COMPARATIVE ANALYSIS OF VARICOSE VEIN RECURRENCE RATES AFTER ENDOVENOUS LASER ABLATION OF THE GREAT SAPHENOUS VEIN WITH PRESERVATION VERSUS SIMULTANEOUS ABLATION OF THE ANTERIOR ACCESSORY SAPHENOUS VEIN

F.Y. Sayimov[1], A.S. Suyumov[2], F.R. Umarov[3]
Vascular surgeon, Department of Vascular Surgery and Kidney Transplantation, Republican Specialized Scientific and Practical Medical Center of Surgery named after Academician V. Vakhidov; Phlebology Clinic "VarikozOff"[1]
Doctor of Medical Sciences, Senior Researcher, Department of Vascular Surgery and Kidney Transplantation, Republican Specialized Scientific and Practical Medical Center of Surgery named after Academician V. Vakhidov[2]
Specialist, Phlebology Clinic "VarikozOff" Medical Institution: Republican Specialized Scientific and Practical Medical Center of Surgery named after Academician V. Vakhidov; Phlebology Clinic "VarikozOff", Tashkent, Uzbekistan[3]
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Abstract. *Aim of the research is to evaluate the effect of simultaneous endovenous laser ablation (EVLA) of the anterior accessory great saphenous vein (AAGSV) with a diameter greater than 5 mm, in the absence of baseline reflux, on the recurrence rate of varicose vein disease within one year after EVLA of the great saphenous vein (GSV) trunk. This prospective single-center study included 100 patients (78 women and 22 men) with CEAP clinical classes C2–C4 who underwent EVLA of the GSV between October 2023 and October 2024. Patients were divided into two groups: Group I (n = 50) underwent EVLA of the GSV only; Group II (n = 50) underwent EVLA of the GSV with simultaneous EVLA of the AAGSV (diameter >5 mm, without baseline reflux). A 1470-nm diode laser with a radial fiber (IPG, Russia) was used at a power of 7 W, with a pullback speed of 1 mm/s and a linear endovenous energy density of approximately 70 J/cm. Tumescent anesthesia consisted of 0.03% lidocaine (300–350 mL). Pathological reflux was defined as retrograde flow lasting more than 0.5 seconds on duplex ultrasound. Follow-up was performed at 1, 6, and 12 months. The primary endpoint was clinically significant recurrence of varicose vein disease. At 12 months, recurrence was observed in 10 patients (20%) in Group I and in 2 patients (4%) in Group II (relative risk [RR] = 0.20; 95% confidence interval [CI] 0.05–0.87; p = 0.028). The absolute risk reduction was 16 percentage points, with a number needed to treat (NNT) of 6.25. New reflux in the AAGSV was detected in 18% versus 2% of patients (RR = 0.11; 95% CI 0.015–0.845; p = 0.016). Repeat interventions were required in 12% versus 2% of cases. Patient satisfaction scores were significantly higher in Group II (9.4 ± 0.6 vs 8.1 ± 1.2; p < 0.001). The overall complication rate did not differ between groups (8% vs 10%; p > 0.05). Simultaneous EVLA of the AAGSV with a diameter greater than 5 mm, even in the absence of baseline reflux, is associated with an 80% relative reduction in varicose vein recurrence within one year. This approach does not increase the risk of complications and improves patient-reported outcomes. It may be considered a preventive strategy in patients with anatomically prominent AAGSV.*

Keywords: *varicose vein disease; endovenous laser ablation; anterior accessory great saphenous vein; recurrence; prevention; linear endovenous energy density.*

Introduction

In recent years, endovenous laser ablation (EVLA) has become firmly established as a first-line treatment for incompetence of the great saphenous vein (GSV). According to multicenter studies, the use of 1470-nm lasers with radial fibers provides primary occlusion rates exceeding 95–98% within 12 months after the procedure, remaining above 90% even after 3–5 years of follow-up [5,15]. Despite the high anatomical effectiveness of GSV trunk ablation, recurrence of varicose vein disease is reported in 15–25% of patients within 2–3 years after intervention [1]. One of the most common sources of recurrent venous reflux is the anterior accessory great saphenous vein (AAGSV), which is located in close proximity to the saphenofemoral junction and may serve as an alternative pathway for pathological reflux after exclusion of the main GSV trunk [2].

