Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 2099-2104 | ISSN:2251-6727

Does Age Impact Clinical Recovery Following EVLA? A Prospective Analysis of 60 Patients

Prajwal Chandrashekhara[1*], Katta Veerendra Yaswanth[2], Kalale Radhakrishnan Bhagavan[3]

[1]Assistant Professor, Department of General Surgery, K S Hegde Medical Academy, NITTE (Deemed to be University), Deralakatte, Mangalore, Karnataka, INDIA- 575 018

[2]Post Graduate, Department of General Surgery, K S Hegde Medical Academy, NITTE (Deemed to be University), Deralakatte, Mangalore, Karnataka, INDIA- 575 018

[3]Professor, Department of General Surgery, K S Hegde Medical Academy, NITTE (Deemed to be University), Deralakatte, Mangalore, Karnataka, INDIA- 575 018

[*]**Corresponding Author**: Prajwal Chandrashekhara, Assistant Professor, Department of General Surgery, K S Hegde Medical Academy, NITTE (Deemed to be University), Deralakatte, Mangalore, Karnataka, INDIA- 575 018

(Received: 16 June 2025 Revised: 20 July 2025 Accepted: 04 August 2025)

KEYWORDS

Endovenous Laser Ablation (EVLA), Varicose Veins, Age, Clinical Recovery, VCSS, Venous Insufficiency

ABSTRACT:

Introduction: Endovenous Laser Ablation (EVLA) is an established treatment for primary varicose veins, offering rapid recovery and excellent occlusion rates. While its efficacy across all age groups is well-documented, limited data exist on the influence of age on the trajectory of clinical recovery. This study aimed to evaluate whether patient age impacts postoperative symptom resolution following EVLA using the Venous Clinical Severity Score (VCSS).

Objective: to assess the impact of age on clinical recovery following EVLA, as measured by parameter-wise VCSS improvement over a 6-month follow-up.

Methods: This prospective observational study included 60 patients undergoing EVLA for symptomatic primary varicose veins between May 2023 and December 2024. Patients were stratified into two groups: <50 years (n=33) and ≥50 years (n=27). All patients were followed for 6 months. Clinical recovery was assessed using total and parameter-wise VCSS at baseline, 1 month, 3 months, and 6 months post-procedure. Statistical analyses included Pearson's and Spearman's correlation to assess the relationship between age and VCSS improvement.

Results: Both age groups showed significant reductions in total VCSS over 6 months (mean improvement: 5.1 ± 1.3). Younger patients had slightly faster improvement in pain, edema, and activity limitation at 1 month; however, the differences between groups were not statistically significant at 6 months ($p > 0.05$). Correlation analysis revealed a weak negative association between age and VCSS improvement (Pearson's $r = –0.164$, $p = 0.21$; Spearman's $\rho = –0.153$, $p = 0.24$). No major complications occurred; minor complications included ecchymosis (13.3%), transient paresthesia (5.0%), and mild skin pigmentation (3.3%).

Conclusions: EVLA leads to substantial symptomatic relief irrespective of patient age. While younger patients may experience faster early recovery, age does not significantly impact long-term clinical outcomes. EVLA proves to be a consistently safe and effective treatment for varicose veins across all age groups.

1. Introduction

Chronic venous insufficiency (CVI) is a prevalent vascular disorder affecting approximately 25–40% of adults worldwide, manifesting clinically as varicose veins, leg pain, edema, pigmentation, and venous ulceration in advanced stages [1,2]. It is primarily caused by valvular incompetence, particularly in the great saphenous vein (GSV), resulting in venous reflux and sustained venous hypertension [3]. Left untreated, CVI

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(4), 2099-2104 | ISSN:2251-6727

can lead to progressive deterioration of the venous system, reduced quality of life, and increased socioeconomic burden [4].

Historically, the mainstay of treatment for symptomatic varicose veins was surgical high ligation and stripping , a method that, despite being effective, was associated with longer hospital stays, higher postoperative morbidity, and extended recovery times [5]. Over the past two decades, endovenous thermal ablation techniques such as Endovenous Laser Ablation (EVLA) have revolutionized varicose vein management, offering a minimally invasive, outpatient-based alternative with comparable or superior efficacy and fewer complications [6,7].

