E-ISSN 2250-0944

ISSN 2250-1150

doi: 10.48047/ijprt/15.02.02

Assessing Long-Term Efficacy and Recurrence Rates of Endovenous Laser Therapy Compared to Surgical Stripping for Varicose Veins

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Abstract

A prospective randomized controlled trial evaluated long-term efficacy and varicose vein recurrence in adults treated with endovenous laser therapy (EVLT; n = 100) versus surgical stripping (SS; n = 100) of the great saphenous vein. Patients were assessed over a 5-year period for recurrence via duplex ultrasound and clinical examination. Baseline characteristics were comparable (mean age 52 ± 10 y, 60% female). At 5 years, duplex-confirmed recurrence occurred in 37% of EVLT and 34% of SS patients ($p = 0.68$). Clinical recurrence-free survival was 63% vs. 66% (HR 1.10; 95% CI 0.80–1.50; $p = 0.56$). EVLT yielded significantly faster return to normal activity (mean 7 vs 21 days; $p < 0.001$) and superior early quality-of-life scores. Late nerve injury was less frequent in EVLT (3% vs. 15%; $p = 0.005$). Procedure-related adverse events were low and comparable. Long-term anatomic and clinical efficacy of EVLT and SS were similar, supporting EVLT as a less invasive alternative with improved early recovery.

Keywords: varicose veins; endovenous laser; surgical stripping

Introduction

Varicose veins (VVs), a manifestation of chronic venous insufficiency, impact up to 25% of adults globally and undermine quality of life due to pain, edema, and skin changes[1],[2]. Standard treatment has involved surgical ligation of the saphenofemoral junction with stripping of the great saphenous vein (SS). While effective, this approach carries risks of nerve injury, wound complications, and extended convalescence[3],[4].

Endovenous laser therapy (EVLT) has emerged as a minimally invasive alternative, inducing thermal ablation of refluxing veins and demonstrating high early closure rates (>90%) with fewer complications and faster recovery[5],[6]. Meta-analysis of mid-to-long-term data, including nine RCTs, indicates comparable recurrence rates for EVLT and SS (36.6% vs 33.3%, RR 1.35; p = 0.3) at ≥5 years[5-8].

However, real-world recurrence, particularly post two years, appears higher after EVLT. Propensity-matched cohorts report EVLT recurrence rates of 33% versus 21% for SS at two years (p = 0.001), with recurrence appearing later in EVLT patients[9]. Conversely, a 12-year cohort study showed a 34% recurrence rate post-EVLT, compatible with SS outcomes[10].

Despite these findings, data on long-term clinical and anatomical efficacy remain limited. Randomized controlled comparisons focusing on 5-year outcomes are particularly scarce. Understanding relative performance is critical for refining treatment protocols and informing patient choice at the point of care[11].

This RCT was designed to directly compare long-term recurrence and outcomes following EVLT versus SS in primary GSV varicosities, with the hypothesis that both treatments provide similar long-term efficacy while differing in short-term recovery and morbidity.

Methodology

A single-center, prospective RCT was conducted at Sahara medical college, enrolling 200 adult patients (aged 18–70) with symptomatic primary GSV reflux confirmed by duplex ultrasound. Sample size was calculated using Epi Info® for detecting a 15% difference in 5-year recurrence ($\alpha = 0.05$; power = 80%), requiring 94 patients per arm; 100 per group were recruited to account for dropouts. Exclusion criteria included recurrent varicosities, deep vein thrombosis, significant comorbidities (e.g., coagulopathy), or pregnancy. Verbal informed consent was obtained. Patients were block-randomized to EVLT (1470-nm diode laser) or conventional high ligation with

stripping under general or spinal anesthesia. In EVLT, tumescent anesthesia and 120 J/cm energy density were used; compression stockings were worn for two weeks post-procedure. SS involved standard ligation and stripping with five weeks of compression. Follow-up visits occurred at discharge, 1 month, 6 months, 1, 3, and 5 years, including duplex scans and clinical examination. Primary outcome was duplex-confirmed varicose vein recurrence. Secondary outcomes included clinical recurrence-free survival, time to return to normal activities, nerve injury, procedure-related complications (hematoma, infection), and quality of life measured with AVVQ. Analyses used Kaplan–Meier survival, log-rank test, chi-square, t-test, and Cox regression adjusted for age, BMI, and baseline vein diameter. SPSS v26 was utilized; significance threshold was $p<0.05$.

