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Comparative Analysis of Endo Venous Laser Ablation vs. Venous Stripping: Safety, Cost-Effectiveness and Efficiency in Varicose Vein Treatment

Dr.Harshika S. Shetty[1]*, Dr.Amith Kiran[2], Dr. Vishnu Keerthi[3]

[1]Post Graduate Resident, Department of General Surgery, Srinivas Institute of Medical Sciences and Research Centre, Mukka, Mangalore, Karnataka, India
[2]Cardiothoracic Surgeon, Department of Cardiothoracic and Vascular Surgery, Srinivas Institute of Medical Sciences And Research Centre, Mukka, Mangalore, Karnataka, India
[3]Junior Resident, Department of Cardiothoracic and Vascular Surgery, Srinivas Institute of Medical Sciences and Research Centre, Mukka, Mangalore, Karnataka, India

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***Corresponding Author**
Dr.Harshika S. Shetty

Post Graduate Resident, Department of General Surgery, Srinivas Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, India

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A B S T R A C T

This comparative study compared endovenous laser ablation (EVLA) and Venous stripping (anterograde and retrograde methods) for the treatment of varicose veins in a tertiary care hospital. ***Objective:*** Endovascular laser ablation (EVLA) is a minimally invasive procedure performed in the OPD or as a day care procedure with minimal blood loss and minimal invasion. The aim of this comparative study is to establish whether these technically improved outcomes are better than traditional venous stripping (anterograde and retrograde methods). ***Methods*:** Duration - 1 year (January 2023 to January 2024). Centre - Srinivas Institute of Medical Science & Research Centre, Mukka, Mangalore, Karnataka, India. ***Study Population:*** Patients presenting with varicose veins to General Surgery/ CTVS OPD. ***Study Design:*** Prospective study. This study compared postoperative patient comfort and the surgical outcome of endovenous laser ablation (EVLA) and high ligation venous stripping (Trendelenburg operation). ***Results*:** EVLA was found to be cost effective, OPD procedure. In our study, as compared between EVLA and venous stripping, study shows that EVLA is safer with minimal complications, early recovery, no recurrence and economically feasible. ***Conclusion*:** The findings of this study support the efficacy and safety of endovenous laser ablation (EVLA) as a superior alternative to high ligation venous stripping (Trendelenburg operation) for the treatment of varicose veins. These results advocate for the wider adoption of EVLA as the preferred treatment modality for varicose veins.

Keywords: EVLA, Venous Stripping, varicose veins, day care procedure, cost effective.

INTRODUCTION

Varicose veins are a common venous disorder affecting millions of people worldwide, characterized by dilated, tortuous veins, usually in the lower extremities [1]. Beyond their aesthetic concerns, varicose veins often lead to discomfort, including pain, swelling, and a heavy sensation in the legs, all of which can significantly diminish an individual's quality of life [2].

Traditionally, the gold standard for the treatment of varicose veins has been surgical venous stripping [3]. This procedure involves the physical removal of the affected veins through incisions in the skin, a method that, while effective in eliminating the problematic veins, comes with considerable drawbacks, including postoperative pain, extended recovery periods, and a higher risk of complications such as infection and nerve damage [4].

In recent years, advancements in medical technology have introduced less invasive alternatives to venous stripping, with Endo Venous Laser Ablation (EVLA) emerging as one of the most prominent options. EVLA involves the insertion of a laser fibre into the affected vein, where laser energy is used to heat and seal the vein shut, thereby

redirecting blood flow to healthier veins [5]. This technique has gained widespread acceptance due to its minimally invasive nature, promising reduced pain, quicker recovery times, and a lower incidence of complications when compared to traditional surgery [6].

In addition to its clinical advantages, EVLA is also more cost-effective than venous stripping. The latter, being a more invasive procedure, typically requires general anaesthesia, extended hospital stays, and longer recovery times, all of which contribute to higher overall costs. In contrast, EVLA is usually performed under local anaesthesia in an outpatient setting, resulting in lower procedure costs and minimal downtime for patients [7].

This comparative analysis of EVLA and venous stripping will provide a comprehensive evaluation of these two prominent treatment options for varicose veins.

METHODOLOGY:

Study design and study settings:

This prospective study was carried out at the Department of General Surgery/ CTVS OPD, Srinivas Institute of Medical Sciences and Research Centre in Mukka, Mangalore, Karnataka, India, for a period of one year, from January 2023 to January 2024.

Study objectives:

To compare the safety, cost-effectiveness, and treatment efficiency of EVLA vs. Venous stripping in cases of varicose veins.

Study population: Patients aged between 50-70 years presenting with varicose vein from January 2023 to January 2024.

Inclusion Criteria:

Patients aged between 50-70 years were included in this study who presented with primary, symptomatic, unilateral/ bilateral varicose veins.

Exclusion Criteria:

Patients with DVT, secondary varicosity, pregnancy, non-palpable foot pulses and inability to give informed consent or complete the follow up visits.

Statistical Analysis:

In a period of one year, after applying the inclusion and exclusion criteria, 52 patients were involved in this study out of which 12 patients underwent surgical venous stripping and 40 patients underwent EVLA in the above mentioned study period.

RESULTS

EVLA was found to be cost effective, OPD procedure. At our centre, above knee, below knee including bilateral EVLA was performed, LSV, SSV both ablated and no tumescence was used. Duration of procedure was comparatively shorter. No recurrence and no complications noted post operatively. In our study, as compared between EVLA and venous stripping, study shows that EVLA is safer with minimal complications, early recovery, no recurrence noted in our study and economically feasible.

