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Original Article

Comparative Study between Conventional Stripping Surgery and Endovenous Laser Ablation in Management of Primary Lower Limb Varicose Veins

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ABSTRACT

Background: Varicose veins are among the commonest conditions encountered in daily vascular surgery practice. Endovascular laser ablation was introduced for its management with an aim to reduce associated complications and recurrence of conventional surgery.

Aim of the work: To evaluate the safety and efficacy of endovenous laser ablation techniques versus conventional stripping surgery techniques as a method of treatment of primary lower limb varicose veins.

Patients and Methods: Forty patients were included, 20 for each group [conventional surgery and laser ablation]. All were assessed preoperatively; and preoperative, operative and post-operative data were documented. All patients were followed up for at least eight months.

Results: The majority of patients were in their forties with female sex predilection. Both groups were comparable regarding patient demographics, clinical presentation, CEAP Classification, clinical signs and preoperative duplex characteristics. Operative time was significantly shorter among laser than the surgery group [41.3 ± 5.8 vs 71.8 ± 11.5 min respectively]. Additionally, patients in laser group stayed for shorter durations in the hospital after intervention and returned earlier to their normal activity. Pain was significantly lower among the laser group [45%] than the surgery group [75%]. Recurrence was similar in both groups.

Conclusion: Endovascular laser ablation is superior to conventional stripping Surgery for the management of Primary Lower Limb Varicose Veins.

Keywords: Varicose veins; Endovascular; Laser; Stripping

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* Main subject and any subcategories have been classified according to the research topic

INTRODUCTION

Varicose veins [VV] represent a common vascular problem that affects a significant number of the general population. The disease affects about 10-40% of 30-70 years old people [1]. Previous trials have proposed that VV is more common among females, with a female to male ratio 3:1 [2].

Varicose veins are veins, which permanently lost its valvular action and constant dilatation with pressure, veins become elongated, tortuous and pouched [3].

The greater incidence of left-sided varicose veins that has been reported by some may be related to the left common iliac vein compression due to partial impedance of the venous return from the leg, where the right common iliac vein lies in the front of the sacral promontory [4].

Truncal varicosities mean that the patient has poor functioning valves and dilatation of one or more of the truncal veins, the great saphenous vein and the small saphenous vein [5].

The initial anatomic location of varicose veins is typically in the great and small saphenous distributions and their tributaries in the superficial system. Related risk factors are multiple, including primary etiologies associated with pregnancy, prolonged standing, female gender, and, rarely, congenital absence of valves [6].

Valvular incompetence and venous hypertension have been considered primary processes of varicosis. The classic theory of descending valve incompetence has the support of famous physicians [7].

Duplex ultrasonography of the extremities is one of the most critical studies for evaluating and diagnosing venous insufficiency and thrombosis; currently, this imaging method, the "gold standard" for superficial venous imaging. Proper assessment comprises an evaluation of the reflux and obstruction in the deep, superficial, tributary, and perforating veins [8].

Varicose veins comprise a progressive condition, except after gestation and delivery. During its course, VV leads to complications that usually propel the patient to seek medical advice. The most frequent comorbidities are thrombophlebitis, bleeding, eczema, and ulceration [9].

For many years, the standard VV management was the surgical ligation and stripping of the affected vessel. The outcome has improved in recent decades due to enhanced understanding of the venous anatomy of the lower limb.

However, the recurrence rate is frequent [up to 20% and 30% [10].

The most notable endovenous advancements are the new widespread techniques of radiofrequency ablation [RFA] and endovenous LASER ablation [ELA]. These techniques may show superiority to stripping and conventional surgical ligation as well as less postoperative pain and recovery time [11]. The thermal energy generates heat and steam bubbles within the lumen of the target vein, destructing the endothelial lining of the vein. This leads to an inflammatory reaction leading to a thrombotic occlusion that efficiently closes off the lumen and finally leads to fibrosis [12].