Numerous randomized controlled trials and systematic reviews have confirmed the safety and durability of EVLA for GSV reflux. Comparative studies have demonstrated that EVLA achieves excellent vein occlusion rates with significantly lower pain scores and quicker return to daily activities than high ligation and stripping [8,9]. The RELACS trial, with a 5-year follow-up, showed a higher recurrence rate at the same site in patients treated with EVLA compared to high ligation and stripping, though EVLA was still preferred due to its minimally invasive nature [10]. Likewise, Eroglu and Yasim's randomized trial comparing EVLA, radiofrequency ablation (RFA), and N-butyl cyanoacrylate found EVLA to be effective with durable mid-term outcomes [11].

As the scope of EVLA has broadened, it has proven effective across a variety of patient populations, including those with advanced disease (CEAP C5–C6) and large-diameter veins [12,13]. EVLA also shows promising results in venous ulcer healing when combined with compression therapy [14]. Furthermore, EVLA has demonstrated a favorable safety profile in elderly populations, including octogenarians, nonagenarians, and centenarians [15], and several studies affirm that increasing age does not necessarily correlate with poor procedural outcomes [16,17].

The Venous Clinical Severity Score (VCSS) remains a widely used and validated tool for assessing symptom severity and tracking recovery following interventions for varicose veins [18]. Despite its utility, few studies have systematically examined the component-wise trajectory of VCSS improvement over time or explored how age may influence recovery patterns following EVLA [18].

2. Aim

This prospective observational study aims to assess the impact of age on clinical recovery following EVLA, as measured by parameter-wise VCSS improvement over a 6-month follow-up. By stratifying patients into age-based groups and analyzing their recovery trajectories, the study seeks to clarify whether age is a determinant of functional improvement after EVLA.

3. Methods

Study Design and Setting

This was a prospective observational study conducted at the Department of General Surgery, in a tertiary care teaching hospital in South India. The study period spanned from May 2023 to December 2024. This study is a secondary analysis of a prospectively maintained dataset approved by the Institutional Ethics Committee, originally titled 'Clinical Outcome and Patient Recovery Following Endovenous Thermal Ablation With or Without Concomitant Foam Sclerotherapy of Varicose Veins'.

A total of 60 consecutive patients diagnosed with primary lower limb varicose veins and scheduled to undergo Endovenous Laser Ablation (EVLA) were recruited for this prospective study. All patients were aged 18 years or older and had symptomatic primary varicose veins classified as CEAP C2 to C6. Duplex ultrasound confirmed incompetence of either the great saphenous vein (GSV) or the small saphenous vein (SSV) in all cases. Patients were included only if they provided written informed consent and demonstrated willingness and ability to adhere to the scheduled follow-up visits.

Patients were excluded if they had recurrent varicose veins due to prior treatment or surgery, venous ulcers of non-venous origin, a current or past history of deep vein thrombosis, known coagulopathy or were on long-term anticoagulation therapy, or if they had incomplete data or were lost to follow-up during the 6-month study period.

All patients underwent clinical examination and duplex ultrasound to confirm venous reflux and assess the extent of varicose veins. The Venous Clinical Severity Score (VCSS) was recorded preoperatively by the operating

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(4), 2099-2104 | ISSN:2251-6727

surgeon. Additional demographic and clinical data such as age, sex, body mass index (BMI), occupation, duration of symptoms, and CEAP classification were also documented.

All procedures were performed under either local or spinal anesthesia in a standardized manner by experienced surgeons. A 1470 nm diode laser system was used in conjunction with a radial fiber. Under ultrasound guidance, vascular access was obtained using a micropuncture set, and the laser fiber was inserted percutaneously and positioned approximately 2 cm distal to the saphenofemoral junction, depending on the target vein. Tumescent anesthesia, composed of normal saline, lidocaine, and sodium bicarbonate, was infiltrated along the course of the vein to provide analgesia and create a thermal barrier to minimize collateral tissue damage. The laser energy was delivered using a linear pullback technique, with an average energy density ranging between 60 and 80 J/cm. Additional procedures such as stab avulsion or foam sclerotherapy were performed when indicated, based on intraoperative findings and clinical judgment.

Patients were observed for a few hours postoperatively and discharged on the same day or next day. Compression stockings (Class II) were advised for at least 6 weeks. Scheduled follow-up evaluations took place at 1 week, 1 month, 3 months, and 6 months. At the 6-month visit, clinical examination and duplex ultrasound were repeated. VCSS was reassessed at this visit by a blinded assessor to reduce observer bias.

Outcome Measures

The primary outcome was clinical improvement, measured by the change in VCSS from baseline to 6 months post-EVLA. VCSS improvement was defined as the difference between the preoperative and 6-month postoperative scores.

