The safest power to be applied in relation to diameter of the vein to give maximal benefit with least complications in endovenous laser ablation of varicose veins

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Background
Over the years, there have been significant advancements in the treatment of varicose veins. In most surgical settings, the open procedure is still the primary approach. Yet, the popularity of less invasive procedures like EVLA and RFA has produced fantastic outcomes.
Objective
to assess the safest power of laser which gives maximal effect and least complications in ablation of varicose veins.
Methodology
A prospective observational study inducing EVLA of different laser power settings (7W & 10W) with preoperative assessment then follow up by CEAP & VCSS and duplex ultrasound measuring great saphenous vein (GSV) diameter and also post-operative complications and time to return to work.
Results
This study included 50 patients (52 limbs). The Patients were distributed as regard laser power used into two groups (7W, 10W) of 26 limbs for each one. As regard GSV measures changes, there was highly statistically significant decrease in GSV diameter after 1 m and after 3 m compared to preoperative, with *P* value $P<0.001$, among patients group. Also, there is higher number of cases with GSV$>$10 mm in power of laser '10w' group compared to '7w; group, with *P* value ($P<0.001$); while there is no statistically significant difference between power of laser 7w versus 10w, because all patients $\leq$10 mm after 1 month and after 3 months, with *P* value >0.05. Statistically there was no significant difference between 7W & 10W groups as regards time to return to work, CEAP scores and postoperative complications except the significant difference in Pain over the treated vein being less in 7W laser power group.
Conclusion
For endovenous laser ablation of varicose veins, both 7W and 10W laser power are indicated. They are risk-free and provide the greatest impact with the fewest difficulties for the chosen vein diameter. In our investigation, we came to the conclusion that patients with small GSV diameter required low laser power (7W), while those with large GSV diameter required high laser power (10W).

Keywords:
endovenous laser ablation, laser energy, Great saphenous vein

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Introduction

One of the most widespread diseases in the world is chronic venous insufficiency (CVI). Varicose veins of the lower limbs are described by the World Health Organization as dilated superficial veins with defective valves that appear as saggy or cylindrical veins. Saphenous veins are damaged in 70% of instances [1].

Varicose vein symptoms can range in intensity from mild discomfort and itchiness to serious skin ulcers, time away from work, pain, and a reduction in quality of life. A venous ulcer may form in about 3% of people with varicose veins, and about 10% of patients experience skin abnormalities including dermatitis or pigmentation [2].

The CEAP (Clinical status, Etiology, Anatomy, and Pathophysiology) classification can be used to categorise the clinical signs and symptoms of venous illness. The Venous Clinical Severity Score (VCSS) can be used to assess the intensity of pain and other

clinical signs or symptoms; the difference between the VCSS values before and after the intervention can be used to assess the effectiveness of the intervention [3].

The preferred method for evaluating CVI to confirm the diagnosis and determine its origin and anatomy is venous duplex imaging. Valvular incompetence is indicated by a flow reversal in the superficial venous system that lasts longer than 0.5 s. When the flow is reversed for more than one second, deep system reflux is regarded as abnormal. Reflux severity has been determined by larger reflux volumes and velocities for longer periods of time [4].

A less invasive surgery called endovenous therapy may have the advantages of a quicker recovery, fewer physical restrictions, fewer problems, and an overall higher quality of life. Both thermal and non-thermal procedures fall under this category. Radiofrequency ablation (RFA), steam vein sclerosis, and endovenous laser ablation (EVLA) are examples of thermal ablation. Foam sclerotherapy, Mechanochemical Ablation (MOCA), and cyanoacrylate glue injection are examples of non-thermal ablation [5].

By applying laser energy intraluminally, EVLA causes a refluxing vein to become permanently, non-thrombotic occluded. The laser light causes mural fibrosis and inflammation, which leads to venous obliteration. Tumescent anaesthetic could be used during an outpatient treatment [6]. A 5-year follow-up duplex ultrasound scan comparing EVLA to open conventional surgery revealed recurrence rates of 6.7% versus 20.3%, respectively [7]. The goal of this study was to determine the safest laser power for endovenous laser ablation of varicose veins that provides the greatest result and the fewest problems.

Patients and method

(1) **Type of Study:** Prospective observational study.
(2) **Study Setting:** Ain Shams University Hospitals and Alagouza Police Hospital
(3) **Study Period :** From December 2019 to July 2021
(4) **Study Population**:

Inclusion criteria

Individuals having duplex ultrasound findings of varicose veins in one or both lower limbs (swelling, discomfort, and heaviness on standing relieved by leg elevation): Great saphenous veins (GSV) that are incompetent are those that have reflux lasting more than 0.5 s, no history of interventions, and a GSV diameter greater than 3 mm when there is reflux.