Endovenous LASER ablation is considered safe and efficacious and recommended for the management of the saphenous reflux. Foam sclerotherapy is advised to treat telangiectasias, reticular veins, and extra-truncal VV. The use of endovenous LASER ablation may be advised over the use of foam sclerotherapy for the management of truncal reflux [13]. Sclerotherapy can be used to treat a different size of veins, although it is commonly used for the treatment of the smaller vessels, like the reticular veins and telangiectasias [10].

AIM OF THE WORK

To evaluate the safety and efficacy of endovenous laser ablation techniques versus conventional surgery techniques as a method of treatment of primary lower limb varicose veins.

PATIENTS AND METHODS

This was a comparative study, conducted on patients presented by primary VV of LL. The surgery was completed at AL-Azhar University Hospital [New Damietta] during the duration from December 2020 to June 2021.

Inclusion criteria: The patient presented by unilateral or bilateral primary VV of LL, complaining of one or more of the following was included in the study: leg pain, varicosities, cosmetic disfigurement, leg ulcer, itching or pigmentation at LL, and incompetence SFJ and/or SPJ.

On the other side, the exclusion criteria were secondary LL VV, lower limb lymphedema, recurrent VV of LL, acute superficial thrombophlebitis of LL, LL arterio-venous fistula [congenital or acquired], congenital anomalies of the venous system of LL, general comorbidities, thrombosis of GSV [acute or chronic], LL skin infection, LL ischemia, LL malignancy, and drug hypersensitivity.

Patients: Forty patients enrolled in this study. The patient in the study was divided into two groups: Group [A]: 20 patients had triple saphenectomy. Group [B]: 20 patients had Endovenous Laser ablation [ELA]. All patients were evaluated by full history taking, clinical examination and laboratory investigation to check of surgical fitness. These laboratory investigations included complete blood count, liver and kidney function test, and coagulation profile. In addition, all duplex ultrasound of the lower limb vascular system was done for all patients with an assessment of the great saphenous vein, small saphenous vein and extra axial varicosities [patency and diameters].

Group [A]: Triple saphenectomy

The GSV is approached through an oblique 2 cm incision in the groin crease. The incision started over the palpable femoral artery and then proceeded medially to assure suitable vision of the saphenofemoral junction and tributaries. The subcutaneous tissue was dissected to identify the GSV main trunk. The plane was extended to the SFJ. Each main tributary was ligated and divided, and GSV high ligation was done close to the femoral vein.



Figure [1]: Stripping of GSV [Al-Azhar University Hospital]

Group [B]: [EVLA] endovenous laser ablation

Color duplex US with an 8 MHz probe was done in the upright position to detect incompetent sources and assign a mark over the skin covers GSV at the SFJ. GSV diameter was determined in upright position and documented. The technique was done in a well-prepared operative theater, assuring the safety precautions for using laser. The target limb was sterilized and draped. The patient was placed in anti-trendelenburg position to simplify the cannulation of GSV with an 18-gauge cannula. The patient position was then changed to the Trendelenburg position to start the manoeuvre. J-tip 0.035-inch guide wire was inserted under ultrasound direction up to the SFJ. A5-F long introducer sheath [up to 36 cm to 50 cm] was position into the GSV

Double ligation was performed on the proximal stump. Caution was exerted to prevent femoral vein narrowing or leaving a long stump. GSV stripping was the central component of the operation for VV. The approach of stripping leaves normal distal veins for future grafting if indicated and prevents injury to the saphenous nerve. This results in less pain without compromising the overall outcome of the procedure. Incompetent accessory saphenous vein, if present, was ligated & stripped during the procedure. After flush ligation was performed, the stripper end was passed after a transverse venotomy was created in the GSV at or below the level of the knee according to the presence of incompetent segment. The caudal incision was made transversely and the subcutaneous tissue was dissected. Stripping was done by the downward direction that is better for avulsion of tributaries and diminish injury to the saphenous nerve. Diseased leg was elevated to reduce bleeding and ecchymosis associated with stripping. Skin incisions were closed by proline 3-0 sutures, elastic stocking were immediately applied for one week, complete bed rest for 24 hours and early ambulation was recommended.