Statistical Analysis

Continuous variables were expressed as mean ± standard deviation (SD) and range.Correlation between age and VCSS improvement was analyzed using Pearson's correlation coefficient (for normally distributed data) and Spearman's rank correlation coefficient (for non-parametric data).A p-value < 0.05 was considered statistically significant.

Missing data were excluded from the final analysis. Graphical visualization was performed with scatter plots and regression lines to illustrate trends.

4. Results

A total of 60 patients undergoing EVLA for symptomatic primary varicose veins were included in the study. The mean age of the cohort was 47.0 ± 13.4 years, with ages ranging from 21 to 73 years. Of these, 33 patients (55.0%) were younger than 50 years of age, while 27 patients (45.0%) were aged 50 years or older. The study population comprised 38 males (63.3%) and 22 females (36.7%). A majority of the patients, accounting for 71.7%, were employed in occupations that required prolonged standing, including professions such as shopkeepers, teachers, and healthcare workers.

The mean preoperative VCSS was 16.5 ± 4.2 (range 7–24), indicating moderate to severe disease burden. At 6 months post-procedure, the mean VCSS was 3.8 ± 2.9 (range 0–12), demonstrating a significant clinical improvement. A mean VCSS reduction of 12.7 ± 2.7 points was observed, with individual improvements ranging from 7 to 19 points as shown in Table 1

Table 1 : VCSS Outcomes

Parameter	Mean ± SD	Range
Pre-op VCSS	16.5 ± 4.2	7 – 24
6-month VCSS	3.8 ± 2.9	0 – 12
VCSS Improvement	12.7 ± 2.7	7 – 19

To assess the influence of age on clinical recovery following EVLA, patients were divided into two groups as shown in Table 2.

Table 2: Subgroup Analysis by Age Group

Age Group	N	Mean VCSS Improvement	Standard Deviation (SD)
<50 years	33	13.1	2.7
≥50 years	27	12.3	2.6

Although patients under 50 years demonstrated a slightly greater mean improvement in VCSS over six months compared to those aged 50 years and older, this difference was not statistically significant (independent

Journal of Chemical Health Risks
www.jchr.org
JCHR (2025) 15(4), 2099-2104 | ISSN:2251-6727

t-test, $p > 0.05$). This suggests that age may have a mild influence on recovery, but it is not a strong determinant of clinical outcome following EVLA.

To further evaluate the relationship between age and clinical improvement, correlation analysis was performed. A weak negative correlation was observed between age and VCSS improvement. Pearson's correlation coefficient (r) was –0.164 with a p-value of 0.21, while Spearman's rank correlation coefficient (ρ) was –0.153 with a p-value of 0.24. These findings suggest that although older patients tended to show slightly less improvement, the relationship between age and clinical recovery following EVLA was not statistically significant.

Figure 1: Scatter Plot of Age vs. VCSS Improvement

A scatter plot with a linear regression trendline is shown above (Figure 1). The trendline shows a mild downward slope, consistent with the weak negative correlation observed. However, the wide spread of data points and non-significant p-values suggest no clinically meaningful relationship.

No major intraoperative or postoperative complications, such as deep vein thrombosis (DVT), infection, or nerve injury, were observed in the study cohort. A small proportion of patients experienced minor complications such as ecchymosis (13.3%), transient paresthesia (5.0%), and mild skin pigmentation (3.3%). All 60 patients successfully completed the 6-month follow-up period, and no cases of symptomatic recurrence were noted during this time.

5. Discussion

Endovenous Laser Ablation (EVLA) has firmly established itself as a first-line treatment for superficial venous incompetence due to its minimally invasive nature, favorable cosmetic outcomes, and low recurrence rates. Our 20-month prospective observational study aimed to explore the clinical efficacy of EVLA using the Venous Clinical Severity Score (VCSS) and examine whether age has any significant impact on the rate and extent of recovery.

Across the entire cohort of 60 patients, there was a statistically significant improvement in VCSS from baseline to 6 months post-EVLA, with a mean reduction of 12.7 ± 2.6 points. This is consistent with the results of multiple prior studies that affirm the effectiveness of EVLA in improving symptoms of chronic venous insufficiency, even over long-term follow-up [1,2,3]. Ghanaati et al. showed sustained symptom relief for up to 12 years post-EVLA, emphasizing the long-term durability of the technique [2].

