Research article

Endovenous Laser Ablation in Management of Primary Varicose Veins

Elhindawy K* MD, Morsy AH MD, Hefnawy ET* MD, Fouad S. Fouad* MD, Osman Ismail** MD, Wael M. Kamel**MSc**

* Department of Surgery, Vascular Surgery Unit, Faculty of Medicine, Cairo University

** Department of Surgery, Vascular Surgery Unit, Faculty of Medicine, Minia University

Abstract

Background: Varicose veins involve at least 20% in the world population. Our study is focusing on the clinical evaluation and management of varicose veins using newly advanced technique Endovenous Laser Ablation (EVLA) to improve the quality of patients care. **Purpose:** To study the clinical presentations, management including Endovenous Laser Ablation and its outcome in varicose vein patients. **Patients & Methods:** A total 30 patients with primary varicose veins (15-45 years old) Most of them were males 26 (86%), rest are females 4 (14%), investigated, operated using diode laser 980 nm, under LA and followed up for 6 months and their Final outcome evaluated. **Results:** In this study we include young adult and middle aged varicose veins patients and majority of patients sought medical help for painful legs 100%, visible varicose vein 93.33%, skin discoloration 16.67%, the whole length Long saphenous vein involvement was seen in 78.125% of patients and SSV involvement in 6.25%. ELA of Truncal involvement is done with success rate about 97%, no recurrence in follows up. **Interpretation & conclusion:** Majority of the patients with Truncal varicose veins associated with or without venous ulcers appeared to have their best chance using EVLA under our settings.

Key words: Endovenous Laser, Ablation, Varicose Veins

Introduction

Varicose veins are dilated, tortuous veins of the superficial venous system. Varicose veins represent a significant clinical problem because they actually represent underlying chronic venous insufficiency with ensuing venous hypertension[1, 2].

Within the last few years, minimally invasive techniques such as radiofrequency ablation and chemical ablation have been developed as alternatives to surgery in an attempt to reduce morbidity and improve recovery time. EVLA is one of the most promising of these new techniques. EVLA is becoming an established treatment option for great saphenous vein (GSV) and short saphenous vein (SSV) incompetence, with success rates comparable to those of conventional surgery[3, 4, 5].

Patients and Method

This is a prospective study, conducted over the period starting at April 2013 till June 2014; we enrolled 30 selected patients who sought medical advice at the Vascular Surgery Unit of Minia University, Complaining of GSV and/or SSV varicosity with or without SFJ and /or SPJ reflux. The principle examination included detailed medical history of the disease, careful physical examination and venous duplex ultra-sound imaging.

Inclusion criteria:

- Adult patients with primary varicose veins which were symptomatic.
- GSV and SSV with reflux > 1 second on duplex ultrasound
- Primary varicose veins with GSV incompetence with or without SFJ reflux with or without active ulcer.

Exclusion criteria:

- Current deep-vein Thrombosis or acute superficial-vein thrombosis; Post-thrombotic syndrome or occlusion of the femoral or iliac vein.
- GSV or SSV <3mm or > 15mm in diameter; Tortuous veins that were considered to be unsuitable for EVLA.
- Contra-indications to foam or to general/ regional anesthesia which may be required for interventional surgery.
- Coagulation disorder, Peripheral arterial diseases; pregnant woman, those who were unable to ambulate.

Patients who are included in this study were subjected to the following:

Consent and patient advice, History taking, Physical examination, Investigation, Operative procedure, Post-operative care.

Figure (1): showing GSV marked enlargement in 2 different patients

DUS examination was performed using color coded duplex **Mindray system™** .The purpose was to measure the diameter of the superficial venous system, determine venous reflux and exclusion of any previous DVT or deep venous insufficiency. The post-operative color duplex ultrasound was concerned about the ablated vein for venous reflux, thrombus and recanalization. The success of the ablation procedure was defined as lack of compressibility of the treated GSV segment, absence of the blood flow inside the vein, decreased vein diameter and no deep venous thrombosis.