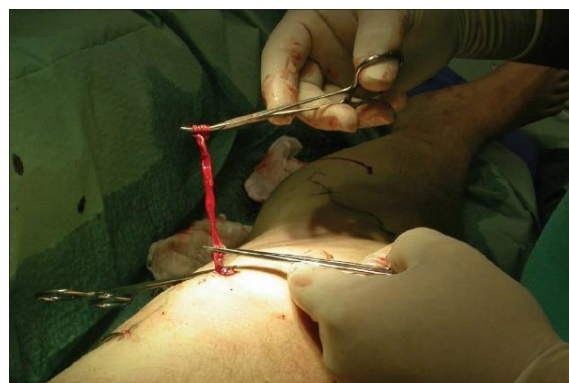


Figure [2]: Stab avulsion of blow outs [Al-Azhar University Hospital].

over the guide wire. The bare-tipped fibre 600-lm diameter connected to a 980-nm diode laser was inseted through the sheath. The device was set with 10 W power and pulsed mode pattern 10 second [on] and one second [off]. The distal tip of the laser fibre was situated 2 cm below the SFJ confirmed by direct visualization of the red aiming beam of the laser fibre tip through the skin. Peri-venous tumescent anesthesia was applied to the fascial space around the GSV under cross-sectional US direction along its length. The amount of anesthetic solution was about 400– 500 cc. The tumescent anesthesia composed of 20–25 ml lidocaine 2% buffered with 1.4% sodium bicarbonate in 500 cc saline 0.9%. Then permitting the laser energy to be fired and the laser fibre and sheath were slowly pulled back untill they reached one centimetre above the site of puncture to

prevent skin burns. Postoperatively, bandage compression was applied for 24 hours then patients were asked to wear full-thigh class II compression stockings [30–40 mmHg] for one week. Patients were instructed to walk directly after the

intervention and to continue their normal daily activities. All patients received routine non-steroidal anti-inflammatory drugs e.g. diclofenac potassium for one week.



Figure [3]: Laser generator, Laser fibres



Figure [4]: Injection of tumescence



Figure [5]: Catheter inside GSV



Figure [6]: The distal tip of the laser fibre was positioned 2 cm below the SFJ under duplex sonographic guidance



Figure [7]: Peri-venous tumescent anesthesia was injected into the fascial space surrounding the GSV under cross sectional sonographic guidance along its length



Figure [8]: Bandages compression

Postoperative follow-up [at eight months]

Clinical follow up for pain, subcutaneous hematoma, return to daily activity, recurrence, ecchymosis, infection, skin ulceration, burns, nerve injury, skin pigmentation and

effect of healing of venous ulcer. Duplex ultrasound follow-up was done for early and late post-operative complications [after one month, three months and then after eight months] especially hematoma in surgery and GSV for [diameter, recanalization].

Ethical considerations

The study protocol was submitted for approval by the Institution Research Board [IRB] of the faculty of medicine, Al-Azhar University, Damietta [IRB 00012367-20-11-003]. Informed consent of the hospital authorities and informed verbal consent was obtained from each participant sharing in the study. Confidentiality and personal privacy were respected in all levels of the study. Collected data not be used for any other purpose.

Statistical analysis

The data for all patients was collected on a pre-prepared sheets, tabulated and analyzed by statistical package for social sciences [SPSS] version 21 [SPSS Inc, Chicago, USA]. For qualitative data, frequency and percent distributions were calculated. For quantitative data, mean, standard deviation [SD], were calculated. Groups compared by student "t" or chi square tests for quantitative and qualitative data respectively. $P < 0.05$ was considered significant.