Exclusion criteria

(1) In contrast, individuals with GSV larger than 2 cm in diameter, acute deep vein thrombosis (DVT), or superficial vein thrombosis (SVT), as well as a variety of other diseases such pregnancy, immobility, and arterial insufficiency, were not included..
(2) Patients have past history of recent surgery.
(3) History of deep vein thrombosis (DVT).
(4) Patient has venous ulcer or other venous complications.
(5) **Sampling Method:** Convenience sample method.
(6) **Sample Size:** Fifty patients (50)

Ethical considerations: study procedures

With the ethics committee's clearance, this study will be carried out. All participants will be asked for their informed consent prior to being enrolled in the study and after being informed of its goals and methods.

All patients will be subjected to the following:

(1) History taking.
(2) Clinical examination: including duplex ultrasound scanning and CEAP & VCSS classifications.

Technique of the procedure

(1) To induce tumescence along the vein segment undergoing EVLA, tumescent anaesthesia (40 ml of 1% lidocaine, 10 ml of sodium bicarbonate, and 450 ml of ordinary saline) is injected subcutaneously. Midazolam 0.02 mg/kg and remifentanil 0.025 g/kg/min were administered as part of the MAC (monitored anaesthesia care) sedation during the procedure.
(2) A diode laser with a wavelength of 1470 nm (ELVeS Radial fibre, FDA-certified) is used to conduct EVLA through percutaneous access to the GSV. We used an FDA-approved endovenous laser kit, which included a 150cm-long catheter, a 6 Fr sheath, and a 21 G needle.
(3) To make it easier to cannulate the GSV, the patient is initially placed in the lateral decubitus position (anti-Trendelenburg). The patient was then placed on an EVLA machine while laying flat and without an incline.
(4) Using a continuous retraction approach, the energy dosage (measured in Joules) was monitored throughout the operation as the probe moved from one section to the next. The operator may precisely alter the pull-back speed using the centimetre scale or the auditory signal as a guide.

(5) To ensure that collapse is locally highly effective, our approach delivers 100 J/cm experimentally to the first 3 cm distal to the saphenous-femoral junction, delivering 300 J in this initial segment. The radiation in the underlying segments is empirically reduced to 80 J/cm.
(6) **In this study** We will attempt to produce various laser power settings that cause greater levels of tissue deep penetration and vein wall damage (raising power from 7W to 10W), followed by monitoring of vein wall damage and occlusion rate.
(7) Following EVLA, compressive stocking 20–25 mm Hg was prescribed for 4 weeks.
(8) Paracetamol 1 g as needed is the suggested dosage for analgesic treatment (up to 3 g per day). A clinical examination (CEAP & VCSS) and duplex ultrasound scanning of the operated limb will be done after one week, one month, and three months of patient follow-up. This will include measuring the GSV diameter and reflux. Follow-up on post-operative problems and, if necessary, hospital-based management (Infection, pain over the vein, bleeding, bruising, nerve damage, inflammation of the vein, blood clots, changes in skin colour over the treated vein).

Statistical analysis

Version 20.0 of the statistical software for social sciences was used to evaluate the recorded data (SPSS Inc., Chicago, Illinois, USA). The mean and standard deviation were used to convey quantitative data (SD). Frequency and percentage were used to convey qualitative data.

The following tests were done:

(1) For comparing samples that were linked, the paired sample t-test of significance was applied.
(2) When comparing two means, the independent-samples t-test of significance was applied.
(3) To compare proportions between qualitative factors, the X^2 test of significance was employed.
(4) The allowable margin of error was set at 5%, and the confidence interval was set at 95%. The *P* value was therefore deemed significant as follows:
(5) Probability (*P* value)
   (a) *P* value <0.05 was considered significant.
   (b) *P* value <0.001 was considered as highly significant.
   (c) *P* value >0.05 was considered insignificant.

Results

It is a prospective observational study including 50 patients (52 limbs, 48 cases were unilateral while bilateral in 2 cases, affecting right side in 30 cases and left side in 22 cases) who underwent EndoVenous Laser Ablation (EVLA), 35 female and 15 males, age range 19–58 years (Mean 38.14±10.44). Preoperative complain was mainly in form of pain, swelling and edema as shown in Table 1. Preoperative CEAP was described in detail in Table 2.

According to the amount of laser power employed, the patients were divided evenly into two groups, each with 26 limbs (7watt and 10watt). After intervention at 1 and 3 months, there was a statistically significant change in the postoperative great saphenous diameter, CEAP, and VCSS (*P* value 0.001), as shown in Tables 3–5, respectively.