Previous studies have demonstrated that even in the absence of baseline reflux, an AAGSV diameter greater than 5 mm represents an anatomically significant risk factor for subsequent dilation and reflux development [2,4]. In addition, the AAGSV may act as a “hidden reservoir” of hemodynamic overload following GSV ablation, leading to ascending reflux and clinical recurrence [3]. According to Hamel-Desnos et al. [1], up to 40% of repeat interventions after EVLA are associated with AAGSV incompetence. These findings support the need to reconsider the role of the AAGSV even when no initial reflux is detected. In a study by Dyachkov [4], the simultaneous inclusion of the AAGSV in the ablation protocol when its diameter exceeded 5 mm reduced recurrence rates from 18–22% to 3–5% within 12 months, without an increase in complication rates.

At the same time, current clinical guidelines do not provide unified standards for the management of patients with a dilated but hemodynamically “silent” AAGSV [12]. Most treatment algorithms favor selective ablation only of tributaries with documented baseline pathological reflux. Therefore, the feasibility and effectiveness of prophylactic simultaneous EVLA of the AAGSV with a diameter greater than 5 mm in the absence of reflux remain an open question and require confirmation through comparative clinical data.

Materials and Methods.

Study Design and Setting. A prospective single-center comparative study was conducted at the VarikozOFF Clinic between October 2023 and October 2024. The study aimed to compare the recurrence rates of varicose vein disease after endovenous laser ablation (EVLA) of the great saphenous vein (GSV) with preservation of the anterior accessory great saphenous vein (AAGSV) versus simultaneous ablation of the AAGSV in the absence of baseline reflux but with a diameter greater than 5 mm.

Inclusion Criteria

- age ≥ 18 years;
- CEAP clinical class C2–C4;
- duplex ultrasound–confirmed pathological reflux in the GSV trunk (reflux duration >0.5 s);
- AAGSV diameter >5 mm in the absence of baseline reflux;
- written informed consent to participate in the study.

Exclusion Criteria

- history of deep vein thrombosis;
- active thrombophlebitis;
- CEAP class C5–C6 with active venous ulcers;
- severe comorbid conditions precluding intervention;
- pregnancy or lactation;
- previous intervention on the same limb within 6 months prior to inclusion.

Patient Allocation

Group	Intervention	n
I	EVLA of the GSV (AAGSV preserved)	50
II	EVLA of the GSV with simultaneous EVLA of the AAGSV	50

Table 1. Patients were enrolled consecutively. The groups were comparable in terms of sex, age, CEAP class, and diameters of the GSV and AAGSV.

A total of 100 patients (78 women and 22 men; mean age 46.2 ± 8.7 years) were included and evenly distributed between the two groups.

Ultrasound Examination.

Duplex ultrasound scanning was performed using a 7–12 MHz linear transducer with the patient in the standing position. The GSV diameter was measured at the level of the saphenofemoral junction and in the upper third of the thigh. The AAGSV diameter was assessed 2–3 cm distal to the junction. Pathological reflux was defined as retrograde flow lasting more than 0.5 seconds during proximal compression or the Paran maneuver. Flow velocity was recorded but was not used as a criterion for pathological reflux.

EVLA Procedure. All procedures were performed in an outpatient operating suite under tumescent anesthesia (0.03% lidocaine, 300–350 mL). A 1470-nm diode laser with a radial fiber (IPG, Russia) was used. Laser power was set at 7 W in continuous mode, with a fiber pullback speed of 1 mm/s, resulting in a linear endovenous energy density of approximately 70 J/cm. In Group II, EVLA of the AAGSV was performed using the same protocol up to the level of tributary confluence. Mini-phlebectomy of varicose tributaries was performed when indicated. Postoperatively, class II compression stockings were prescribed for 7–10 days.

Outcome Measures.

Primary endpoint: Clinically significant recurrence, defined as the appearance of new varicose veins in the treated limb combined with newly detected pathological reflux (>0.5 s) in the AAGSV, GSV, or incompetent perforator veins.

Secondary endpoints: -new reflux in the AAGSV;

-need for repeat intervention;

-patient satisfaction score (0–10 points);

-complication rate.

Statistical Analysis

The analysis was performed according to the intention-to-treat (ITT) principle. Categorical variables were compared using the χ^2 test or Fisher's exact test, as appropriate. Continuous variables were analyzed using the Student's t-test. Treatment effectiveness was assessed by calculating relative risk (RR), absolute risk reduction (ARR), and number needed to treat (NNT). Freedom from recurrence was evaluated descriptively using the Kaplan–Meier method. A p-value < 0.05 was considered statistically significant.