RESULTS

Demographic data

The number of treated patients was 40 divided into 2 groups; twenty cases in each group. Group [A] in which patients underwent surgical stripping there were 10 males 50% and 10 females 50%, while there were 13 females [65%] and 7 [35%] males in group B [laser group]. Patients in both groups were ranged from 17 to 42 years with a mean age 30.8 ± 7.9 in surgery group and 31.7 ± 1.2 in laser group. There was non-significant difference between two groups in age [Table 1].

Clinical presentation

All patients in both groups were presented with heaviness sensation in the lower limbs. In surgery group 16 patients [80%] complained from pain, 11 complained from edema [55%], 2 patients presented with venous ulcers [10%] and 4 patients complained from cosmetic issues [20%]. While in laser group, there were 15 patients complained from pain [75%], 12 cases complained of edema [60%], one presented with venous ulcer [5%] and 4 cases complained from cosmetic issues [20%]. There was no significant difference between two groups in clinical presentation [Table 1].

Seventeen patients [9 patients in surgery group and 8 patients in laser group] were classified as CEAP class II, 16 patients were classified as CEAP class III [7 cases in

surgery group and 9 cases in laser group], 4 patients were classified as CEAP class IV [2 patients in surgery group and 2 in laser group] and 3 patients were classified as CEAP class V [2 patients in surgery group and one patient in laser group]. There was no significant difference in the distribution of CEAP classification in both groups [Table 2].

Clinical signs

In the surgery group, 11 patients presented with right lower limb varicosities [55%] and 9 patients were presented with left lower limb varicosities [45%], while in laser group there were 9 patients presented with right side varicosities [45%] and 11 presented with varicosities in the left side [55%]. All patients in both groups suffered from saphenofemoral junction incompetence with GSV incompetence and reflux. There were 9 cases in surgery group suffered from incompetent perforators [45%] and 8 cases in laser group [40%] suffered from incompetent perforators. There was no significant difference in side of varicosities and site of incompetence in both groups [Table 2].

Preoperative venous duplex revealed that the GSV diameter in our study ranged from 6 mm to 12 mm in both groups with a mean vein diameter 8.9 ± 1.5 mm in surgery group and 8.2 ± 1.6 [mm] in laser group. The extension of diseased segment of GSV was below the knee in 18 cases in surgery group [90%] and in 15 cases in laser group [75%], while it was limited to the thigh in 2 cases in surgery group [10%] and 5 cases in laser group [25%] [Table 2].

Operative data

Spinal anesthesia was used in all patients in both groups. Operative time in surgery group ranged from 49 minutes to 93 minutes with a mean time $[71.8 \pm 11.5]$ minutes, while it was between 29 minutes and 50 minutes in laser group with a mean time $[41.3 \pm 5.8]$ minutes. There was a significant difference in operative time in both groups with P value ≤ 0.001 . In addition, there was no major intraoperative complication in both groups. In the surgical group there were 2 cases complicated with intraoperative bleeding due to avulsion of tributaries during high ligation of GSV at the saphenofemoral junction. While in laser group, one case complicated with failure of below the knee access and was replaced by the above the knee puncture site with surgical ligation of infragenicular portion, as they were multiple tributaries in below knee portion making the wire hard to pass [Table 3].

The hospital stay and ambulation time after the procedures were recorded to compare between both groups. In surgery group, hospital-stay ranged from 24 hours to 48 hours with a mean time 32.7 ± 6.6 hours, while

in laser group hospital stay time was ranged from 7 hours to 18 hours with a mean time 10.9 ± 2.7 hours. There was a significant difference between two groups with P value ≤ 0.001 . Also, there was a significant difference between two groups in return to daily activity with P value ≤ 0.001 . In surgery group, it took a time ranged between 5 and 8 days with a mean time 5.9 ± 1.3 days, while this took a time ranged between 1 and 4 days in laser group with a mean time 2.3 ± 0.9 days [Table 3].