Technique: Patients admitted to the operative room and asked to disrobe completely from the waist down, the course of GSV, branch varicosities and perforating veins were identified by inspection and marked during DUS scan while the patient in the upright position.

The patient lie supine on the operative table and pre-operative duplex ultrasound is performed and the GSV is marked on the skin every 6 to 8 cm along its course from the proposed access site to the sapheno-femoral junction using skin marker. The patients were placed in anti-trendelenburg position on the table in order to minimize shrinkage of the vein, EVLT with 980 nm diode Laser (**Fox ™, Cherolase ™** of ARC Laser Systems, Germany) was performed under tumescent anesthesia for all 30 patients. The GSV was cannulated at knee level via percutaneous needle puncture under ultra-sound guidance in 10 patients in other patients it had been cannulated at the ankle level.

Figure (2): The GSV was cannulated at ankle level via venous cutdown

Figure (3): introducing calibrated sheath with SFJ duplex monitoring

A 4 FR guide catheter was then passed over the, 0.35 j-tip 55cm guide wire 3-4 cm below SFJ; the sheath has calibrated marking which are useful during the Laser fiber pullback. Once we confirmed the position of the sheath with ultrasonography 600 mm bare tipped Laser fiber was inserted in the vein, the distal tip of the Laser fiber was positioned 2-3 cm below SFJ, Once the device is appropriately placed for ablation, the patient is placed in Trendelenburg position to facilitate vein emptying and peri-venous tumescent anesthesia is then delivered .Optimal delivery of this fluid into the saphenous space is accomplished under DUS examination.

Fig (4): Tumescent anesthesia injected under DUX scan.

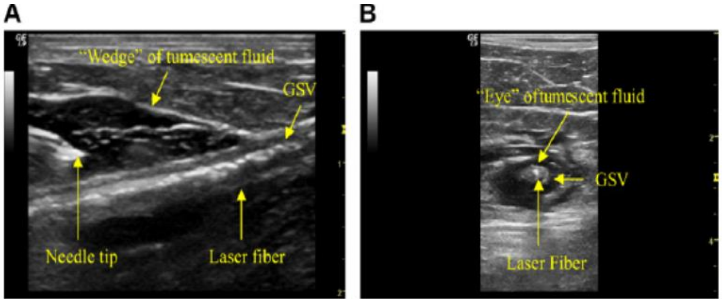

Fig (5): Longitudinal (A) and cross-sectional (B) views of DUS during tumescence.

The tumescent local anesthetic solution consists of 20 ml 1% lidocaine and 1 ml adrenaline (1:100000) diluted in 500 ml of cold (4^{o}c) saline was applied peri-venously. The Linear Endovenous Energy Denisty (LEED) values were used to calculate the Laser energy based on the GSV diameter 1.5 -2 cm distal to SFJ.

- For GSV diameters between 4.5 -6.9 mm 60/70 j/cm^2 of energy was used.
- For GSV diameter between 7-10 mm 80/90 j/cm^2 energy was used.

Figure (6): the laser system in action 12 watt pulsed waves 2 m sec intervals

The Laser unit is turned off and sheath and Laser fiber are removed from the patient, manual pressure is held over the access site to obtain hemostasis.

Further treatment by ultra –sound guided sclerotherapy for the residual tributaries was required after 30% of procedure, usually performed 1-3 weeks after EVLT; this was done in the out-patient clinic. The sclerosant used in this study was Aethoxysklerol™.
After discharge, the patient is given instructions regarding activity level, pain control, the use of a compression stocking and follow-up. The patients are encouraged to ambulate after the procedure.

DUS criteria for successful treatment: At 1-week follow-up, an enlarged non-compressible GSV, with echogenic, thickened vein walls and no flow seen. At 3 and 6 months follow-up, an occluded GSV with substantial (50%) reduction in diameter.

Figure (7) showing post-operative duplex follow up obliterated GSV

Clinical evaluation was performed on all subjects at 1 week, 1, 3 and 6 months. Patients were asked about symptomatic relief at follow-up visits, particularly improvement or resolution of lower-extremity pain associated with venous insufficiency.