Patients showed marked improvement of their complain in 1 week postoperative follow up with return to work range was 2-4 weeks (mean 2.58 ±0.61), most of patients were without complications (*P* value<0.001) as shown in Tables 6 and 7 respectively, while Postoperative complications were about skin inflammation in 9 cases (17.3%), Eight instances (15.4%) had discomfort over the vein, seven (13.5%) had ecchymosis, and four (7.5%) had

Table 1 Preoperative complain distribution among study group (*n*=52)

Complain	Total (*n*=52)
Pain	52 (100.0%)
Swelling	44 (84.6%)
Edema	38 (73.1%)
Ulceration	1 (1.9%)
Pigmentation	1 (1.9%)

The most common complain was pain (100%), followed by swelling (84.6%) and edema (73.1%). On the other hand ulceration and pigmentation was the lowest noticed complain, and there was agreement on the ratio (1.9%).

Table 2 Pre-operative CEAP distribution among study group (*n*=52)

Pre-operative CEAP	Total (*n*=52)
C	
2	13 (25.0%)
3	38 (73.1%)
5	1 (1.9%)
E	
P	52 (100.0%)
A	
S2	4 (7.7%)
S3	48 (92.3%)
P	
R	52 (100.0%)

This table shows that the CEAP C2 was (25%), C3 (73.1%) and C5 (1.9%); while EP (100%), while CEAP AS2 (7.7%) and AS3 (92.3%) and PR (100%) among all patients.

Table 3 Comparison between preoperative of GSV and other measurements 'After 1 month and after 3 months' in patients group

			Paired sample *t*-test		
GSV	Range	Mean±SD	MD±SE	*t*-test	*P* value
Preoperative	4-11	7.00±1.43			
After 1 month	1.5-5	2.84±0.71	4.16±0.14	29.805	<0.001**
After 3 months	1-2.5	1.25±0.34	5.75±0.17	34.178	<0.001**

MD, Mean difference; SD, Standard deviation; SE, Standard error. ***P value* <0.001 is highly significant. The patients group were comparison in preoperative of GSV with the mean &±SD in each of measurements 'after 1 m and after 3 m' was preoperative 7.00±1.43 compared follow up to '2.84±0.71 and 1.25±0.34' respectively, there was a highly statistically significant reduction of GSV in follow up compared to preoperative, with *P* value <0.001.

Table 4 Comparison between preoperative, after 1 m and after 3 m according to CEAP in patients group

CEAP	Preoperative *(n=52)*	After 1 m. *(n=52)*	After 3 m. *(n=52)*	x^2	*P* value
1	0 (0%)	43 (82.7%)	49 (94.2%)		
2	13 (25.0%)	9 (17.3%)	3 (5.8%)		
3	38 (73.1%)	0 (0%)	0 (0%)	130.667	<0.001**
4	0 (0%)	0 (0%)	0 (0%)		
5	1 (1.9%)	0 (0%)	0 (0%)		

Using: χ^2 test. ***P value* <0.001 is highly significant. This table shows a highly statistically significant decrease number of CEAP after 1 m and after 3 m compared to preoperative, with *P* value *P*<0.001, among patients group.

Table 5 Comparison between preoperative of VCSS and other measurements 'After 1 month and after 3 months' in patients group

			Paired sample t-test		
VCSS	Range	Mean±SD	MD±SE	*t*-test	*P* value
Preoperative	3–10	5.77±1.11			
After 1 month	0–4	2.38±0.72	3.38±0.13	25.614	<0.001**
After 3 months	0–2	0.67±0.61	5.10±0.17	29.617	<0.001**

MD, Mean difference; SD, Standard deviation; SE, Standard error. ***P value* <0.001 is highly significant. The patients group were comparison in preoperative of VCSS with the mean &±SD in each of measurements 'after 1m and after 3m' was preoperative 5.77±1.11 compared follow up to '2.38±0.72 and 0.67±0.61' respectively, there was a highly statistically significant reduction of VCSS in follow up compared to preoperative, with *P* value <0.001.

