

# Technical Efficacy and Safety of Outpatient Endovenous Laser Ablation of Varicose Veins Under Local Anesthesia

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**Background:** Endovenous Laser Ablation (EVLA) is the recommended method for treating varicose veins. It is commonly performed in an inpatient or as day surgery setting under either general or spinal anesthesia. The purpose of this study is to assess the technical efficacy and safety performing outpatient EVLA for varicose veins under local tumescent anesthesia for procedure success, complications, recovery time, and patient satisfaction.

**Methods:** A retrospective review of 300 consecutive patients who underwent outpatient EVLA under local tumescent anesthesia from October 2014 to June 2019 was undertaken. Patients 25–55 years diagnosed with symptomatic varicose veins and Great Saphenous Vein (GSV) incompetence were enrolled. Patient demographics, clinical characteristics, procedure duration, complications, and follow-up outcomes were recorded.

**Results:** A total of 331 limbs were treated. The mean procedure time was 36 minutes. Five procedures were aborted for technical reasons, resulting in an overall technical success rate of 98%. They were minor complications of bruising (13%) and phlebitis (5%), that were resolved and did not require further intervention. There were no significant complications, including deep vein thrombosis (DVT) or pulmonary embolism (PE). Patients were discharged and resumed normal activities within approximately seven days and were well satisfied.

**Conclusion:** EVLA for varicose veins can be performed as an outpatient procedure under local tumescent anesthesia safely and with high technical efficiency. It offers the benefits of shorter recovery times, less risk of complications, and lower health care costs.

**Keywords:** varicose veins, saphenous vein, venous insufficiency, endovenous laser ablation, outpatient

## Introduction

In most parts of the world, chronic venous insufficiency (CVI), which is due to poor return circulation of blood into the veins, resulting in varicose veins, is common. Studies have estimated that CVI affects 25–30% of women and approximately 10–20% of men in Western societies.<sup>1,2</sup> Even in areas such as Saudi Arabia, the prevalence is higher among women who have had multiple pregnancies.<sup>3,4</sup> Varicose veins is one of the most common CVI symptoms, which not only destroys the look of legs, but also leads to pain and discomfort, thus resulting in low quality of life.<sup>5</sup> The veins can be extremely painful and uncomfortable for the patient so they usually visit the doctor.

In the past, varicose veins were treated surgically with the removal of the vein via a procedure called a venous stripping that can involve general anesthesia, a long spell in hospital, or traditionally “under the drop”. However, these conventional techniques have distinct drawbacks: This results in prolonged recovery time, higher risk of post-operative complications, and higher overall healthcare costs as a result of needing inpatient care and more invasive procedures used.<sup>6</sup> Due to the high costs and side effects of surgeries, a call for less invasive interventions has been made; one of these techniques is Endovenous Laser Ablation (EVLA), a technique that has been shown to have advantages over surgery such as less recovery time, lower risk of complications and lower costs.<sup>7,8</sup>

It is commonly done in an inpatient or day surgery setting and uses general or spinal anesthesia, though the EVLA is more commonly done as Tumescant anesthesia (TA). Nonetheless, the recent breakthrough in medical technology has made it possible for surgeons to carry out EVLA using Local Anesthesia under LA on an outpatient basis. It is a response to rising patient expectations of minimum invasive treatment and a response to healthcare system challenges such as bed scarcity and high inpatient costs. This has prompted questions regarding the general use of outpatient EVLA in normal clinical practice under local anesthesia. This study therefore seeks to examine the effectiveness, safety and potential benefits of outpatient EVLA under local anesthesia versus standard inpatient surgery.

## Materials and Methods

### Study Design and Patient Selection

The technical success and safety of outpatient EVLA for varicose veins under local tumescent anesthesia (LA) was evaluated with a retrospective cohort study. For this study, electronic clinical records of 300 patients who received EVLA from October 2014 to June 2019 were assessed within a single medical institution. The institutional review board was approached for ethical consideration of this study, and their consent was deemed to have been exempted, since the data was collected retrospectively.

The inclusion criteria for the study were: (1) age 25–55 years old; (2) diagnosis of primary symptomatic varicose veins classified by the Clinical Etiological Anatomical and Pathophysiological Classification (CEAP); (3) GSV insufficiency with vein diameter between 4.7 and 8.6mm as assessed clinically before the intervention through duplex ultrasound. All the patients with severe tortuosity of veins, patients with other severe complications like diabetes, hypertension, or other cardiovascular diseases, and patients requiring procedures other than essential, simple procedures were also not considered for the study.