Results

The studied patients were classified according to CEAP classification which entails clinical, etiological, anatomical and pathophysiological classification, is illustrated in the pie chart of fig (8):

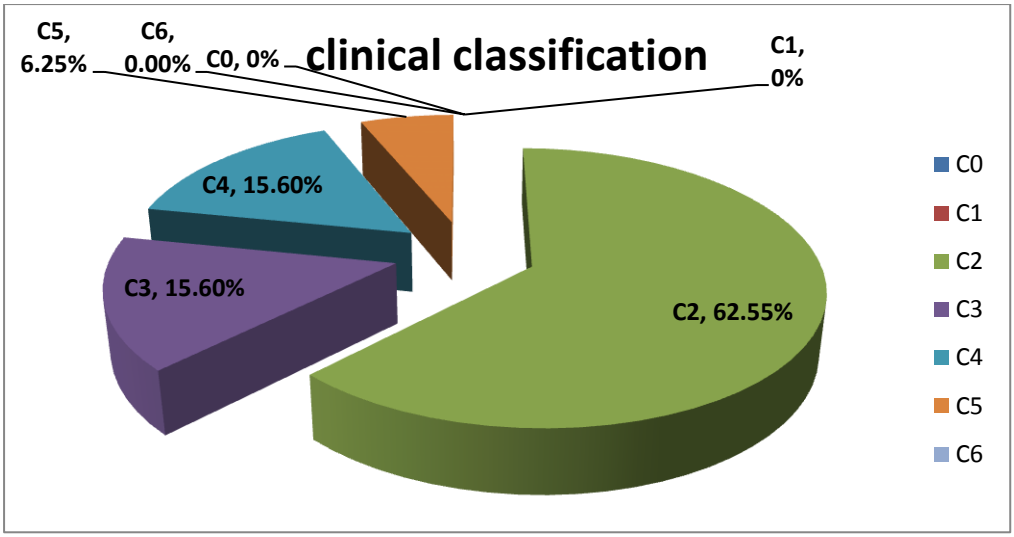

Fig (8): Pie chart showing clinical classification of the studied patients.

On the colored duplex examination all the patients were found to have incompetent saphenous veins in one or both limbs, significant reflux was seen in the great saphenous veins and /or small saphenous vein. Post-operative duplex was performed to all our 30 patients immediately post-operative, 1 week, 2 and 6 months to assess the superficial and deep system which show decrease in the diameter of GSV in all limbs except in one patient whose GSV diameter was > 7 cm in the follow up duplex in the first week post-operative.

Table (1): Post-operative duplex in the studied patients:

Time	diameter of the GSV 3 cm Below SFJ	diameter of the GSV Mid-thigh	No. of the limbs (N=32 limbs in 30 patients)	%
Pre- operative	11.5	7.8	32	100% both
1 week post	(7.6 +/- 1.00) mm	5.5	31	96.875%
2 month post	(5.5 +/- 1.00) mm	4.5	31	96.875%
6 month post	(3.5 +/- 1.00) mm	3.0	31	96.875%

After the EVL ablation +/- sclerotherapy, no major complications occurred, minor complication however, was quite common and included bruising /ecchymosis, postoperative pain that require analgesic, superficial thrombophlebitis and skin burn as demonstrated in bar chart of fig (9).

