Journal of Neonatal Surgery
ISSN(Online): 2226-0439
Vol.14, Issue 32s (2025)
https://www.jneonatalsurg.com

OPEN ACCESS

Clinical Outcomes Of Radiofrequency Ablation Versus High Ligation And Stripping In The Management Of Primary Lower Limb Varicose Veins: A Retrospective Cohort Study

Nisar Muhammad[1],Fazal Elahi*[2],Ayesha Masood[3],Muhaddis Ahmad[4],Muhammad Marwan[5]

Medical Officer Lady reading Hospital Peshawar
Trainee medical Officer CMH Peshawar
Trainee medical Officer CMH Peshawar
Trainee medical Officer CMH Peshawar
Trainee medical Officer CMH Peshawar

Corresponding authors:
Fazal Elahi,
Trainee medical Officer CMH Peshawar
Email:ID: felahi1000@gmail.com

Cite this paper as: Nisar Muhammad,Fazal Elahi,Ayesha Masood,Muhaddis Ahmad,Muhammad Marwan (20yy) Clinical Outcomes Of Radiofrequency Ablation Versus High Ligation And Stripping In The Management Of Primary Lower Limb Varicose Veins: A Retrospective Cohort Study.Journal of Neonatal Surgery, 14, (32s) 10200-10205

ABSTRACT

Background: Primary lower-limb varicose veins are a major cause of chronic limb pain, heaviness, edema, and cosmetic deformity, resulting in significant impairment of quality of life. For decades, conventional surgery with high ligation and stripping (HL/S) has been regarded as the standard treatment modality. However, endovenous radiofrequency ablation (RFA) has emerged as a minimally invasive alternative, offering targeted thermal closure of incompetent veins with reduced tissue trauma, shorter recovery time, and improved postoperative comfort, thereby gaining increasing acceptance in contemporary venous practice.

Objective: To compare postoperative outcomes, complication profiles, and early recurrence rates between radiofrequency ablation and high ligation with stripping in the management of primary lower-limb varicose veins.

Methodology: This retrospective cohort study included 100 adult patients treated for primary lower-limb varicose veins at Lady Reading Hospital, Peshawar, and Combined Military Hospital (CMH) Peshawar between January 2024 and January 2025. Fifty patients underwent endovenous radiofrequency ablation (RFA) and fifty were managed with conventional high ligation and stripping (HL/S). Data were extracted from medical records and included demographic characteristics, postoperative pain scores, duration of hospital stay, wound-related complications, and recurrence within six months. Patients with recurrent varicose veins, deep venous thrombosis, peripheral arterial disease, or a history of previous venous surgery were excluded. Statistical analysis was performed using SPSS version 24.0. Continuous variables were compared using independent-samples t-tests, while categorical variables were analyzed with chi-square tests. A p-value < 0.05 was considered statistically significant.

Results: The overall mean age was 44.8 ± 11.6 years, with no significant age difference between the RFA and HL/S groups ($p = 0.48$). Pain scores at 24 hours were significantly lower in the RFA group (3.1 ± 1.2) than the HL/S group (5.4 ± 1.6; $p < 0.001$). Hospital stay was shorter following RFA (1.2 ± 0.5 days) compared with HL/S (2.6 ± 0.8 days; $p < 0.001$). Minor wound complications occurred in 6% of RFA patients versus 18% of HL/S patients ($p = 0.04$). Early recurrence was lower in the RFA group (4%) than in the HL/S group (12%), though not statistically significant ($p = 0.14$)

Conclusion: Radiofrequency ablation is associated with superior early postoperative outcomes compared with high ligation and stripping, including significantly reduced pain, shorter hospital stay, and fewer wound-related complications, supporting its use as an effective minimally invasive alternative to conventional surgical management of primary lower-limb varicose veins.