Post-operative complications

In surgery group, there were fourteen patients with no reported complications, 3 patients complained of scars of groin incision and incisions of perforator's ligation. Three cases reported with edema which improved with usage of elastic stocking within 2-3 weeks. Two cases complicated with post stripping hematomas which were managed conservatively. On the other hand, there were no complications occurred in 16 cases in laser group 2 cases were complicated by burn and pigmentations in the form of mild to moderate erythema along the infragenicular portion of GSV which might be due to insufficient tumescent injection and very superficial segment of GSV. The two cases improved with conservative treatment. Two cases complained of edema and managed by elastic stocking. Only one case suffered from DVT in the posterior tibial vein and popliteal vein and might be caused by patient factors such as obesity and delayed ambulation. This condition was improved with full anticoagulation. There was a non-significant difference between two groups in post-operative complications [Table 3].

Regarding post-operative pain, all patients in both groups was managed by non-steroidal anti-inflammatory drugs. Five patients in laser group complained of persistent pain for one week post operatively, while there were 15 patients in surgery group complained of post-operative pain, 11 was controlled by analgesic and 4 patients suffered from paranesthesia for one month and might be caused by the saphenous and sural nerve affection during

stripping. There was a significant difference in post-operative pain between two groups [Table 3]. Regarding patient's satisfaction, We found that 6 patients in the surgical group were not satisfied with the results due to paresthesia that lasts for relative long time [4 cases], groin scar [one case] and hematoma along the course of stripped GSV [one case], while there were 3 cases not satisfied with results in laser group due to burn and pigmentations. There was no significant difference between two groups [Table 3].

Follow up

Short term technical success is defined as the successful occlusion of the vein lumen. Immediate vein occlusion with lack of spontaneous & augmented flow demonstrated by duplex US and vein wall thrombosis was achieved in all patients. No cases of failure of vein occlusion [in laser group] saphenofemoral ligation [in surgery group] were identified at the time of the procedure by the completion of duplex US scan. Follow up was done at one month, 3 months, and 8 months. This was done by clinical evaluation and duplex US. There was a non-significant difference between both groups. At one month, only one case in surgery group presented with the presence of saphenavarex. Also, in laser groups there was one case presented with recanalization of the proximal part of GSV with the presence of heaviness sensation. After three months, the same radiological results were found in both groups with a remarkable improvement in the manifestation in patients underwent both surgery and laser procedures. After eight months, duplex US was performed for all patients. In the surgery group there were 2 cases with recurrence, one case presented with saphenavarex and another case presented with superficial varicosities in the back of the knee joint with the absence of any complaint in both patients, while duplex US that was performed for the laser group revealed there were two cases presented with recurrence, one presented with recanalized the proximal part of GSV and another case complaint of incompetent perforators around medial malleolus. There was no significant difference between two groups [Table 3].

Table [1]: Demographics and clinical presentation of studied patients

Variable		Surgery [n=20]	Laser [n=20]	P value
Age [years]		30.8±7.9	31.7±1.2	0.7
Sex	Male	10 [50.0%]	7 [35.0%]	0.3
	Female	10 [50.0%]	13 [65.0%]	
Clinical presentation	Pain	16 [80.0%]	15 [75.0%]	0.71
	Edema	11 [55.0%]	12 [60.0%]	0.74
	Ulcer	2 [10.0%]	1 [5.0%]	0.50
	Heaviness	20 [100.0%]	20 [100.0%]	1.0
	Cosmetic	4 [20%]	4 [20 %]	1.0

Table [2]: CEAP classification, clinical signs and preoperative duplex among studied groups

Variables		Surgery [n=20]	Laser [n=20]	P value
CEAP classification	C2	9 [45 %]	8 [40 %]	0.88
	C3	7 [35 %]	9 [45 %]	
	C4	2 [10 %]	2 [10 %]	
	C4	2 [10 %]	1 [5 %]	
Side	Right	11 [55 %]	9 [45 %]	0.74
	Left	9 [45 %]	11 [55 %]	
Site of incompetence	GSV only	11 [55 %]	12 [60 %]	0.50
	GSV + perforators	9 [45 %]	8 [40 %]	
Preoperative duplex	Vein diameter [mm]	8.9±1.5	8.2±1.6	0.10
	Vein extension	Below the knee	15 [75 %]	0.20
	Level of the. Knee	2 [10 %]	5 [25 %]	