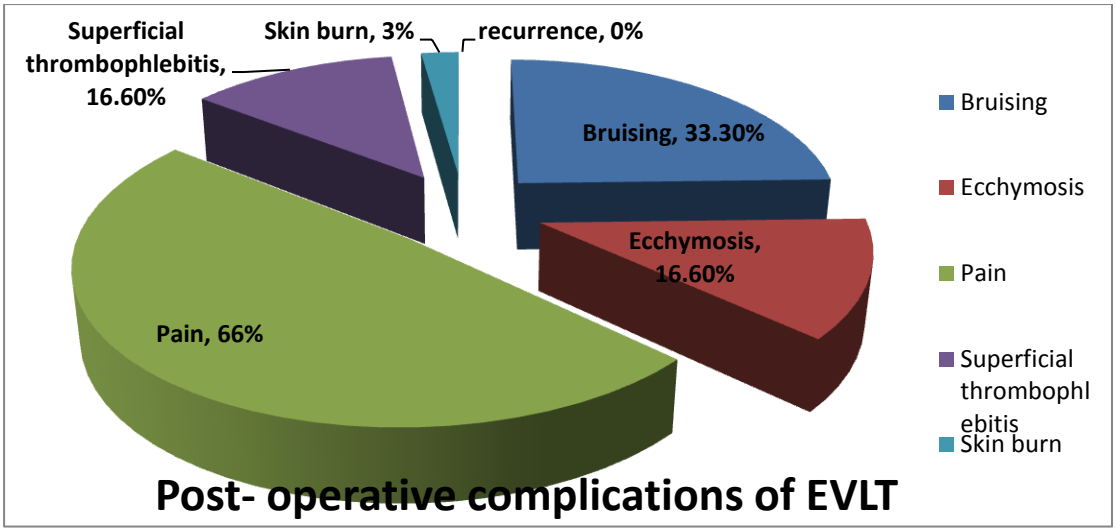

Fig (9): PIE chart showing post- operative complications of EVLT in the studied patients.

Discussion

The cooperation between Physics and Phlebology has opened doors that one alone never could even have unlocked[6]. In this study the basis of classification of varicose veins was according to CEAP classification[7], and Revision of the CEAP classification[8].

Duplex ultrasound was performed to all the studied patients, GSV reflux was found in 30 limbs (93.75%), SSV reflux was found in 2 limbs (6.25%), in a similar ratios Ł. Dzieciuchowicz et al., recently managed 147 out of total 185(79.5%) great saphenous veins (GSV), 23(12.5%) small saphenous veins (SSV), 1(0.5%) Giaco-mini vein, 8(4.3%) anterior accessory saphenous veins (AASV) and 6(3.2%) dilated thigh tributaries of GSV in a total number of 154 patients (171 limbs, 185 veins)[9].

In this study, we used the tumescent local anesthetic solution in all patients. In Łukas z Dzieciuchowicz1 et al., under general anesthesia in 9(6%) and under spinal anesthesia in 5 (3%) patients. In 148(96%) patients mini-phlebectomy was performed during the same procedure[9].

In this study, The Laser system used was German Fox™, Chrolase ™ diode Laser 980 nm which is one of the highest quality Laser in the world, mean energy applied was 70 J/cm; The LEED values were used to calculate the Laser energy based on the GSV diameter 1.5 -2 cm distal to SFJ: For GSV diameters between 4.5 -6.9 mm 60/70 j/cm2 of energy was used, For GSV diameter between 7-10 mm 80/90 j/cm2 energy was used, this was comparable to the amount of energy which was applied in the studies of Theivacumar et al.,[10], Timperman et al.,[11] and Proebstle et al.,[12] that reported 60-70 J/cm, 63.4 J/cm and 63 J/cm respectively.

Our early results 97% success with EVLT has been similar to Duran Mario[13]. Promising results were published by H. Shi et al., as the technical success rate of EVLA was 100% in their evaluation of the Effect of Endovenous Laser Ablation of Incompetent Perforating Veins and the Great Saphenous Vein in Patients with Primary Venous Disease[14]. Piotr Terlecki et al., achieved very high efficacy of the procedure with 100% primary occlusion rate in their Endovenous laser treatment of the small saphenous vein[15].

EVLT has shown several advantages including lower recurrence rates compared to ligation and stripping, minimal groin dissection and preserving venous drainage in competent tributaries while removing only the abnormal refluxing segments[4].

However, to demonstrate the gold standard against which ELA will be compared, Dwerryhouse et al., 1999 noted a 34% 5-year recurrence rate of varicose veins after ligation/ stripping, with a 29% incidence of recurrent SFJ incompetence. There was a 50% incidence of groin neovascularization in this cohort as well. In the short term at least, endovenous therapy appears to have less morbidity, faster recovery, and potentially lower costs than surgery[16].