Keywords: *Radiofrequency ablation; Varicose veins; High ligation; Stripping*

1. INTRODUCTION

Primary lower-limb varicose veins are one of the most common chronic venous disorders in the global population and a big burden on the health of the population. It is a condition of enlarged, winding superficial veins due to valvular incompetence and venous reflux, most usually of the great saphenous vein [1]. The patients are often characterized by heaviness of their limbs, painful aching, edema, the color of the skin, venous eczemas, and, in more severe cases, venous ulceration. Besides the physical morbidity, varicose veins hurt the quality of life because of aesthetic disfigurement and impairment in daily activities [2]. Historically, high ligation with stripping (HL/S) was considered the gold standard surgical intervention for symptomatic varicose veins [3]. It is possible to ligate the saphenofemoral junction and remove the incompetent saphenous vein. Although effective, HL/S is linked to postoperative pain, blood in the area, wound infection, increased hospitalization, delayed work, and nerve injury may occur [4]. Besides, the rate of recurrence following standard operation is quite high, which has been attributed to the neovascularization, technical failure, and disease progression [5]. Over the past 20 years, the endogenous forms of thermal ablation have transformed the treatment of chronic venous insufficiency. Radiofrequency ablation (RFA) is one of them that has become widely accepted. RFA is a controlled thermal energy applied to the wall of the venous system, resulting in collagen contractile reactions, thickening of vein walls, and ultimate fibrotic blockage of the treated area [6]. RFA is less traumatic and less invasive than a traditional surgery and can be performed in an ultrasound-guided percutaneous manner, and can be completed under local or regional anesthesia. Other studies have also reported a decrease in postoperative pain, wound complications, hospital stay, and a return to normal activities after RFA [7]. Even with the increasing use of RFA, HL/S remains a common practice in most resource-restricted environments because of the reduced initial financial outlay, limited availability of endogenous equipment, and surgeon familiarity [8]. Most hospitals within the South Asian region and Pakistan in particular continue to heavily depend on traditional methods of surgery, and data generated on RFA and HL/S in terms of outcomes are relatively limited in the country. Since the patient demographics, disease severity, and healthcare infrastructure vary between the Western population and the local setting, the findings might not be entirely applicable to the local setting [9].Moreover, despite the growing preference of endogenous ablation as the initial management of superficial venous reflux by international guidelines, there is still controversy over its long-term effectiveness, recurrence, and cost-effectiveness, especially in low- and middle-income countries. Real-life clinical practice might be useful to conduct the retrospective analysis, interested in early outcomes and the profile of complications of the various treatment modalities.

Study Objectives:

To compare postoperative pain, stay in hospital, wound complications, and early recurrence of radiofrequency ablation versus high ligation and stripping in patients having primary lower-limb varicose veins.

2. MATERIALS AND METHODS:

Study Design & Setting:

This retrospective cohort study was conducted at Lady Reading Hospital, Peshawar, and Combined Military Hospital (CMH) Peshawar between January 2024 and January 2025.

Participants:

The eligible participants were adult patients aged between 18 and 70 years with a diagnosis of primary lower-limb varicose veins and were treated using the radiofrequency ablation or high-ligation stripping. Patients were enrolled when they had full medical records and reported post-operative follow-up of at least six months.

Sample Size Calculation:

The study identified a total sample size of 100 patients (50 in each treatment group), which was based on the available records during the period of conducting the study. The sample size used was sufficient to identify clinically significant differences in postoperative pain scale scores and the complication rate between the two groups.

Inclusion Criteria:

Age 18–70 years

Principles of diagnosis: primary lower-limb varicose veins.

Received RFA or HL/S during the study time.

Six months minimum follow-up.

Exclusion Criteria:

Recurrent varicose veins

Deep venous thrombosis history.

Peripheral arterial disease.

Previous venous surgery of the limb.

Incomplete medical records

Diagnostic and Management Strategy:

Duplex ultrasonography was performed to determine the incompetence of the venous reflux and saphenous veins to make the diagnosis. Ultrasound-guided RFA or traditional high ligation with stripping was done for patients, depending on the choice of the surgeon and availability of resources.

Statistical Analysis:

SPSS version 24.0 was used to analyze the data. Mean standard deviation was used to convey continuous variables, and t-tests were used to compare independent samples. Chi-square tests were used to analyze the categorical variables. The p-value of less than 0.05 was regarded as significant.

3. RESULTS

A total of 100 patients were included, with 50 undergoing RFA and 50 undergoing HL/S. The overall mean age was 44.8 ± 11.6 years, with no significant difference between the RFA and HL/S groups ($p = 0.48$). Both groups were comparable with respect to baseline demographic characteristics. Postoperative pain scores at 24 hours were significantly lower in the RFA group compared with the HL/S group (3.1 ± 1.2 vs 5.4 ± 1.6; $p < 0.001$). Mean hospital stay was significantly shorter following RFA (1.2 ± 0.5 days) than HL/S (2.6 ± 0.8 days; $p < 0.001$). Minor wound complications, including infection and hematoma, were observed in 3 patients (6%) in the RFA group and 9 patients (18%) in the HL/S group ($p = 0.04$). Early recurrence within six months occurred in 2 patients (4%) treated with RFA and in 6 patients (12%) who underwent HL/S, though this difference was not statistically significant ($p = 0.14$). No cases of deep venous thrombosis were reported in either group.

