



# Endovascular Laser Therapy in Varicose Veins: One Year Follow-up of 200 Patients

<sup>1</sup>Shivaji Pole, <sup>2</sup>Devidas Dahifale, <sup>3</sup>Asmita Suryawanshi

## ABSTRACT

Two-hundred patients suffering from varicose veins of the great saphenous vein with chronic venous insufficiency underwent endovascular laser therapy (EVLT) in MGM Hospital, Aurangabad, Maharashtra, India. Diode laser fiber of 1470 nm wavelength was used. In a few cases, residual dilated veins were injected with sclerosants (Inj. Polidocanol). Doppler studies were carried out immediately after the procedure to confirm complete occlusion of the ablated vein, elimination of reflux and to rule out deep vein thrombosis. The procedure was carried out as a day-care procedure under local anesthesia. All patients were followed up clinically and ultrasonographically at 1 month, 3 months, 6 months and 12 months. Results were quite satisfactory. 96.5% of patients showed complete occlusion of the treated veins and 98.5% showed complete elimination of reflux at 1-year follow-up. Of the 21 patients who had venous ulcers, 20 healed completely at 1 year. Deep vein thrombosis occurred in 2.5%. All other complications were minor. We conclude that EVLT gave satisfactory results in the management of varicose veins during a follow-up period of 12 months post-procedure.

**Keywords:** Ablation, Chronic venous insufficiency, Endovascular laser therapy, Varicose veins

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## INTRODUCTION

Chronic venous insufficiency and varicose veins considerably decrease the quality of life of patients.<sup>1,2</sup> Surgical high ligation of the great saphenous vein at the sapheno-femoral junction, removal of varicose segments of veins and ligation of perforators is the standard treatment which gives excellent results.<sup>3</sup> EVLT was introduced as a minimally invasive, day-care procedure by Dr Bone in 1999.<sup>4</sup> The procedure got food and drug administration

(FDA) approval in 2002 in the USA. The principle of EVLT is to cause thermal damage to the intimal lining of the vein by laser energy. The vein becomes immediately occluded. Later its wall becomes thickened and fibrosed. It is usually done as an outpatient department (OPD) procedure under local anesthesia.<sup>5</sup> Results have been gratifying with a reported recurrence rate of less than 7% at 2 years.<sup>6</sup> Patients feel less pain and recover faster after EVLT, as compared to surgery. Another minimally invasive procedure for treatment of varicose veins is radio frequency ablation (RFA), in which thermal injury to the vein is delivered through radio waves by means of an intravascular probe.<sup>7</sup>

## MATERIALS AND METHODS

A prospective study was conducted in 200 patients presenting with symptomatic varicose veins. One hundred and sixty-four patients (82%) were males and 36 (18%) females. All patients except pregnant females and those with deep vein thrombosis were included in the study. One hundred and eighteen (59%) patients were in the age group 21 to 40. Age and gender distribution are shown in Table 1. Total 113 (56.5%) limbs treated were right sided, and 87 (43.6%) left sided (Table 2). Varicosities were graded as per CEAP classification in which C=clinical disorder, E = etiology, A = anatomical distribution of reflux, and P = perforators.<sup>8</sup> Total 151 patients (75.5%) had C2-C3 grade varicosities (Table 3). All patients underwent color Doppler studies of lower limb veins, during which the following points were noted:

- Deep vein status: Thrombosed/Patent.
- Sapheno-femoral reflux (Grade 1 to 4).

**Table 1:** Age and gender distribution of patients

AGE in years	EVLT Male	EVLT female	Total
11-20	2	0	2
21-30	24	04	28
31-40	52	12	64
41-50	44	10	54
51-60	28	06	34
61 and more	14	04	18
Total	164	36	200

**Table 2:** Side of limb treated

Side of limb treated	Right side	Left side
No. of limb treated	87	113
Percentage	43.5%	56.5%

<sup>1</sup>Associate Professor and Chief Interventional Radiologist, <sup>2</sup>Professor, <sup>3</sup>Assistant Professor

<sup>1-3</sup>Department of Radiology, MGM Medical College and Hospital, CIDCO, Aurangabad, Maharashtra, India