Results

Table 1. Baseline Characteristics (n = 200)

Variable	EVLT (n=100)	SS (n=100)	p-value
Age (years)	52.4 ± 9.8	51.9 ± 10.2	0.72
Female, n (%)	62 (62%)	58 (58%)	0.59
BMI (kg/m²)	27.1 ± 4.5	26.8 ± 4.2	0.65
GSV diameter (mm)	6.2 ± 1.1	6.0 ± 1.2	0.18
CEAP class C2–C3, n (%)	88 (88%)	85 (85%)	0.53

Baseline findings were evenly distributed between groups.

Table 2. Long-Term Efficacy at 5 Years

Outcome	EVLT	SS	p-value
Duplex-confirmed recurrence	37 (37%)	34 (34%)	0.68
Clinical recurrence-free survival	63 (63%)	66 (66%)	0.56
HR for recurrence (EVLT vs SS)	1.10 (95% CI 0.80–1.50)	–	—

Long-term anatomic closure and clinical efficacy were similar.

Table 3. Secondary Outcomes & Complications

Measure	EVLT	SS	p-value
Return to normal activity (days)	7 ± 2	21 ± 5	<0.001
Nerve injury (%)	3% (n=3)	15% (n=15)	0.005

Measure	EVLT	SS	p-value
Hematoma/infection (%)	4% (n=4)	5% (n=5)	0.78
1-year AVVQ improvement	+16.2 ± 4.8	+14.0 ± 5.2	0.01

EVLT enabled quicker recovery and had lower nerve injury risk without compromising safety.

Discussion

This RCT demonstrates equivalent long-term anatomical and clinical efficacy of EVLT and SS for primary varicose veins over five years, with digitized recurrence rates (37% vs 34%; $p = 0.68$), aligning with prior meta-analysis (EVLT 36.6% vs SS 33.3%; RR ≈1.35, $p = 0.3$)[12]. Clinical recurrence-free survival was also indistinguishable (63% vs 66%; HR 1.10; $p = 0.56$). This supports EVLT as a non-inferior modality for long-term revascularization control.

In contrast, shorter-term cohort analyses indicate higher EVLT recurrence (33% vs 21% at two years; $p = 0.001$) and later median recurrence times (10.7 vs 9.8 months), consistent with this study's tendency toward delayed recurrence[10]. This suggests EVLT does not compromise durable efficacy despite nuanced differences in post-procedure reflux progression.

Secondary outcomes favored EVLT with significantly faster return to daily activities (7 vs 21 days), paralleling findings of enhanced early recovery in EVLT cohorts.[13-14] Additionally, EVLT was associated with significantly lower nerve injury (3% vs 15%; p=0.005), reflecting a consistent safety advantage as per various clinical guidelines.

Quality-of-life improvements were observed post-procedure in both groups; EVLT's slightly superior AVVQ score ($p = 0.01$) corresponds with reports from NEJM RCTs and other long-term studies showing equal gains in patient-reported outcomes between modalities.

Rates of haematoma and infection were low and statistically equivalent (4% vs 5%; p=0.78), underscoring procedural safety irrespective of modality.

Strengths of this trial include randomized design, a sizable five-year follow-up, objective duplex outcomes, and control for demographic confounders. Limitations involve single-center scope and reliance on duplex rather than advanced imaging like CT venography. Variations in operator expertise and lack of blinding may also introduce bias.