In our study, we observed that patients under 50 years of age had slightly greater VCSS improvement (mean: 13.1 ± 2.7) compared to patients aged 50 years and above (mean: 12.3 ± 2.6), but this difference did not reach statistical significance. A weak negative correlation between age and VCSS improvement was observed, suggesting that increasing age may have a mild impact on the speed or degree of recovery, although not enough to influence clinical outcomes in a meaningful way.

These findings are in line with those of Chen et al., who noted that age is not a barrier to good outcomes following ambulatory venous procedures [15]. Similarly, Kibrik et al. [3] demonstrated that EVLA remains both safe and effective in octogenarians and nonagenarians, effectively challenging the perception that advanced age compromises outcomes.

Regarding safety, we observed minimal complication rates, including transient ecchymosis (13.3%), mild paresthesia (5%), and skin pigmentation (3.3%). Importantly, there were no cases of deep vein thrombosis (DVT), nerve injury, or symptomatic recurrence at 6 months. These outcomes resonate with existing literature supporting the low-risk profile of EVLA [7,8,10,13].

The observed safety and efficacy of EVLA were also mirrored in a recent real-world study by Cong et al., who

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 2099-2104 | ISSN:2251-6727

demonstrated that hybrid EVLA significantly reduces recurrence below the knee compared to radiofrequency ablation [4]. Bontinis et al. further validated EVLA's long-term benefits through their meta-analysis, showing sustained clinical improvements with low recurrence rates [7].

Although age did not significantly influence clinical outcomes in our study, it is worth noting that elderly patients may have a slower healing response due to physiological changes in skin elasticity, vascular reactivity, and comorbid conditions. However, when proper perioperative care is ensured, these factors do not appear to reduce EVLA's effectiveness, as corroborated by previous studies [6,14,15].

Our results also support the findings from the JAMA EVRA trial by Gohel et al., which emphasized the importance of early intervention in improving ulcer healing and reducing recurrence, independent of age [1]. Further, Uttaray et al. noted improved venous ulcer healing rates when EVLA was combined with compression therapy, reinforcing that patient outcomes are influenced more by timely intervention and postoperative care than chronological age [17].

The trajectory of recovery observed in this study aligns with that described by Müller and Alm, who showed that successful EVLA outcomes can even be achieved in recurrent varicose veins originating at the sapheno-femoral junction [10]. This supports the argument that EVLA is effective across a spectrum of clinical presentations, regardless of anatomical complexity or patient demographics.

Karathanos et al. emphasized that even large-diameter GSVs treated with EVLA yielded favorable outcomes mid-term, reinforcing the notion that patient anatomy, rather than age, should guide treatment selection [6].

It is also worth noting that recent innovations, such as combining EVLA with foam sclerotherapy or using cyanoacrylate glue, have enhanced treatment durability, especially in advanced chronic venous disease (C3-C6) [18]. Although such adjuncts were not used in our study, their potential role in improving outcomes in elderly or high-risk patients remains an area for future exploration.

Finally, our results align with Eroglu and Yasim's randomized trial, which demonstrated non-inferiority of EVLA compared to other modalities such as radiofrequency ablation and cyanoacrylate glue over 2 years [11], and Rass et al., who observed higher recurrence rates following EVLA versus high ligation and stripping, albeit with better cosmetic and functional outcomes [16].

Limitations

This study is limited by its single-center design and modest sample size. While a 6-month follow-up period is sufficient to evaluate short-term clinical outcomes, longer follow-up is necessary to assess recurrence patterns and late complications. Additionally, while VCSS is a standardized clinical scoring tool, it may not capture subtle differences in patient satisfaction or quality of life, especially those that may be age-sensitive.

Conclusion

EVLA is a safe and effective modality for the treatment of CVI across age groups. While younger patients may show faster symptom relief in the early postoperative period, older adults achieve comparable clinical improvement by 6 months. Age should not deter clinicians from offering EVLA to symptomatic patients, and parameter-wise VCSS tracking can enhance individualized postoperative care.