### Data Collection

For this study, data were collected using electronic medical records of the patients who retrospectively underwent outpatient EVLA. The collected data entailed demographic data (age, sex, etc.), clinical data (CEAP classification, GSV diameter, baseline symptom), procedural details (duration, type of anesthesia used, etc.), and post-procedure data (complications, recovery time, etc.). It also means that the researcher made no direct intercessions for treatment since the study only required data from patient records.

### Statistical Analysis

Descriptive statistics were used to describe the patient characteristics regarding demographic and clinical profiles. These values were presented as the mean and SD for continuous variables like age, GSV diameter, and the total time taken for the procedure. Descriptive statistics included frequencies and percentages for categorical variables, including gender, CEAP classification, and complications.

### Procedure Description

EVLA was done on all of the patients as an outpatient procedure while under local tumescent anesthesia. Pre-surgery preparations consisted of instructions on fasting, medication, and precautions to be taken before and after the surgery. The use of regional anesthesia was employed to reduce pain, and the type of anesthesia used was tumescent anesthesia (TA), which was administered on the leg of the patient. The tumescent solution involved mixing lidocaine, epinephrine, and sodium bicarbonate in saline, with the volume and concentration-dependent on the size of the patient and the region that was to be treated. The site of the GSV was determined through duplex ultrasound, and an 18G needle was used for venous access. Next, a guidewire was passed through a saphenofemoral junction (SFJ), and a catheter was then introduced to accommodate the laser fiber. Laser treatment was performed with a 980nm laser, and the energy of 50–120 J/cm. After the ablation, the compression bandage was put on, and the patients were advised to wear the class I compression stockings for a week and go about their everyday business. It is important to note that they were prohibited from exercising within the initial week after the procedure.

## Follow-Up and Complications

Follow-up was scheduled at 1 week, 3 weeks, and 6 weeks post-procedure to assess occlusion rate and monitor for complications such as bruising, phlebitis, and other adverse events. Occlusion was still achieved in 98% of patients at 6 weeks. Complications were managed conservatively, and complete resolution was expected within a few weeks. Additionally, using the visual analogue scale patients were asked to provide feedback regarding pain, recovery time, and overall satisfaction during these follow-up visits.

## Ethical Considerations

Given that this study was a retrospective chart review, the institution's ethical review board at Dr Sulaiman Al Habeeb Hospital, waived the requirement for informed consent. The study was conducted according to the moral standards outlined in the Declaration of Helsinki, and all patient data was anonymized to maintain confidentiality.

## Results

A total of 300 patients (representing 331 limbs) were included in this study. Most patients were female 77% (257), while 23% (43) were male. The mean age of the patients was 40 years (range: 25–55 years) (Table 1). Most of the patients (83%) were classified as CEAP C1 and C2, indicating mild to moderate symptoms of varicose veins, with only 6% of patients classified as CEAP C5 or C6, which are more severe stages of venous disease (Figure 1).

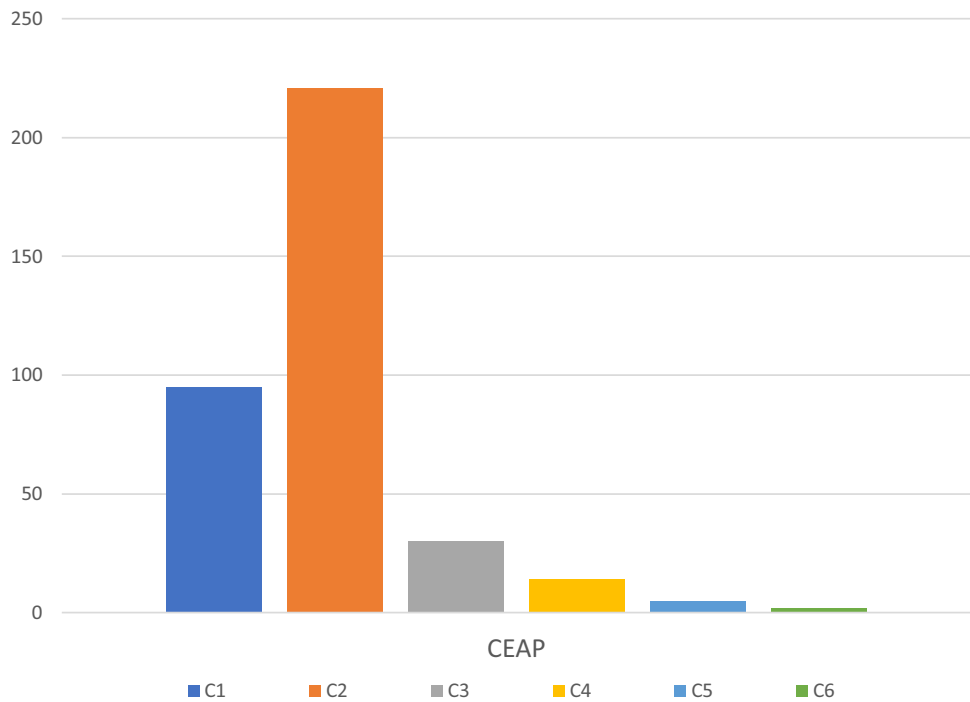
The average length of the GSV in the study cohort was 31 cm (range: 22–40 cm), and the mean diameter of the GSV was 6.5 mm (range: 4.7 mm to 8.6 mm). Of the 300 patients, 31 had bilateral GSV reflux, while the remaining 269 had unilateral GSV reflux. The procedures were completed successfully in 295 patients, with a procedure completion rate of 98%. Five procedures were aborted due to the inability to cannulate the vein, resulting in a failure rate of 1.7% (Table 1).