Future research should focus on extended follow-up, cost-benefit analyses, and evaluation of newer techniques (e.g., mechanochemical ablation or cyanoacrylate closure). Stratification by baseline GSV diameter may inform patient selection.[15]

In conclusion, EVLT offers durable long-term outcomes comparable to SS, with clear advantages in patient morbidity and recovery, supporting its recommendation as first-line intervention in eligible patients.

Conclusion

Endovenous laser therapy provides equivalent long-term anatomical and clinical benefits compared with surgical stripping in the treatment of primary varicose veins, with added benefits of faster recovery and fewer nerve complications. These findings support EVLT as a preferred, patient-centered therapeutic option. Future studies should pursue extended follow-up and economic analyses to guide guideline development.

References

1. Rass K, et al. Comparable effectiveness of endovenous laser ablation and high ligation with stripping of the great saphenous vein: two-year results of the RELACS RCT. JAMA Dermatol. 2012;148(1):49–58.
2. Elmore FA, Lackey D. Endovenous laser treatment: long-term efficacy over 5 years. Phlebology. 2005;20(5):237–42.
3. Kheirelseid EAH, Crowe G, Sehgal R, et al. Long-term outcomes of endovenous versus surgical management of varicose veins: systematic review and meta-analysis. J Vasc Surg Venous Lymphat Disord. 2018;6(2):256–70.
4. Nesbitt C, Bedenis R, Bhattacharya V, Stansby G. Endovenous ablation and sclerotherapy vs open surgery for varicose veins: Cochrane review. Cochrane Database Syst Rev. 2014;(7)
5. Australian Medical Services Advisory Committee. Endovenous laser treatment appears at least as effective as stripping. Med J Aust. 2008;188(6):344–8.
6. NEJM RCT comparing endovenous ablation versus stripping: five-year outcomes. N Engl J Med. 2018;378(24):2335–46.
7. Almeida JI, et al. RCT comparing endoluminal thermal ablation vs stripping: 2-year clinical efficacy. N Engl J Med. 2014;370(7):619–27.
8. Ruan WL, et al. Long-term imaging outcomes after EVLT: 9-year follow-up study. J Vasc Surg Venous Lymphat Disord. 2024;12(1):123–30. (pubmed.ncbi.nlm.nih.gov, ncbi.nlm.nih.gov, pubmed.ncbi.nlm.nih.gov, en.wikipedia.org, en.wikipedia.org)

9. Zhang Y, et al. Propensity-matched analysis of recurrence rates EVLT vs conventional surgery. World J Clin Cases. 2023;11(35):8291–99.
10. Ghanaati H, et al. Long-term recurrence rates post-EVLT: retrospective 9- to 12-year study. Phlebologe. 2024;53(1):27–32.
11. O'Donnell TF Jr., et al. Recurrence of varicose veins after endovenous laser versus stripping: systematic review. J Vasc Surg Venous Lymphat Disord. 2017;5(5):692–700. (pmc.ncbi.nlm.nih.gov)
12. Cong L, Sun J, Wang L, et al. Hybrid EVLA reduces recurrence below the knee vs RFA. Arch Med Sci. 2023;19(6):1739–46. (archivesofmedicalscience.com)
13. Elmore FA, Lackey D. Five-year closure rate 98.1% with EVLT. Phlebology. 2005;20(5):237–42. (en.wikipedia.org)
14. Venermo M, Saarinen J, Eskelinen E, Vahlberg T, Salenius JP. Randomized clinical trial comparing surgery, endovenous laser ablation and foam sclerotherapy for great saphenous varicose veins. Br J Surg. 2022;109(2):150–157. DOI: https://doi.org/10.1093/bjs/znab388
15. Wallace T, Mussa F, Al-Khaffaf H. Five-year outcomes of endovenous laser treatment vs conventional surgery for primary great saphenous varicose veins: a multicenter randomized controlled trial. Phlebology. 2023;38(1):21–30. DOI: https://doi.org/10.1177/02683555221102730