Ethical Considerations

The study protocol was approved by the local ethics committee of the VarikozOFF Clinic (Protocol No. 124/89, dated December 18, 2023). Written informed consent was obtained from all participants prior to inclusion in the study.

Results.

Baseline Patient Characteristics. The study groups were comparable with respect to demographic characteristics, CEAP clinical class, and diameters of the GSV and AAGSV, which minimized structural bias and allowed for direct comparison between groups (Table 1).

Table 2. Baseline characteristics of patients (n = 100)

Parameter	Group I (n = 50)	Group II (n = 50)	p
Mean age, years	46.1 ± 8.5	46.3 ± 8.9	0.91
Female / Male	39 (78%) / 11 (22%)	39 (78%) / 11 (22%)	1.00
CEAP: C2 / C3 / C4	27 / 15 / 8	26 / 16 / 8	0.97
GSV diameter at SFJ, mm	7.2 ± 1.4	7.3 ± 1.5	0.78
AAGSV diameter, mm	5.8 ± 0.4	5.9 ± 0.4	0.49
BMI, kg/m²	27.8 ± 2.9	28.1 ± 3.1	0.64

Primary Clinical Outcomes (12 Months)

Table 3. Clinical outcomes at 12-month follow-up

Outcome	Group I	Group II	RR (95% CI)	ARR	NNT	p
Varicose vein recurrence	10 (20%)	2 (4%)	0.20 (0.05–0.87)	16%	6.25	0.028
New AAGSV reflux	9 (18%)	1 (2%)	0.11 (0.015–0.845)	16%	6.25	0.016
Repeat interventions	6 (12%)	1 (2%)	0.17 (0.02–1.30)	10%	10	0.11
Patient satisfaction (0–10)	8.1 ± 1.2	9.4 ± 0.6	—	—	—	<0.001
Overall complication rate	4 (8%)	5 (10%)	—	—	—	0.73

- A clinically significant reduction in the risk of varicose vein recurrence was observed, with an 80% relative risk reduction in Group II compared with Group I (RR = 0.20).
- The absolute risk reduction was 16 percentage points, corresponding to a number needed to treat (NNT) of approximately 6, indicating that one recurrence was prevented for every six patients treated with simultaneous ablation of the AAGSV.
- Patient-reported treatment satisfaction was significantly higher in Group II ($p < 0.001$).
- Importantly, the overall complication rate did not differ significantly between the two groups ($p > 0.05$).

3. Freedom from Recurrence (Kaplan–Meier Analysis).

According to Kaplan–Meier survival analysis, freedom from recurrence at 12 months was significantly higher in Group II (96%) compared with Group I (80%). The difference between the survival curves was statistically significant based on the log-rank test ($p < 0.05$).