Table 6 Complain distribution among study group at follow up 1 week

Complain	Partial Complain Number (%)	Still Complain Number (%)	No Complain Number (%)	Total No.
Pain	21 (40.4%)	5 (9.6%)	26 (50.0%)	52
Swelling	19 (43.2%)	12 (27.3%)	13 (29.5%)	44
Edema	17 (44.7%)	21 (55.3%)	0 (0.0%)	38
Ulceration	0 (0.0%)	1 (100.0%)	0 (0.0%)	1
Pigmentation	0 (0.0%)	1 (100.0%)	0 (0.0%)	1

Complain of the obtained specimens showed that 52 patients (100%) had pain, including 21 patients were partial complain, 5 patients still complain and 26 patients no complain; while 44 patients (84.6%) had swelling, including 19 patients were partial complain, 12 patients still complain and 13 patients no complain; additionally, 38 patients (73.1%) had edema, including 17 patients were partial complain and 21 patients still complain; as well as, one patient (1.9%) had ulceration was still complain; also one patient (1.9%) had pigmentation was still complain.

thrombophlebitis. In subgroups analysis between patients who were offered a 7W or 10W power of laser, there was a significant difference (*P* value 0.05) between the two as regard VCSS after 3 months, with the 10W group performing better than the 7W group, as opposed to an insignificant difference after one month, as shown in Table 8 and Fig. 1.

As regard to power of laser used and its relation to CEAP classification, There is no statistically significant difference between power of laser '7w vs. 10w' according to CEAP, with *P* value (*P*>0.05) as described in Table 9.

As regard GSV measures changes, there significant higher number of cases with GSV>10 mm in power of laser '10w' group was (92.3%) compared to '7w' group was (0%), with *P* value (*P*<0.001); while there is no statistically significant difference between power of laser 7w versus 10w, because all patients ≤10 mm after 1 month and after 3 months, with *P* value >0.05. as shown in Table 10 and Fig. 2.

In comparison between GSV diameter preoperative, after 1 month and after 3 months there is highly statistically significant decrease in GSV diameter

Table 7 Comparison with and without complications of postoperative according to time to return to work 'wks'

Time to return to work (weeks)	Without complications (n=37) Number (%)	With complications (n=15) Number (%)	x^2	P value
2 wks.	23 (62.2%)	2 (13.3%)		
3 wks.	14 (37.8%)	10 (66.7%)	14.615	<0.001**
4 wks.	0 (0.0%)	3 (20.0%)		

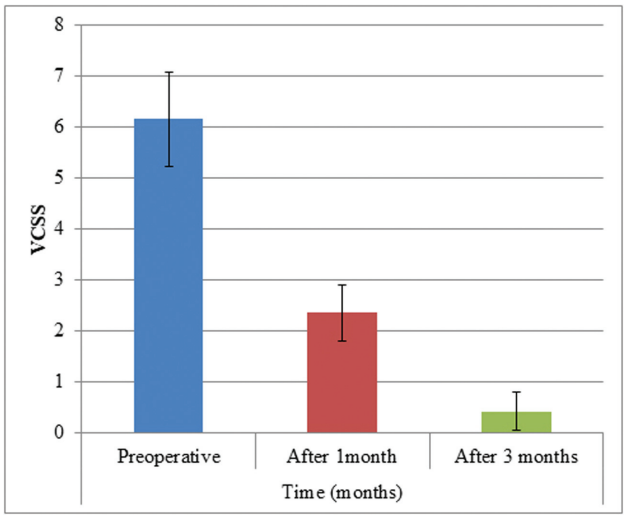
Using: χ^2 test. ***P value* <0.001 is highly significant. This table shows highly statistically significant increase frequency of time to return to work 'wks.' in with complications group compared to without complications group, with P value (P<0.001).

Table 8 Comparison between preoperative of VCSS and other measurements 'After 1 month and after 3 months' in power of laser (10W)

		Paired sample t-test		
VCSS	Mean±SD	MD±SE	t-test	P value
Preoperative	6.15±0.92			
After 1 month	2.35±0.56	3.81±0.15	25.909	<0.001**
After 3 months	0.42±0.38	5.73±0.20	28.058	<0.001**

MD, Mean difference; SD, Standard deviation; SE, Standard error. ***P value* <0.001 is highly significant. The patients of power of laser '10w' group were comparison in preoperative of VCSS with the mean &±SD in each of measurements 'after 1 m and after 3 m' was preoperative 6.15±0.92 compared follow up to '2.35±0.56 and 0.42±0.38' respectively, there was a highly statistically significant reduction of VCSS in follow up compared to preoperative, with P value <0.001.