Table [3]: Operative and postoperative data among studied patients

Variables		Surgery [n=20]	Laser [n=20]	P value
Operative time		71.8±11.5	41.3±5.8	<0.001*
Operative complications	No complication	18 [90 %]	19 [95 %]	0.7
	Failed access	0 [0 %]	1 [5 %]	0.2
	Bleeding	2 [10 %]	0 [0 %]	0.5
Hospital stay [hours]		32.7±6.6	10.9±2.7	<0.001*
Return to normal activity [days]		5.9±1.3	2.3±0.9	<0.001*
Postoperative complications	No complication	14 [70 %]	16 [80 %]	0.5
	Scar	3 [15 %]	0 [0 %]	0.1
	Hematoma	2 [10 %]	0 [0 %]	0.2
	Edema	3 [15 %]	2 [10 %]	0.5
	Burn	0 [0 %]	2 [10 %]	0.2
	DVT	0 [0 %]	1 [5 %]	0.5
	Pigmentation	0 [0 %]	2 [10 %]	0.2
	Pain	15 [75 %]	5 [45 %]	0.002*
Patient satisfaction		14 [70 %]	17 [85 %]	0.20
Recurrence	Recurrence After one month	1 [5 %]	1 [5 %]	1.0
	Recurrence after three months	1 [5 %]	1 [5 %]	1.0
	Recurrence after eight months	2 [10 %]	2 [10 %]	1.0

DISCUSSION

In the current study, female predominance was a remarkable as it represents about 57.5 % of patients. This may be due to the cosmetic point of views which pushes females to seek medical advice earlier than males. These data are nearly similar in all recent studies. Although male persons tend to stand longer time times and exert more effort, but there is awareness among populations about this disease and its side effect which considered as motivation to a lot of females to seek medical care. However, these results are in contradiction to Basavarajappa *et al.* [14] who reported that, of 222 patients, 162 were males and 60 were females with male to female ratio of 3:1. This could be explained by different inclusion criteria, and study sample size. But, Nishibe *et al.* [15] reported similar female sex predominance as in the current work. They included a total of 140 patients [58 males and 82 females].

In the current research, out patients were in and around their forties, with no significant difference between groups. This was to lower than previous studies. Christenson *et al.* [16] had published a study on 200 cases, one hundred cases in each group, and the mean age was 45 in the laser group and 46 in the patients underwent surgical ligation and stripping. Pronk *et al.* [17] published his study which was done on 130 patients and also had documented older mean age which was 50 years in the surgical group, and 49 years in the laser group. There was no definite cause for this difference between studies, but this can be explained by increase social awareness about symptoms and signs of varicose veins that push people for scanning of varicose veins.

All patients in our study were presented with heaviness sensation in the lower limbs. Pain was reported by 77.5%, edema in 62.5%, 7.5% with ulcers, and 20.0% with cosmetic issues. Most of previous studies mentioned

comparable presentations. Ash and Moore ^[18] documented 200 limbs, all of them complained from pain, and 89% suffered from heaviness. Kalteis *et al.* ^[19] published a study on 95 patients, 61 % and 75% of patients in both laser and surgical groups respectively complained from heaviness. However, only 4 % of the laser group and 8 % of the surgical group suffered from pain in their lower limbs. This can be explained by the difference between the first times of the first visit to the clinic. On the other hand, different studies show that cosmetic issues had a main role as a motivation for patients to seek intervention. For example, Pronk *et al.* ^[17] mentioned that some patients about 20% underwent endovenous laser ablation and surgical stripping present mainly with disfigurement and seek for intervention.