**Corresponding Author:** Shivaji Pole, Associate Professor and Chief Interventional Radiologist, Department of Radiology, MGM Medical College and Hospital, CIDCO, Aurangabad, Maharashtra, India, Phone: +91-9822333380 e-mail: drsmp111@gmail.com

**Table 3:** Preoperative clinical CEAP grading

Clinical CEAP grading	No. of limbs EVLT	Percentage
C1	0	0
C2	73	36.5
C3	78	39
C4	28	14
C5	07	3.5
C6	14	7

(C0 no visible or palpable signs of venous disease, C1 telangiectasia or reticular veins, C2 varicose veins, C3 edema, C4 skin changes due to venous disorders (pigmentation, eczema, dermatosclerosis), C5 as C4) but with healed ulcers, C6 skin changes with active ulcers]

- Great saphenous vein: Dilated/ normal (more than 3 mm dilated).
- Saphenopopliteal junction reflux (Grades 1 to 4).
- Short saphenous vein: Dilated/normal.
- Perforators: Competent/incompetent (leg and thigh perforators).

After obtaining consent, patients underwent EVLT with 1470 nm diode laser (Fig. 1) under local anesthesia with 2% Lignocaine. Under ultrasonography (USG) guidance laser fiber with sheath was inserted into the vein, up to a point 2 cms distal to saphenofemoral junction (Fig. 2). Tumescant anesthesia (15 mL 2% Lignocaine + 10 mL sod bicarb + 5 mL sensoricaine in 300 mL normal saline) was injected peri-venously under USG guidance. The laser was fired at appropriate energy and power to ablate the vein. Deep vein damage was prevented by keeping the tip of laser fiber 2 cm below the saphenofemoral junction. Post-ablation USG was done to confirm complete occlusion of dilated veins, patency of deep veins and occlusion of incompetent perforators. Class II compression stockings (with a gradient of 30 to 40 mm Hg) were applied to the limb up to the groin and patient was asked to walk for 20 minutes post-procedure. Patients were instructed to wear stockings continuously for 48 hours and thereafter during daytime for 3 to 6 months.



**Fig. 2:** 6fr sheath placed in the GSV with 4fr long laser sheath introduced through GSV under ultrasound

### RESULTS

Ultrasound and Doppler studies were repeated at 1, 3, and 6 months and one-year post-procedure (Table 4). Overall 193 patients (96.5%) showed complete occlusion of treated veins at one year, and 197 (98.5%) showed absent reflux at saphenofemoral/saphenopopliteal junctions and perforators. Twenty-one patients had come with a venous ulcer before EVLT. At one year follow-up, all except one ulcer had healed fully (Table 5).

Postoperative complications have been listed in Table 6. Deep venous thrombosis occurred in five patients (2.5%). All other complications were minor in the form of puncture site infection, paresthesia, pain, superficial induration, hematoma, etc. and their incidence was 0.5 to 35%.

Pre- and post-EVLT pictures of some of the treated legs have been shown in Figures 3 to 6.

### DISCUSSION

This study shows more male patients than females, whereas past studies done in developed countries show female preponderance. Probably this is because,



**Fig. 1:** 1470 painless Biolitec laser machine with optical power 15W with a laser fiber, guide wire, and sheath

**Table 4:** Follow-up ultrasound and Doppler evaluation

Follow up	No. of limbs with the elimination of SFJ/SPJ/IP Reflux		No. of limbs with complete occlusion of treated veins	
	Percentage	Percentage	Percentage	Percentage
One month	199/200	99.5	196/200	98
Three months	198/200	99	195/200	97.5
Six months	198/200	99	195/200	97.5
One year	197/200	98.5	193/200	96.5

**Table 5:** Follow-up of patients with healed ulcers

Preoperative area of Ulcer	No. of limbs treated	1 month	6 months	12 months
Less than 5 cm	13	09	11	13
More than 5 cm	08	01	06	07
Total	21			

**Table 6:** Percentage of postoperative complications

Complications	No. of limbs treated	Percentage of complications
Superficial vein thrombophlebitis	14	7
Induration	32	16
Pain, bruising and tightness	70	35
Hematoma	10	5
Burns	01	0.5
Paresthesia	62	31
Puncture site infection	06	3
DVT	05	2.5
Pulmonary embolism	0	0