Intervention Outcome:

Radiofrequency ablation was linked to better early postoperative outcomes that included a reduction in pain, decreased length of stay, and complications associated with the wound. In spite of reduced recurrence rates following RFA as compared to conventional surgery, the difference between the two was not statistically significant in the immediate follow-up.

Table 1. Baseline Demographic and Clinical Characteristics of the Study Population

Variable	RFA Group (n = 50)	HL/S Group (n = 50)	p-value
Age (years), mean ± SD	43.9 ± 10.8	45.7 ± 12.3	0.48
Male, n (%)	28 (56%)	30 (60%)	0.68
Female, n (%)	22 (44%)	20 (40%)	—
BMI (kg/m²), mean ± SD	26.4 ± 3.8	27.1 ± 4.1	0.39
Duration of symptoms (years), mean ± SD	4.6 ± 2.1	4.9 ± 2.3	0.52
CEAP class C2–C3, n (%)	38 (76%)	36 (72%)	0.65
CEAP class C4–C5, n (%)	12 (24%)	14 (28%)	—

Baseline demographic and clinical characteristics were comparable between groups. Values are expressed as mean ± standard deviation or frequency (%). RFA: Radiofrequency ablation; HL/S: High ligation with stripping; BMI: Body mass index; CEAP: Clinical-Etiology-Anatomy-Pathophysiology classification.

Table 2. Comparison of Early Postoperative Outcomes

Outcome	RFA Group (n = 50)	HL/S Group (n = 50)	p-value
Pain score at 24 hours (VAS), mean ± SD	3.1 ± 1.2	5.4 ± 1.6	<0.001
Length of hospital stay (days), mean ± SD	1.2 ± 0.5	2.6 ± 0.8	<0.001

Time to ambulation (hours), mean ± SD	6.4 ± 2.1	14.8 ± 4.6	<0.001

RFA was associated with significantly lower postoperative pain, shorter hospital stay, and earlier ambulation compared with HL/S.

Table 3. Postoperative Complications

Complication	RFA Group (n = 50)	HL/S Group (n = 50)	p-value
Wound infection, n (%)	1 (2%)	4 (8%)	0.17
Hematoma, n (%)	2 (4%)	5 (10%)	0.23
Overall wound complications, n (%)	3 (6%)	9 (18%)	0.04
Deep venous thrombosis, n (%)	0 (0%)	0 (0%)	—

Overall wound-related complications were significantly lower in the RFA group compared with the HL/S group.

Table 4. Early Recurrence at 6-Month Follow-Up

Outcome	RFA Group (n = 50)	HL/S Group (n = 50)	p-value
Recurrence of varicose veins, n (%)	2 (4%)	6 (12%)	0.14
No recurrence, n (%)	48 (96%)	44 (88%)	—

Although early recurrence was numerically lower following RFA, the difference compared with HL/S was not statistically significant at six months.