Mozafar and Khashayar ^[20] also documented 85% of patients underwent surgical high ligation in their study and 92.3% of patients in the thermal ablation group had cosmetic issues which need intervention.

CEAP classification usually considered as a corner stone in process of clinical sign categorization. Most of studies documented that most patients were CEAP II and CEAP III classification. In 2010, Rasmussen *et al.* ^[21] showed that 85% of patients were CEAP 2 and CEAP 3. Carradice *et al.* ^[22] documented their results in 2011 , as patients presented with CEAP 2 were about 69 % and patients with CEAP 3 were 31 % of total patients .

Regrading operative data, Kalteis *et al.* ^[19] had published that mean operative time was 67 minutes needed to accomplish laser ablation for GSV with reflux, while surgical intervention need 65 minutes as a mean operative time. Rautio *et al.* ^[13] had published his research in 2002 with mean operative time of 99 minutes and for the surgical group and 115 minutes for the laser ablation group. This may be due to technical difficulties during the beginning of operation to get accurate venous axis, and long-time taken by the device to perform sufficient thermal ablation. However, different result was noticed in our study regarding operative time. In the surgical group, the mean operative time was 72 minutes, while in the laser group it was 41 minutes. This result can be explained by the recent popularity of this technique that allow accurate preoperative assessment of the vein by duplex ultrasound, well trained and skilled surgeons who can perform accurate and fast venous cannulation with the aid of ultrasound and revolution happened in devices abilities that can perform sufficient venous ablation in less time.

Unlike most of studies, there was a significant difference between two groups was documented in our study regarding hospital stay. The mean time was 32.7 hours with SD 6.6 hours in surgery group, while it is

10.9±2.7 hours in the laser group with P value ≤ 0.001. This difference could be explained by the presence of wound in the surgical group which needed dressing and follow up to observe any hematoma in tack of GSV or in the groin incision.

Pronk *et al.* ^[17] showed that all patients included in the study were discharged in the first day post operatively. Another study also had similar results with no significant difference between the surgical and the laser groups regarding hospital stay ^[23].

Return to normal activities after surgery is of the great importance to patients. They usually care about the time needed to resume usual life style they used to do before surgical intervention. Kalteis *et al.* ^[19] documented that patients underwent laser ablation needed longer time to return to daily activities than patients who underwent surgical ligation of saphenofemoral junction and stripping. Despite that complications following the laser ablation were less severe, a significant difference was marked in ambulation time after intervention, that is why sick leave could not be a real indicator of clinical outcome.

Other studies also had the same opinion about time needed to return to normal activity after intervention. A longer time was needed in the laser ablation group. The explanation was usage of endovenous wave length 810, 940 & 980 nm with bare tip catheters which might cause vein wall perforation and usually associated with a higher rate of complications. Recently, new devices with wave length 1470 nm with radial fibre are used to gain better results with less side effects ^[24]. Socio-economic status also plays a great role in the determination of the time needed to return to daily activities after intervention, so the procedure itself could not be the only factor that affects time needed to return to normal activity ^[25]

On the other hand, Pronk *et al.* ^[17] had different result in their study published in 2010. They noticed that there was no significant difference between the surgical intervention and the laser ablation groups. Mean time needed to return to normal activity was 3.2 with SD 4 in patients underwent conventional surgery while it was 3.2 with SD 4.3 in patients group who underwent laser ablation. Assadian *et al.* ^[26] also showed that, there was no significant difference between both groups regarding the ambulation time with slight privilege in the laser ablation group.

According to our study, there was a significant difference between both groups regarding time needed for return to normal activity with P value <0.001. In surgery group, it took a time ranged between 5 to 8 days with a mean time [5.9±1.3] days, while this took a time ranged

between one to 4 days in the laser group with a mean time $[2.3 \pm 0.9]$ days. This variation could be explained by variation of patient's socio-economic levels, nature of their jobs and cultural factors because patients considered operations with surgical wound as a major surgery need a long time of rest and rehabilitation. Similar to our results, Gloviczki *et al.* [27] reported that patients of the laser ablation group returned back to their normal life style 3 days earlier than patients of conventional surgery group.