Figure 1



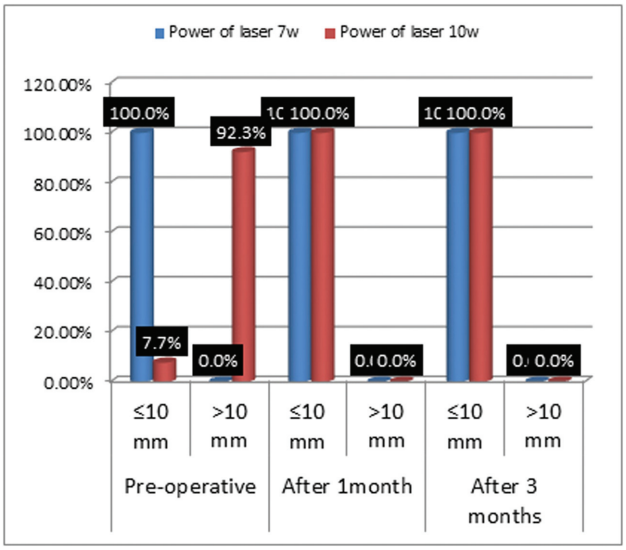
Comparison between preoperative of VCSS and other measurements 'After 1month and after 3 months' in power of laser (10W).

Table 9 Comparison power of laser (7w and 10w) according to CEAP

	Power of laser (W)			
CEAP	7 w Number (%)	10 w Number (%)	x^2	P value
Preoperative				
2.00	11 (42.3%)	2 (7.7%)		
3.00	15 (57.7%)	23 (88.5%)	8.915	0.012*
5.00	0 (0.0%)	1 (3.8%)		
After 1 m.				
1.00	23 (88.5%)	20 (76.9%)	1.209	0.271
2.00	3 (11.5%)	6 (23.1%)		
After 3 m.				
1.00	26 (100.0%)	23 (88.5%)	3.184	0.074
2.00	0 (0.0%)	3 (11.5%)		

Using: χ^2 test. P value >0.05 is insignificant; **P* value <0.05 is significant. There is no statistically significant difference between the power of laser '7w vs. 10w' according to CEAP, with P value (P>0.05).

Figure 2



Comparison power of laser (7w and 10w) according to GSV level.

after 1 m and after 3 m compared to preoperative, with P value P<0.001, among patients group as shown in Table 11 and Fig. 3.

Statistically there was no significant difference between 7W/10W groups as regard time to return to work as described in Table 12. On analyzing the postoperative complications, there were insignificant difference between 7W/10W groups except in Pain over the treated vein there was significant difference being less in patients who exposed to 7W laser power, as found in Table 13 and Fig. 4.

Discussion

Varicose veins are a benign yet widespread and progressing condition. Operations like the minimally invasive RFA and EVLA MOCA are helpful for

Table 10 Comparison power of laser (7w and 10w) according to GSV level

GSV	Power of laser (W)		Total Number (%)	χ^2 test	
	7w (n=26) Number (%)	10w (n=26) Number (%)		X^2	P value
Preoperative					
≤10 mm	26 (100.0%)	2 (7.7%)	28 (53.8%)	44.571	<0.001**
>10 mm	0 (0.0%)	24 (92.3%)	24 (46.2%)		
After 1 month					
≤10 mm	26 (100.0%)	26 (100.0%)	52 (100.0%)	0.000	1.000
>10 mm	0 (0.0%)	0 (0.0%)	0 (0.0%)		
After 3 months					
≤10 mm	26 (100.0%)	26 (100.0%)	52 (100.0%)	0.000	1.000
>10 mm	0 (0.0%)	0 (0.0%)	0 (0.0%)		

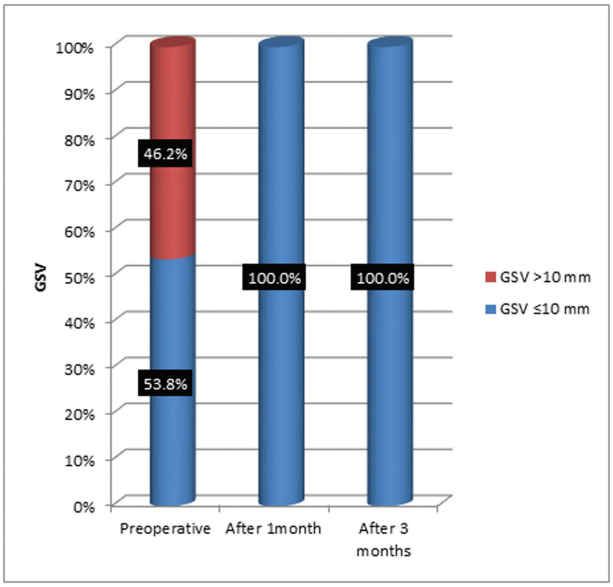
Using: χ^2 test. P value >0.05 is insignificant; *P value <0.05 is significant. This table shows statistically significant higher frequency GSV>10 mm in power of laser '10w' group was (92.3%) compared to '7w' group was (0%), with P value (P<0.001); while there is no statistically significant difference between power of laser 7w versus 10w, because all patients ≤10 mm after 1 month and after 3 months, with P value>0.05.

