 (17)
Secondary injection sclerotherapy	3 (13)	1 (4)
Pain	0	0
Oedema	1 (4)	0
Pigmentation	6 (25)	5 (21)
Inflammation	0	0
Ulcer	0	0
Bleeding	0	0
Thrombophlebitis	0	0

noted in 11 (46%) patients. Three of these patients subsequently had injection sclerotherapy to obliterate their residual varicose veins. No patient underwent a secondary surgical procedure. The mean time to resumption of daily activities was 4 (SD, 3; range, 1-10) days. Eleven patients were in employment, and the mean time to resumption of work was 11 (SD, 6; range, 3-21) days. All patients attended for their 8-week and 6-month follow-up appointment. Their clinical symptoms at these times are summarised in Table 2.

Discussion

Regarding the treatment of varicose veins, randomised controlled studies have shown comparable complication and recurrence rates for the endovenous obliteration approach (either radiofrequency ablation or laser) and conventional SF ligation and stripping.[1-3] The EVOLVeS study[2] showed a better quality-of-life score for the endovenous group at the 1- and 2-year assessments. Rautio et al[4] concluded that endovenous obliteration had advantages over conventional surgery in terms of less postoperative pain, shorter periods of sick leave, earlier return to normal activities, and reduced overall costs to society. In terms of the type of energy used for saphenous vein obliteration, Puggioni et al[5] showed no significant difference in the efficacy and complication rates between procedures using radiofrequency energy and laser. Laser energies of various wavelengths including 810 nm,[6,7] 940 nm,[8] 980 nm,[3] and 1320 nm Nd:YAG[9] have been applied to obliterate the long saphenous vein. A prospective randomised study[10] comparing the use of 980 nm and 810 nm laser for endovenous obliteration procedures showed no significant difference in their effectiveness and complication rate. Laser energy of 940 nm was used in this study, as it was readily available in our locality. The early outcomes in our series were comparable to those in the above-mentioned studies and assured us that EVLT using a laser wavelength of 940 nm was a safe procedure with a very high treatment success rate. However, continued clinical and duplex follow-up is needed to assess its effectiveness in the long term.

One of the procedural difficulties commonly encountered is that of passing up the instruments through the tortuous long saphenous vein. This problem can be solved by positioning of the patient in the reversed Trendelenburg's position, negotiating the passage with a hydrophilic glidewire, advancing the straight flush catheter with simultaneous saline injection, or inserting a blunt-ended stripper to guide the glidewire. Occasionally an additional small incision over the kinking site in the thigh is needed to allow passage of the glidewire and straight flush catheter. The number of incisions for avulsion of varicosities has to be planned judiciously. Even with intravenous sedation and local anaesthesia, patients may experience some discomfort with avulsion phlebectomy. We tended to use avulsion phlebectomy to remove varicosities around perforators (especially the incompetent ones) and apply injection sclerotherapy for the remainder with a view to minimise the number of incisions. After EVLT, induration over the treated long saphenous vein (with or without associated pain) was frequent and lasted several weeks. This occurred more frequently in patients with large-diameter long saphenous veins. Clinicians should warn patients of this possibility before the procedure. Longer duration of treatment with a non-steroidal anti-inflammatory drug appeared necessary for patients with significant pain associated with a thrombosed long saphenous vein.

In patients with a groin access problem, the endovenous obliteration approach has particular advantages over conventional SF ligation and stripping. A randomised controlled trial compared endovenous radiofrequency VNUS closure and conventional surgery for patients with recurrent varicose veins. The former evidently produced less pain, bruising, and was associated with shorter procedure durations.[11] In the current study, EVLT of the refluxed long saphenous vein was successfully performed on all four patients with recurrence after previous SF ligation. One of them had excessive soft tissue outgrowths around the groin area. Performing SF ligation on this patient would have been extremely difficult and carried a significant risk of wound complications. In another patient who had previous hip surgery resulting in limited hip external rotation, conventional SF ligation would also have been technically challenging. In such situations, EVLT is definitely a more favourable option for both the patient and the clinician.

Over the last few decades, there has been a tendency to change from various kinds of in-hospital

surgery to ambulatory out-patient settings.[12-14] The economic benefits derived[13,14] and the advancements in minimally invasive technology have been the main reasons for this trend. Endovenous laser treatment is an ideal procedure for an ambulatory setting. Minimal surgical exposure allows the treatment to be performed under sedation and local anaesthesia, thus avoiding spinal or general anaesthesia. In the current study, the procedure was well tolerated by most patients with low average visual analogue pain scores. The simple post-procedural care necessary and a low complication rate associated with EVLT are added benefits, making it more acceptable as an ambulatory procedure. To provide a good day surgery service, an effort from both clinicians and the nurses is required.[15] Preoperative assessment by an experienced clinician and an information pamphlet[16] help build up the patient's sense of security. Patients also feel more comfortable when the operating clinician is the same person who assessed them in the clinic.[17] Detailed explanation of postoperative care by the nurses, telephone follow-up, and a hotline for queries can reduce patient anxiety and thus anxiety-related re-admission. Having such a low unplanned admission and re-admission rate in this study, day surgery by EVLT for varicose veins effectively reduced the hospital stays and hence costs.

Conclusion

Endovenous laser obliteration of the long saphenous vein under local anaesthesia and sedation is a safe and feasible treatment for varicose vein patients in a day surgery setting.

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