Table 1: Procedures Performed in the Study

Procedure	EVLA [N=40]	Venous stripping [N=12]
Procedure performed on LSV only	30	08
Procedure performed on SSV only	Nil	02
Procedure performed on both LSV and SSV	06	02
Procedure performed on bilateral lower limb	04	Nil
EVLA: Endo Venous Laser Ablation; LSV: Long Saphenous Vein; SSV: Short Saphenous Vein		

Table 2: Parameters associated with EVLA and Venous Stripping Procedure

Parameters	EVLA	Venous Stripping
Cost factor	Cost effective	Costly comparatively
Duration of stay	Shorter duration (OPD procedure)	Prolonged hospital stays
Duration of procedure	Shorter	Longer
Recurrence	No recurrence noted	One recurrence noted
Complication	No complications noted	Complications present

Table 3: Complications associated with EVLA and Venous Stripping Procedure

Complications	EVLA [N=40]	Venous stripping [N=12]
Lower limb Oedema	Nil	04
DVT	Nil	Nil
Sural nerve injury	Nil	01
Recurrence	Nil	01
Hypertrophic Scar	Nil	02
Surgical site infection	Nil	01
Total	Nil	09
EVLA: Endo Venous Laser Ablation; DVT: Deep vein thrombosis		

DISCUSSION

The venous stripping procedure was performed on 12 patients using an inguinal incision about 3-4 cm long, located 3 cm below and away from the pubic tubercle, parallel to the inguinal ligament. Tributary veins at the saphenofemoral junction were ligated or clipped. The long saphenous vein was exposed, severed, and stripped using a venous stripper in either a retrograde or anterograde method. Incisions were then closed in layers. All venous stripping patients were made to take rest for 7-10 days till the sutures were removed.

Among the 40 patients who underwent EVLA in a period of one year, no incision was made and no tumescence was used. Instead, we used a saline bottle where saline was frozen, along the course of the vein, during the course of the ablation procedure. Among some doubtful cases, we performed a venogram to rule out deep vein thrombosis.

It is observed that ablation of Long saphenous vein is done above knee and no ablation below knee either for long saphenous vein/ short saphenous vein.

In our centre we have performed laser ablation over the whole course of long saphenous vein and short saphenous vein till the ankle level, keeping different strength. Energy of 70-80 Joules/cm for the whole course of long saphenous vein or short saphenous vein with the delivery of 8-10 Watt above the knee and 6 Watt below knee and 4 Watt at the ankle was used.

Calculation of Watt depends upon the size of thigh, diameter of vein and depth of the vein.

EVLA in our study was performed anterograde and retrograde. This anterograde and retrograde method was observed by entering the vein through laser cable (Radial fibre of 600 micrometre, NumericalAperture (NA), determines the resolution and brightness of the image. $NA=n\sin\theta$, Outer Diameter (OD) = 1650 micro meter at the knee level.

Above knee till saphenofemoral junction it was retrograde. Below knee till some perforators of ankle it was anterograde.Two separate puncture site was made at knee level for anterograde and retrograde method to reduce the length of non intervened segment. Among few cases entry point of radial fibre of 600 micrometre through long saphenous vein was at ankle level.

To start with, a puncture on LSV by ultrasound guidance at knee level with 18G puncture needle. Meanwhile adjacent to previous puncture, 2nd puncture retrograde way is made to enter the distal vein at knee towards ankle.In this prospectus, whole of LSV is ablated without missing of a small segment too.

By retrograde method, when we puncture from saphenofemoraljunction we could ablate medial and lateral accessory veins which communicate to long saphenous vein. At knee level by retrograde method, we could ablate anterior tibial vein or accessory vein which communicate with LSV below knee. The guide for entering this accessory vein was the illuminating tip of cable along with guidance of ultrasound. In addition to this sclerosant was injected into the lumen of the spider veins, telangiectasia and reticular veins of shorter length which could not be ablated with the help of the laser cable tip which was illuminated and showing the origin of the above said vein. Every minor veins received 0.5-1 ml of injection sodium tetradecyl to the maximum 10 ml including all sites.

Following this procedure, we applied crepe bandage upto inguinal region at our centre. In patients who received sclerosantwere avoided blood thinner for at-least 7-10 days to avoid recanalization of sclerosed vessels.

This study compared the cost effectiveness, duration of hospital stay, postoperative patient comfort and the surgical outcome of endovenous laser ablation (EVLA) and high ligation venous stripping (Trendelenburg operation) and their associated complications, recurrence of varicose veins post procedure. The patients were followed up for next 6 months and were evaluated for post op complications, cosmesis, recovery period required etc.

Study Outcomes:

Most of our patients who had varicosity, the stoplight was occupational hazard. The aim was to make the treatment opd/day care procedure and make it economical for the labour group of population so that they can meet the expenses. EVLA procedure costed about Rs.20,000 and venous stripping costed approximately about Rs.50,000-60,000 including hospitay stay.

EVLA was found to be:

- Cost effective
- Very short hospital stay / OPD procedure
- Only local Anaesthesia was used
- No recurrence noted following EVLA even after 6 months follow up
- No complications noted in EVLA such as deep vein thrombosis, oedema, nerve injury, infection etc.

CONCLUSION

The findings of this study support the efficacy and safety of endovenous laser ablation (EVLA) as a superior alternative to high ligation venous stripping (Trendelenburg operation) for the treatment of varicose veins. EVLA demonstrated better postoperative patient comfort, rapid recovery, and favourable surgical outcomes, including complete resolution of symptoms and minimal complications. The comprehensive technique employed in EVLA, including frozen saline injection, anterograde and retrograde ablation methods, and concurrent sclerosant therapy for minor varicosities, contributed to its success in treating varicose veins effectively. These results advocate for the wider adoption of EVLA as the preferred treatment modality for varicose veins.

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Conflict of Interest: None

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