The mean duration of each procedure was 36 minutes (range: 28–45 minutes). No significant complications were observed during or immediately after the procedure. Minor complications included mild bruising in 40 patients (13%), which resolved within one week, and phlebitis in 15 patients (5%), managed conservatively and resolved within 2–5 weeks.

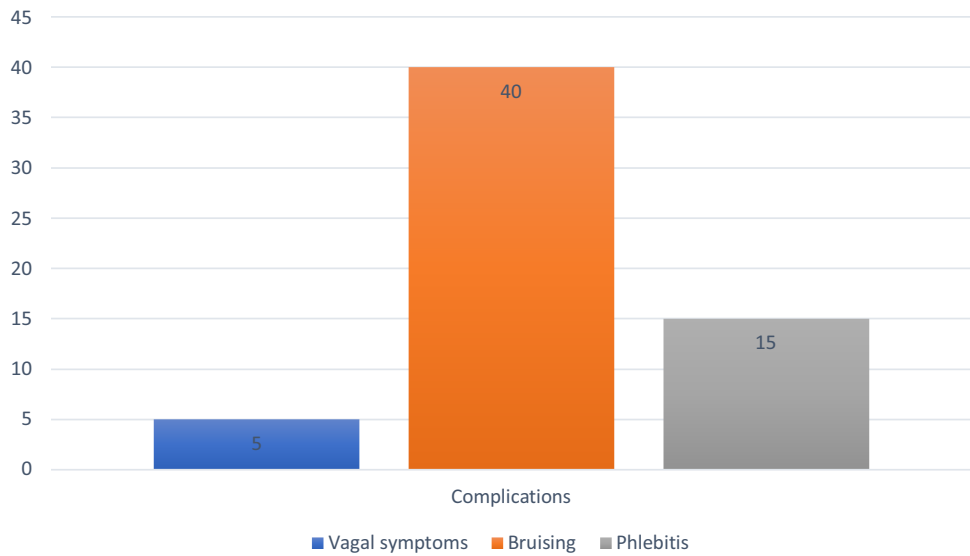
Further, five patients (1.7%) developed vagal reactions in the course of the procedure; however, the episodes were brief, lasting a few minutes, and did not hinder the procedure's continuance. (Figure 2).

**Table 1** Demographic and Clinical Data of Study Population

Variable	Number	Percentage (%)
Total Patients	300 patients	100%
Number of Limbs (legs)	331 legs	N/A
Bilateral Cases	31 Cases	10.3%
Gender	(43) Males	23%
	(257) Females	77%
Age (Mean)	40 (Range: 25–55 years)	N/A
Average GSV Length	31 cm (Range: 22–40 cm)	N/A
Average GSV Diameter	6.5 mm (Range: 4.7–8.6 mm)	N/A
Side of GSV Affected	Right (156)	47.1%
	Left (175)	52.9%
Aborted EVLA Procedures	5	1.7%
Mean Procedure Duration	36 (Range: 28–45 min)	N/A



**Figure 1** Number of patients for each CEAP classification.



**Figure 2** Number of patients with each complication.

Regarding gender and age distribution, Subgroup analysis failed to reveal any disparities in the rate of complications encountered. The data also revealed that the average procedure time was not significantly different between the patients with unilateral and bilateral GSV reflux ( $p = 0.23$ ).