Table 11 Comparison between preoperative, after 1 m and after 3 m according to GSV diameter in patients group

GSV	Preoperative Number (%)	After 1month Number (%)	After 3 months Number (%)	χ^2 test	
				X^2	P value
≤10 mm	28 (53.8)	52 (100)	52 (100)		
>10 mm	24 (46.2)	0 (0)	0 (0)	56.727	<0.001**
Total	52 (100.0)	52 (100)	52 (100)		

Using: χ^2 test. **P value <0.001 is highly significant. This table shows highly statistically significant increase frequency of GSV≤10 mm after 1 m and after 3 m compared to preoperative, with P value P<0.001, among patients group.

Figure 3



Comparison between preoperative, after 1 m and after 3 m according to GSV level in patients group.

varicose veins. Procedures including foam sclerotherapy, MOCA, RFA, and EVLA are risk-free, easy to perform, highly successful, and inexpensive when using an ultrasound-guided synchronous, real-time process system of assessment. The best way to lower the risk of an operation, postoperative complications, and recurrence is to thoroughly assess varicose vein patients before surgery, select the best operation method, improve monitoring and management, and maintain the treatment's safety, effectiveness, and ease of manipulation [8].

The elimination of the incompetent venous segment is the primary goal of any treatment strategy for saphenous vein dysfunction. EVLA is the endovascular technique that is applied in this way most commonly. According to reports, EVLA often has success rates between 90% and 95% [9].

As EVLA still has no standardized parameters and can be used in many different settings, the optimal effective settings particularly the laser power remain under question [10].

In our study, taking in consideration that we used diode laser of 1470 nm wavelength, all patients showed significant improvement in clinical scores as CEAP and VCSS which associated with significant reduction of mean GSV diameter throughout 1 and 3 months postoperative follow up but these findings were analyzed trying to find the effect of laser power on patients' outcomes. As there are few studies focused on this parameter.

Table 12 Comparison power of laser (7w and 10w) according to time to return to work weeks

	Power of laser (W)			
Time to return to work (weeks)	7W Number (%)	10W Number (%)	X^2	*P* value
2 wks.	15 (57.7%)	10 (38.5%)		
3 wks.	10 (38.5%)	14 (53.8%)	2.000	0.368
4 wks.	1 (3.8%)	2 (7.7%)		
Total	26 (100.0%)	26 (100.0%)		

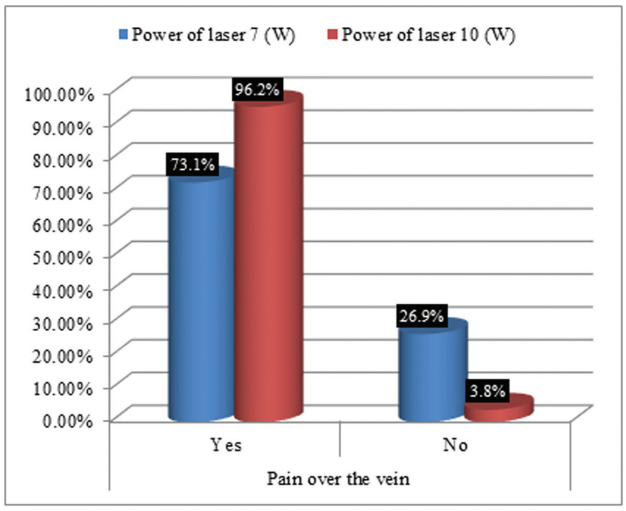
Using: χ^2 test. *P* value >0.05 is insignificant. There is no statistically significant difference between power of laser 7w group and 10w group according to time to return to work 'wks', with *P* value (*P*>0.05).

Table 13 Comparison power of laser (7w and 10w) according to overall complications

	Power of laser (W)			
Complications	7w Number (%)	10w Number (%)	X2	*P* value
Pain over the vein	19 (73.1%)	25 (96.2%)	5.318	0.021*
Inflammation	7 (26.9%)	2 (7.7%)	3.359	0.067
Ecchymosis	5 (19.2%)	2 (7.7%)	1.486	0.223
Thrombophlebitis	1 (3.8%)	3 (11.5%)	1.083	0.298
Overall complications	10 (38.5%)	5 (19.2%)	2.342	0.126

Using: χ^2 test. *P* value >0.05 is insignificant; **P* value <0.05 is significant. This table shows statistically significant higher frequency pain over the vein in power of laser '10w' group was (96.2%) compared to '7w' group was (73.1%), with *P* value (*P*<0.05); while there is no statistically significant difference between sub-group regarding inflammation, ecchymosis, thrombophlebitis and overall complications, with *P* value>0.05.

Figure 4



Comparison power of laser (7w and 10w) according to overall complications.