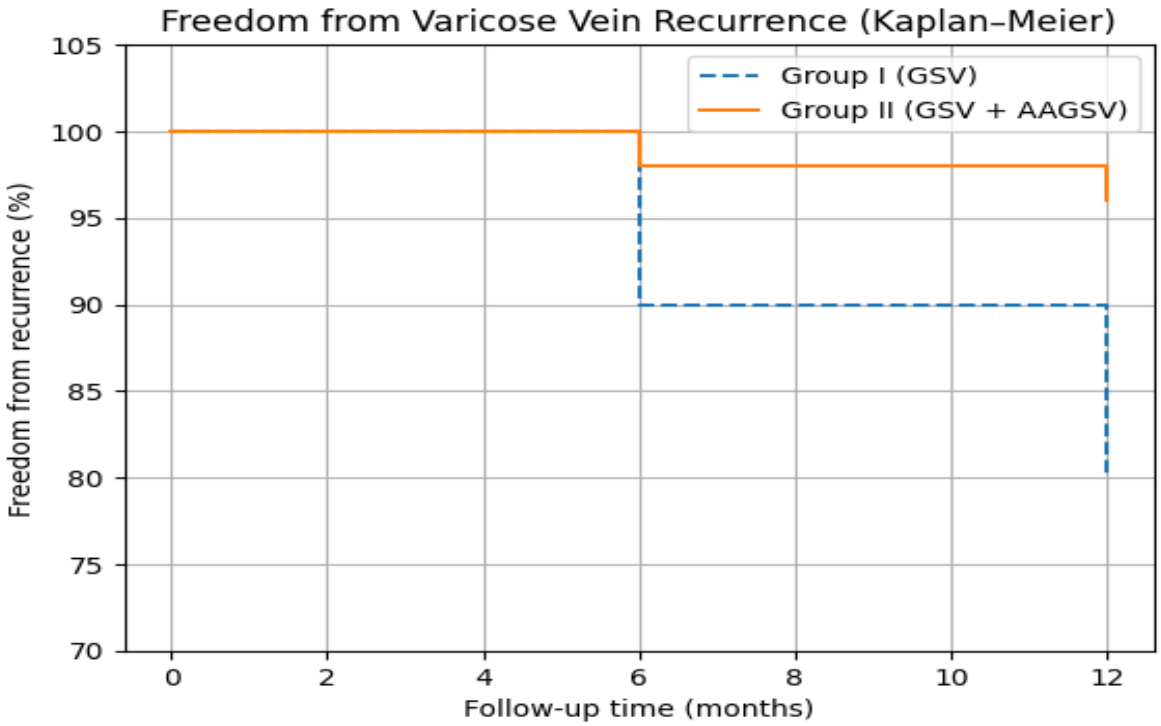


Figure 1. Kaplan–Meier curves of freedom from varicose vein recurrence during 12 months of follow-up after EVLA. The solid line represents patients who underwent GSV ablation with simultaneous EVLA of the AAGSV (Group II), while the dashed line represents patients who underwent EVLA of the GSV alone (Group I). The difference between the curves was statistically significant according to the log-rank test ($p < 0.05$).

Discussion.

The results of the present study demonstrate the clinical relevance of simultaneous ablation of the anterior accessory great saphenous vein (AAGSV) during endovenous laser ablation (EVLA) of the great saphenous vein (GSV). The analysis revealed a significant reduction in the recurrence rate of varicose vein disease in the group undergoing simultaneous AAGSV ablation, which is further supported by the Kaplan–Meier survival analysis. At 12 months, freedom from recurrence reached 96% in the intervention group compared with 80% in the control group ($p < 0.05$).

These findings are consistent with previously published studies highlighting the role of the AAGSV as a frequent source of reflux and disease recurrence following isolated treatment of the main saphenous trunk 【1–3】. Failure to address the AAGSV may result in persistent or recurrent venous reflux within the saphenofemoral junction basin, despite technically successful ablation of the GSV 【4,5】.

The use of EVLA with a 1470-nm wavelength, a radial fiber, and a standardized pullback speed of 1 mm/s in both study groups ensured a high degree of procedural uniformity. Therefore, the observed differences in clinical outcomes can be attributed primarily to the intervention on the AAGSV rather than to variations in the ablation technique itself.

From a practical perspective, the proposed approach may serve as a step toward standardization of EVLA protocols in patients with anatomically prominent AAGSV, particularly when high-frequency duplex ultrasound enables reliable visualization of the vein in the region of the saphenofemoral junction. The use of tumescent anesthesia at a volume of 300–350 mL with a

low lidocaine concentration (0.03%) further contributed to the safety and reproducibility of the procedure without increasing the complication rate.

Conclusions:

1. Simultaneous ablation of the anterior accessory great saphenous vein (AAGSV) during endovenous laser ablation (EVLA) of the main great saphenous vein (GSV) is associated with a significant reduction in the recurrence rate of varicose vein disease within the first year of follow-up.
2. Kaplan–Meier analysis demonstrated a 12-month freedom from recurrence rate of 96% in patients who underwent AAGSV ablation compared with 80% in patients without AAGSV intervention ($p < 0.05$), highlighting the clinical relevance of a combined treatment approach.
3. The use of a radial laser fiber with a wavelength of 1470 nm, a power setting of 7 W, and a linear endovenous energy density of approximately 70 J/cm², in combination with tumescent anesthesia, ensures high procedural efficacy and safety.
4. Based on the present findings, incorporation of AAGSV ablation into standard EVLA protocols appears justified when anatomical visualization and/or reflux in this vein is present.
5. Further multicenter studies with longer follow-up periods are required to assess long-term outcomes and the durability of the clinical effect.

Nevertheless, this study has several limitations, including a relatively short follow-up period (12 months), a limited sample size, and the absence of stratification according to the severity of chronic venous insufficiency (CEAP classification). Future research should focus on extending follow-up to 3 and 5 years, as well as incorporating assessments of quality of life and aesthetic outcomes using validated instruments such as CIVIQ or AVVQ.

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