Overall, it took an average of 7 days for patients to regain full functionality after the procedure, and all patients reported no re-emergence of symptoms that would necessitate hospitalization or further treatment. No severe complications such as DVT or PE were observed in the short or long term follow up period.

## Discussion

Outpatient Endovenous Laser Ablation (EVLA) under local anesthesia (LA) is proven to be safe, effective and is a low-risk modality for treatment of varicose veins, with better results compared to traditional surgical procedures. The studies also showed it is a less invasive method and more beneficial in comparison with the traditional ones in faster healing, fewer complications and less expenses.<sup>6</sup>

## Effectiveness and Safety of Outpatient EVLA

The study's success rate was 98% (Five cases could not cannulate the vein). This is considerably lower than the previous research studies of the success rates (ie, 95–98%) of the complete EVLA procedures (eg, inpatient or outpatient).<sup>7,8</sup> The average procedure time of 36 minutes also falls within the 30–45 minutes range, as documented in the literature concerning EVLA procedures under local anesthesia.<sup>9</sup>

These findings about complications also provide evidence endorsing the safety of outpatient EVLA. Minor lower limb complications frequently observed in this study were mild bruising 13% and phlebitis 5%, similar to the findings in other studies on the same subject.<sup>10</sup> However, all complications were minor and resolved within a few weeks without further specific intervention. The development of vagal attacks in 1.7% of patients is consistent with the findings of other researchers who have reported similar transitory symptoms during EVLA that usually last briefly.<sup>11</sup> Notably, no cases of deep vein thrombosis (DVT) and pulmonary embolism (PE) were reported in this case series, which supports the procedure's safety.

## Patient Satisfaction and Recovery

It was established that patients with outpatient EVLA under LA could recover quickly. The patients could return to their normal activities in about seven days on average, which conforms to some of the findings of other works on EVLA where local anesthesia was used.<sup>12</sup> The convenience of regaining the ability to perform daily tasks quickly is a significant benefit, particularly when considering other surgical procedures that may necessitate more extended downtime.

There was also high patient satisfaction regarding the completed procedure according to the follow-up visits and feedback. Previous studies have indicated that outpatient EVLA tends to yield high levels of patient satisfaction because patients do not have to stay in a hospital and can resume normal activities quickly.<sup>13,14</sup>

## Cost-Effectiveness and Healthcare Resource Utilization

Additionally, implementing outpatient EVLA under local anesthesia will likely help cut health costs drastically. The traditional treatments of varicose veins require hospitalization, general anesthesia, and a more extended hospitalization and recovery, which is costly for the health care system. To elaborate, outpatient EVLA does away with inpatient treatment requirements and general anesthesia, which lowers the price tag and helps the healthcare system run more efficiently due to the release of hospital beds and operating theaters for other essential utilizations. According to our findings, outpatient EVLA is equally effective as inpatient procedures. Since the latter can be significantly more expensive, outpatient treatment is a valid option in organizations with scarce resources.<sup>15,16</sup>

## Limitations

However, certain limitations are inherent to this study that need to be considered. First, they were cross-sectional and retrospective, which are known to limit the data due to probable missing information. It also prevents a direct comparison between outpatient EVLA and other surgical procedures or inpatient EVLA, where patients undergo general anesthesia.

Moreover, the study excluded patients without significant venous tortuosity and those with other related diseases, which would reduce the generalizability of the findings to other patients. However, it is important to point out that patients in this study had relatively uncomplicated varicose veins and, therefore, any treatment outcomes and experiences might have been different in a population of patients with more severe varicosities and comorbidities. The effectiveness of outpatient EVLA in a wider patient population needs to be further researched.

## Future Directions

Due to the low recurrence rate and potential cost savings, future prospective studies are required in determining the safety and efficacy of outpatient EVLA under local anesthesia, the long-term recurrence rate, and overall patient satisfaction. Outpatient EVLA could be compared to other treatment modalities such as radiofrequency ablation, sclerotherapy or other treatment modalities with randomized controlled trials (RCTs) that provide concrete guidelines for appropriate treatment plans. Importantly, if this approach is effective in differing settings-from low resource to developed settings-its implications can be expanded.

## Conclusion

Outpatient endovenous laser ablation under local anesthesia is a safe and effective treatment for varicose veins. Taking into consideration the never-ending pressure on the healthcare systems and the rise of minimally invasive treatments, outpatient EVLA is a viable solution to the issues created by varicose vein treatment. Longitudinal research and RCTs must be conducted to support these findings, including post-operative patient prognosis, recurrence of disease, and cost analysis in various healthcare environments.

## Disclosure

The author reports no conflicts of interest in this work.

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