In agreement with the current study, Siribumrungwong *et al.* [28] reported that patients treated with the surgical ligation of SFJ had higher rates of hematoma compared with who were treated with the laser ablation. Post-operative pain also was less severe in EVLA than surgical intervention. It is announced that wound infection is less in the laser ablation group by 60% compared with the incidence of infection in patients underwent the surgical ligation of SFJ and stripping. This study also mentioned that EVLA had a lower incidence of hematoma formation and pain on day 0 to day 7 following the procedures was less in the laser group. Different results had been published by Pronk *et al.* [17]. They found that post-operative pain on day 14 was more severe in patients underwent laser ablation. They explained this result as a device used with wavelength of 810nm–980nm usually cause affection to adjacent tissues and increase possibilities of post-operative complications.

Recurrence remains a significant problem after either endovenous laser ablation or surgical ligation and stripping. After the surgical intervention, neovascularization in the subcutaneous tissue around the saphenofemoral junction can lead to recurrence [29].

The process of neovascularization may be associated with groin incision. The presence of non-competent tributaries after ligation is another possible cause for recurrence. In general, recurrence is caused by a connection between the remaining segment of GSV and new vessels or incompetent tributaries [30].

We agreed with Bush *et al.* [30] that the most important factors associated with varicose veins recurrence included new or recurrent perforator veins incompetence, re-canalized GSV and reflux in anterior accessory great saphenous vein. Other published studies show similar results. The authors documented that patients managed by EVLA had the same risk of recurrence as patients who were underwent the surgical ligation of SFJ and stripping.

In a review presented by McBride [31] confirmed that endovenous techniques were as effective as standard surgery, but in the most of comparative data presented

EVLA was better regarding post-operative complications, pain and return to normal activity.

However, some studies demonstrated that the endovenous techniques had a lower rate of recurrence. Pronk *et al.* [17] announced that, patients treated with the endovenous laser ablation had 40 % less risk than surgery patient to have recurrent varicosities. This can be explained by the study done by Kianfard *et al.* [32], as they did not observe neovascularization in those patients who underwent the laser ablation versus 12 % in those who were managed by the surgical stripping. The laser ablation maintains a permeable epigastric vein that protects against neovascularization by preserving physiological drainage of the abdominal wall.

Measurement of outcome of the procedures used to manage varicose veins cannot only rely on duplex ultrasound evaluation of ablated saphenous veins, it is also depending on patient's satisfaction which is based on many factors especially relieve of symptoms, remission of pain, presence of post-operative pain and patient ability to return to normal life style and activities.

As in the current work, Winterborn *et al.* [33] documented that up to one third of patients may remain unsatisfied in the long term after both surgical ligation and the laser ablation. On the other hand, there are many studies reported that both procedures had the same quality of life post operatively and similar satisfactory rates with slight privilege toward the laser ablation due to better cosmetic results [19, 34]. Other studies reported that more than 90 % of patients said they would recommend the endovenous ablation procedures to friends and relatives [35, 36].

The study limitations include the small number of patients included in each group, which prevents the globalization of the study results. In addition the short duration of follow up represented another limitation. These limitations warrant future studies on a large scale of patients for a long duration.

CONCLUSION

In short, our study results indicated that, endovascular laser ablation is superior to conventional stripping surgery for the management of Primary Lower Limb Varicose Veins. However, the recurrence rate is similar between both procedures.

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None

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The background of the cover is a light beige color with a faint, repeating pattern of a heartbeat line (ECG). Overlaid on this background is a large, semi-transparent illustration of a medical stethoscope. The stethoscope's chest piece is positioned over a globe that shows the continents of North and South America. The stethoscope's tubing and earpieces extend across the frame, creating a sense of global medical connectivity.

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