In this present study, we could be able to touch the amazing Truncal venous occlusion in both GSV and SSV in somewhat complication free technique. Endovenous laser ablation appears to be successful in occluding incompetent great, short, and accessory saphenous veins[4].

Conclusion

EVLT have shown to be very promising techniques and should be considered the treatment modality of choice for patients suffering from varicose veins who are suitable for this treatment options, the most important is to choose the optimum way for each case to have good outcome.

References

1. Allegra C, Antignani PL, Carlizza A. (2007): Recurrent varicose veins following surgical treatment: our experience with five years follow-up. Eur J Vasc Endovasc Surg.; 33(6): 751–756.
2. Zimmet SE (2007): Endovenous laser ablation. Phlebolymphology; 14(2): 51–58.
3. Navarro L, Min R, Boné C. (2001): Endovenous laser: a new minimally invasive method of treatment for varicose veins-preliminary observations using an 810 nm diode laser. Dermatol Surg; 27:117–122.
4. Min RJ, Khilnani NM, Zimmett SE. (2003): Endovenous laser treatment of saphenous vein reflux: long-term results. J Vasc Interv Radiol; 14:991-996.
5. Desmyttere J, Grard C, Wassmer B, et al., (2007): Endovenous 980-nm laser treatment of saphenous veins in a series of 500 patients. J Vasc Surg; 46(6):1242-7.
6. Heger M, van Golen RF, Broek gaarden M, et al., (2014): The role of thermal coagula, thrombosis, cell death, and vascular wall damage in the removal of varicose veins following endovenous laser therapy. Lasers Med Sci. doi:10.1007/s10103-013-1490-3
7. Bergan JJ, Eklof B, Kistner RL et al., and the International ad hoc committee of the American Venous Forum (1996): Classification and grading of chronic venous disease in the lower limbs. A consensus statement, Vasc. Surg. 30: 5–11.
8. Eklöf B., Rutherford R.B., Bergan J.J et al., & for the American Venous Forum International ad hoc committee for the revision of the CEAP classification (2004) Revision of the CEAP classification for chronic venous disorders: Consensus statement. Journal of Vascular Surgery. 40(no.6). Pp 1248-1252.
9. Ł. Dzieciuchowicz, Z. Krasiński, M.Gabriel, et al., (2011): A Prospective Comparison of Four Methods of Endovenous Thermal Ablation, Polish Journal of Surgery. Vol 83, Issue11; Pages 597–605, ISSN (Print) 0032-373X, DOI: 10.2478/v10035-011-0095-4.
10. Theivacumar NS, Dellgrammaticas D, Beale RJ et al., (2008): Factors influencing the effectiveness of endovenous laser ablation (EVLA) in the treatment of great saphenous vein reflux. Eur J Vasc Endovasc Surg 35:119-123.
11. Timperman PE, Sichlau M, Ryu RK. (2004) Greater energy delivery improves treatment success of endovenous laser treatment of incompetent saphenous veins. J Vasc Interv Radiol; 10:1061-1063.
12. Proebstle TM (2006): The vein book, chapter 29, endovenous Laser (EVL) for saphenous vein obliteration, 267-273.
13. Duran Mario (2005): Endovenous laser treatment with 980 diode laser: follow up in two years in 670

procedures. Presented at the 15th World Congress of UIP; Rio, Brazil.
14. H. Shi, X. Liu, M. Lu et al., (2015): The Effect of Endovenous Laser Ablation of Incompetent Perforating Veins and the Great Saphenous Vein in Patients with Primary Venous Disease. Eur J Vasc Endovasc Surg; 49:574-580.
15. Piotr Terlecki, Stanisław Przywara, Marek Iłżecki et al., (2014): Endovenous laser treatment of the small saphenous vein. Single-centre experience study. Phlebological Review; 22, 1:6–10.DOI: 10.5114/ pr.2014.46047.
16. Rautio T, Ohinmaa A, Pera¨ la¨ J, et al., (2002): Endovenous obliteration versus conventional stripping operation in the treatment of primary varicose veins: a randomized controlled trial. J Vasc Surg ; 35: 958–965.