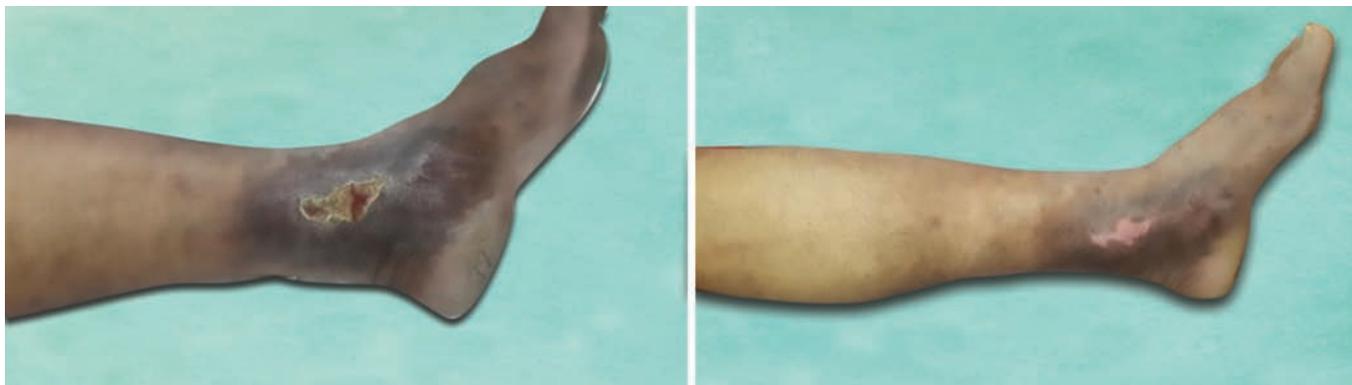
in developing countries like India, the percentage of working women is much less than in developed countries. Our results of short-term follow-up of one year are comparable to those published by others. Merchant et al.<sup>9</sup> reported complete vein occlusion rates of 96.8%, 89.2%, and freedom from reflux rates of 96.6%, 91.3%, and 88.2% at 1 week, 6 months and 12 months follow-up. Our results were similar *viz.* complete occlusion rates of 98%, 97.5% and 96.5 and reflux-free rates of 99.5%, 99% and 98.5% at 1 month, 6 months, and 12 months follow-up respectively. Chronic non-healing venous ulcers in patients with varicose veins and chronic venous insufficiency are a source of great discomfort and pain to most patients. In our study, the results were very gratifying. After EVLT, most ulcers less than 5 cm healed within 6 months and all within 12 months. It looks a little longer time for ulcers more than 5 cm in size to heal, but even in this group, 7 out of 8 ulcers healed within 12 months. Healing of chronic ulcers gives a lot of satisfaction to patients.

**Figs 3A and B:** (A) Tortuous varicose veins in the left lower thigh and leg along the GSV prior to laser treatment. (B) No varicosity seen in left lower limb immediate post laser treatment**Fig. 4:** Varicose veins before laser treatment and after 1 week of laser treatment

This study had essentially two limitations. One was that we didn't compare it with another minimally invasive mode of treating varicose veins, *viz.* RFA. However, published results of a meta-analysis of both modes (EVLT and RFA) show slightly better results with EVLT. At 32 months follow-up, EVLT success rates were 94% and RFA 84% in one study.<sup>10</sup> Second drawback of the current study is that the follow-up period is only 12 months. We are following up all patients who underwent EVLT and shall publish long-term results later. However, our preliminary observations show that complete occlusion and reflux-free rates have not decreased even after one year.

## CONCLUSION

Endovascular laser therapy is a very useful, effective and safe minimally invasive procedure for the treatment of varicose veins. It can be done as an OPD procedure under local anesthesia. Complete occlusion and reflux



**Fig. 5.** Non-healing venous ulcer with skin changes before laser treatment and after 6 months of laser treatment



**Fig. 6.** Large non-healing venous ulcer with skin changes before laser treatment and after 1 year of laser treatment

elimination are achieved in most patients which are maintained over 12 months, as observed in this study. Postoperative complications are minimal and mostly minor. Relief of symptoms of chronic venous insufficiency and healing of venous ulcers after EVLT are other significant benefits of this procedure than conventional surgery. Wherever possible EVLT is the first choice for varicose ulcers treatment.

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