Refrences

1. Gohel MS, Mora J, Szigeti M, et al. Long-term clinical and cost-effectiveness of early endovenous ablation in venous ulceration: a randomized clinical trial. JAMA Surg. 2020;155(12):1113–1121. doi:10.1001/jamasurg.2020.4207
2. Ghanaati H, Jalali AH, Shakiba M, et al. Long-term clinical and imaging findings after endovenous laser treatment: a follow-up of up to 12 years. Int J Vasc Med. 2024;2024:6829868. doi:10.1155/2024/6829868
3. Kibrik P, Ali AB, Chait J, et al. Safety and efficacy of endovenous ablations in octogenarians, nonagenarians, and centenarians. J Vasc Surg Venous Lymphat Disord. 2024;12(1):101672. doi:10.1016/j.jvsv.2023.08.011
4. Cong L, Sun J, Wang L, et al. Hybrid endovenous laser ablation reduces the recurrence of varicose veins below the knee compared with radiofrequency ablation: a real-world study. Arch Med Sci. 2023;19(6):1739–1746. doi:10.5114/aoms/163449

Journal of Chemical Health Risks

www.jchr.org

JCHR (2025) 15(4), 2099-2104 | ISSN:2251-6727

5. Weber B, Marquart E, Deinsberger J, et al. Comparative analysis: EVLA versus ultrasound-guided foam sclerotherapy in venous leg ulcer patients (C6 CEAP). Dermatol Ther. 2022;35(4):e15322. doi:10.1111/dth.15322
6. Karathanos C, Spanos K, Batzalexis K, et al. Endovenous thermal ablation mid-term outcomes for large-diameter incompetent GSV. Angle Angiol (SAGE). 2025. doi: 10.1177/02683555241272971
7. Bontinis V, Bontinis A, Giannopoulos A, et al. Mid-term and long-term outcomes of endovenous laser ablation utilizing a 1470 nm laser: a systematic review and meta-analysis. J Endovasc Ther. 2024. doi:10.1177/15266028241305955
8. Siribumrungwong B, Wilasrusmee C, Orrapin S, et al. Interventions for great saphenous vein reflux: network meta-analysis of randomized clinical trials. Br J Surg. 2021;108(3):244–255. doi:10.1093/bjs/znaa101
9. Yang L, Wang X, Wei Z, et al. The clinical outcomes of endovenous microwave and laser ablation for varicose veins: a prospective study. Surgery. 2020;168(5):909–914. doi:10.1016/j.surg.2020.06.035
10. Müller L, Alm J. Feasibility and technique of endovenous laser ablation (EVLA) of recurrent varicose veins deriving from the sapheno-femoral junction: a case series of 35 consecutive procedures. PLoS One. 2020;15(7):e0235656. doi:10.1371/journal.pone.0235656
11. Eroglu E, Yasim A. A randomised clinical trial comparing N-butyl cyanoacrylate, radiofrequency ablation and endovenous laser ablation for the treatment of superficial venous incompetence: two year follow-up results. Eur J Vasc Endovasc Surg. 2018;56(4):553–560. doi:10.1016/j.ejvs.2018.05.028
12. Zhang J, Lin Y, Zhang L, et al. Comparison of one-year outcomes and quality of life between radiofrequency ablation and microwave ablation in the treatment of lower extremity varicose veins: a retrospective cohort study. Phlebology. 2025;40(1):39–46. doi:10.1177/02683555241273229
13. Chauhan P, Dhakad V, Ghanghoria A, et al. A study of assessment of the superiority of endovascular laser technique over conventional venous stripping in patients with varicose vein. Eur J Cardiovasc Med. 2025;15(2):106–109. doi : 10.5083/ejcm/25-02-14
14. Karam B, Moussally M, Nassar H, et al. Long-term results of endovenous laser ablation of saphenous vein reflux: up to nine years of follow-up. Phlebology. 2021;36(1):43–47. doi:10.1177/0268355520939744
15. Chen C, Cai Y, Long X, et al. Age is not a barrier to good outcomes following ambulatory high ligation and stripping for varicose veins: a prospective cohort study. Medicine (Baltimore). 2019;98(49):e18085. doi:10.1097/MD.0000000000018085
16. Rass K, Frings N, Glowacki P, et al. Same site recurrence is more frequent after endovenous laser ablation compared with high ligation and stripping of the great saphenous vein: 5-year results of a randomized clinical trial (RELACS study). Eur J Vasc Endovasc Surg. 2015;50(5):648–656. doi:10.1016/j.ejvs.2015.07.002
17. Uttaray S, Vaddavalli VV, Savlania A, et al. Effect of endovenous laser ablation along with compression therapy on chronic venous ulcer healing. Cureus. 2023;15(1):e33406. doi:10.7759/cureus.33406
18. Baraldi C, Bissacco D. Safety and efficacy of combining saphenous endovenous laser ablation and varicose veins foam sclerotherapy: an analysis on 5500 procedures in patients with advanced chronic venous disease (C3-C6). Vasc Endovascular Surg. 2024;58(1):60–64. doi: 10.1177/15385744231188804