In subgroups analysis between patients who offered 7W or 10W power of laser, venous clinical severity score (VCSS) after 3 months was better in 10W group in contrast to insignificant difference after 1 month.

There is no discernible difference between the EVLA and RFA techniques for improving Clinical CEAP at 1 month, 6 months, and 12 months, according to Shah Swenil *et al.* (*P*=0.827). In comparison to RFA, EVLA shows extremely significant improvement at 6 months (*P*=0.0023) and considerable improvement at 12 months (*P*=0.0463) [11].

In Tomasz Zubilewicz et al study, VCSS and CEAP shown a statistically significant decline in the severity of clinical symptoms at each observation day over the 3-month follow-up period as compared to baseline values [12].

Patients in our research had a significant improvement in their complaints in the week following surgery, with a return to work window of 2–4 weeks.

In R Suhartono *et al.*, patients who had therapy with MOCA or EVLA reported feeling content since their clinical problems, such as discomfort and an unattractive look, were alleviated.

[13]

Van den Bos *et al.* analysed 119 studies in a meta-analysis and calculated success rates of 94% for EVLA and 84% for RF based on data for 12 320 legs [14].

Almeida *et al.* reported recanalization rates of 5.5% for RF and 1.7% for EVLA [15].

As regard GSV measures changes, there was high significant difference between those exposed to laser power 7W in comparison to those of 10W at 1 and 3 months follow up in relation to preoperative measures showing more reduction in 7W group.

The occlusion rates for the GSV were 98 (84.5%) at 1 month and 116 (100%) at 6 months postoperatively in

Yoong-Seok Park *et al.* employing power (6W) in EVLA. Males were more likely than females to have partial occlusion (P=0.004). At 1 month, there were 2 DVT, 27 cord emotions (23.3%), and 36 numbness in the knee area (31.0%). At 6 months after surgery, there were 3 cord feelings (3.4%) and 6 numbness of the knee (8.6%). The rates of cord sensation or numbness were unaffected by the GSV's diameter or depth (P=0.728, 0.208, 0.247, and 0.884, respectively) [16].

In N.S Theivacumar *et al.*, GSV occlusion was achieved in 599/644 (93%) limbs (group A). In 45 limbs (group B) the vein was partially occluded (n=19) or patent (n=26). Neither BMI [group A: 25.2 (23.0–28.5); group B: 25.1 (24.3–26.2)], nor GSV diameter [A: 7.2 mm (5.6–9.2); B: 6.9 mm (5.5–7.7)] influenced success. TLE (total laser energy) and ED (energy density) were greater $P<0.01$) in group A (median [inter-quartile range]: 1877 J (997–2350), 48 [37–59] J/cm) compared to group B (1191J (1032–1406), 37 [30–46] J/cm). Although TLE reflects the greater length of GSV ablated in Group A (33 cm vs. 29 cm, P=0.06) this does not influence ED. GSV occlusion always occurred when ED≥60 J/cm with no increase in complications [17].

Most of our study patients found to be without postoperative complications which was reflected in the short time of recovery and early return to work. With no influence of laser power on the time to return to work and postoperative complications except the pain over treated vein as was significantly less in patients treated with 7-W laser power in comparison to those with 10-W laser power, most of patients were without complications, while postoperative complications were about skin inflammation in 9 cases (17.3%), pain over the vein in 8 cases (15.4%), ecchymosis in 7 cases (13.5%) and thrombophlebitis in 4 cases (7.7%).

In Witold Woźniak *et al.*, hyperpigmentation occurred in as few as 3.6% in the EVLA group [18].

Bozoglan et al., higher occlusion rates were detected in EVLA group in contrast to RFA group (100 vs. 93.2%) [19].

In Hossam El-Mahdy et al., Superficial thrombophlebitis and ecchymosis were more prevalent in EVLA group, with statistically significant P values (P=0.00138 and 0.0034, respectively) [20].

The limitations of the study

The research's limitations are important to note. As it was an observational study, there were fewer instances overall and a lower sample size in relation to the results. It was also not multicentric and did not represent any particular group. Moreover, the Covid-19 epidemic, which was prominent at the beginning of the current trial, hampered patient accessibility and participation. The current study can add to the body of knowledge and provide some insight for prospective studies with bigger sample sizes in the future to evaluate the safest laser power that produces the greatest result and the fewest problems during endovenous laser ablation of varicose veins.

Conclusion

For endovenous laser ablation of varicose veins, both 7W and 10W laser power are indicated. They are risk-free and provide the greatest impact with the fewest difficulties for the chosen vein diameter. In our investigation, we came to the conclusion that patients with small GSV diameter required low laser power (7W), whereas those with big GSV diameter required high laser power (10W).

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Conflicts of interest

No conflict on interest.

References

1 Vasić DM, Davidović LB, Maksimović ZV. Primary varicose veins: frequency, clinical significance and surgical treatment. Srp Arh Celok Lek 2004; 132:398–403.

2 Chwala M, Szczeklik W, Szczeklik M. Varicose veins of lower extremities, hemodynamics and treatment methods. Adv Clin Exp Med: Off Organ Wroclaw Med Univ 2015; 24:5–1.

3 Carroll C, Hummel S, Leaviss J. Systematic review, network meta-analysis and exploratory cost-effectiveness model of randomized trials of minimally invasive techniques versus surgery for varicose veins. Br J Surg 2014; 101:1040–1052.

4 Rafetto J, Eberhardt R. Chronic Venous Disorders, Rutherford vascular surgery book 2014:850–857. ch. 55

5 Wittens C, Davies A, Bwkgaard N. Editor's choice – Management of chronic venous disease clinical practice guidelines of the European Society for Vascular Surgery (ESVS). Eur J Vasc Endovasc Surg 2015; 49:678–737.

6 Carradice D, Leung C, Chetter I. Laser; best practice techniques and evidence. Phlebology/Venous Forum Royal Soc Med 2015; 30:36–41.

7 Brar R, Nordon IM, Hinchliffe RJ. Surgical management of varicose veins: meta-analysis. Vascular 2010; 18:205–220. (Epub 2010/07/21)

8 Gloviczki P, Gloviczki ML. Guidelines for the management of varicose veins. Phlebol/Venous Forum Royal Soc Med 2012; 27:2e9.

9 Mosti G, De Maeseneer M, Cavezzi A, Parsi K, Morrison N, Nelzen O. Society for Vascular Surgery and American Venous Forum guidelines on the management of venous leg ulcers: the point of view of the International Union of Phlebology. Int Angiol 2015; 34:202–218.

10 Malskat WSJ, Engels LK, Hollestein LM, Nijsten T, van den Bos RR. Commonly used Endovenous Laser Ablation (EVLA) parameters do not influence efficacy: results of a systematic review and meta-analysis. Eur J Vasc Endovasc Surg 2019; 58:230–242.

11 Swenil S, Rahul J, Jawahar R. RFA vs EVLT: A comparison of treatment options for varicose veins. J Med Sci Clin Res 2017; 71:58. Volume

12 Zubilewicz T, Terlecki P, Terleck K. Application of endovenous mechanochemical ablation (MOCA) with Flibogrif^{TM} to treat varicose veins of the lower extremities: a single center experience over 3 months of observation. Acta Anglion 2016; 22:137–142.

13 Suhartono R, Irfan W, Wangge G, Moenadjat Y, Destanto WI. Post ablation recanalization of varicose veins of the limbs: Comparison ablation method of mechanochemical and laser procedure. J Phys: Conf. Ser 2017; 884:012125.

14 Van den Bos R, Arends L, Kockaert M, Neumann M, Nijsten T. Endovenous therapies of lower extremity varicosities: a meta-analysis. J Vasc Surg 2009; 49:230–239.

15 Almeida JI, Raines JK. Radiofrequency ablation and laser ablation in the treatment of varicose veins. Ann Vasc Surg 2006; 20:547–752.

16 Park YS, Kim YW, Park YJ, Kim DI. Clinical trials of endovenous laser ablation (EVLA) using low linear endovenous energy density (LEED) combined with high ligation of great saphenous varicose veins. Surg Today 2016; 46:1019–23. doi: 10.1007/s00595-015-1289-x

17 Theivacumar NS, Dellagrammaticas D, Beale RJ, Mavor AID, Gough MJ. Factors influencing the effectiveness of endovenous laser ablation (EVLA) in the treatment of great saphenous vein reflux. Eur J Vasc Endovasc Surg 2008; 35:119–123.

18 Woźniak W, Krzysztof Mlosek R, Ciostek P. Complications and Failure of Endovenous Laser Ablation and Radiofrequency Ablation Procedures in Patients with Lower Extremity Varicose Veins in a 5-Year Follow-Up. Vasc Endovascular Surg 2016; 50:475–483.

19 Bozoglan O, Mese B, Eroglu E, Ekerbicer H, Yasim A. Comparison of endovenous laser and radiofrequency ablation in treating varices in the same patient. J Lasers Med Sci 2017; 8:13–16.

20 El-Mahdy H, El-Wan H, Ghoneim B. Endovenous laser versus radiofrequency ablation of great saphenous vein: early postoperative results. Egypt J Surg 2018; 37:304.