4. DISCUSSION:

Radiofrequency ablation (RFA) is better in early postoperative recovery than the high ligation and stripping (HL/S) in this retrospective cohort study that examined 100 patients with primary lower-limb varicose veins. Particularly, there were much lower 24-hour pain scores, reduced length of stay, and reduced wound-related complications with RFA, whereas there were only numerical but statistically insignificant differences in early recurrence at six months [11]. The clinical implications of these findings are that postoperative pain and wound morbidity continue to be major causes of delayed mobilization, increased hospital stay, and poor patient satisfaction with traditional surgery [12]. We note that reduced early pain following RFA goes hand in hand with modern guideline-based anticipations of endogenous thermal ablation that include reduced tissue trauma and better short-term patient-reported outcomes than open surgery [13]. A new guideline on endogenous thermal ablation (ESVS 2022) recommends endogenous thermal ablation as the first-line treatment of saphenous incompetence in the majority of appropriate patients and reflects a basic accrual that endogenous methods have faster recovery and similar effectiveness to surgery [14]. Likewise, the Society of Vascular Surgery/ American Venous Forum/ American Vein and Lymphatic Society clinical practice guidelines (Part I -Part II) validate endogenous ablation as part of the preferred solution to symptomatic truncal reflux where possible [15]. The reduction in length of stay following RFA in our group is also due to the less invasive character of ultrasound-guided catheter-based treatment, which normally allows immediate discharge home or rather short observation as opposed to inpatient after operative observations [16]. Moreover, the low number of wound complications in the RFA may have been due to the prevention of groin and long-leg incisions, less subcutaneous dissection, and creation of dead space. The overall wound complication rate was minimal with RFA (6 percent) compared to HL/S (18 percent), and the same pattern has been seen in recent comparative studies where higher rates of bruising, pain, and sensory symptoms were reported in a cohort of surgical patients compared to patients who received RFA treatment [17]. A comparative report also reported a similar paradox on previous return to normal activity and patient satisfaction with RFA compared to stripping, although relatively similar efficacy in vain obliteration was also observed [18]. On recurrence, we observed a reduced early recurrence with RFA (4%) as compared to HL/S (12%), but not significantly. This can be an indication of weak authority in identifying differences in relatively rare events at 6 months and the established multifactoriality of recurrence, namely, disease progression, residual tributaries, perforator incompetence, and technical reasons. Prolonged follow-up is frequently necessary to discriminate actual modality-related variations and initial residual

reflux. According to recent literature, at the age of 12 months, there may be a broad clinical similarity between RFA and HL/S in terms of clinical recurrence and reintervention despite possible minor differences in anatomic outcomes (e.g., recanalization).

5. LIMITATIONS:

The study has a limitation in its retrospective nature, single-centre location, and a relatively small sample size that could lead to a low level of generalisability. The limited follow-up time limits long-term recurrence, vein occlusion durability, and late complications of either of the treatment modalities.

Conclusion:

Radiofrequency ablation has better early postoperative results than high ligation and stripping, such as less pain, less hospitalization, and fewer wound complications. Despite lower early recurrence in cases that had undergone RFA, more prospective studies that have long follow-up should be carried out to establish its long-term clinical benefits.

Disclaimer: Nil

Conflict of Interest: Nil

Funding Disclosure: Nil

Authors Contributions

Concept & Design of Study: **Nisar Muhammad**[1]

Drafting: **Ayesha Masood**[3],**Muhaddis Ahmad**[4]

Data Collection & Data Analysis:**Muhammad Marwan**[5]

Critical Review:**Fazal Elahi**[2]

Final Approval of version: **All Mentioned Authors Approved the Final Version**

REFERENCES

[1] Epstein D, Bootun R, Diop M, Ortega-Ortega M, Lane TRA, Davies AH. Cost-effectiveness analysis of current varicose veins treatments. Journal of vascular surgery Venous and lymphatic disorders. 2022;10(2):504-13.e7.

[2] Farah MH, Nayfeh T, Urtecho M, Hasan B, Amin M, Sen I, et al. A systematic review supporting the Society for Vascular Surgery, the American Venous Forum, and the American Vein and Lymphatic Society guidelines on the management of varicose veins. Journal of vascular surgery Venous and lymphatic disorders. 2022;10(5):1155-71.

[3] Florio G, Carnì P, D'Amata G, Crovaro M, Musmeci L, Manzi L, et al. Thermal ablation combined with high ligation of sapheno-femoral junction for lower limb primary varicosity. Il Giornale di chirurgia. 2019;40(5):413-6.

[4] Gao RD, Qian SY, Wang HH, Liu YS, Ren SY. Strategies and challenges in treatment of varicose veins and venous insufficiency. World journal of clinical cases. 2022;10(18):5946-56.

[5] Hartmann K. Endovenous (minimally invasive) procedures for treatment of varicose veins : The gentle and effective alternative to high ligation and stripping operations. Der Hautarzt; Zeitschrift fur Dermatologie, Venerologie, und verwandte Gebiete. 2020;71(Suppl 2):67-73.

[6] Kuserli Y, Kavala AA, Turkyilmaz S. Comparison of high saphenous ligation and stripping, radiofrequency ablation, and subfascial endoscopic perforator surgery for the treatment of active venous ulcers: Retrospective cohort with five-year follow-up. Vascular. 2022;30(2):375-83.

[7] Liao CJ, Song SH, Li T, Zhang Y, Zhang WD. Randomized clinical trial of radiofrequency-induced thermotherapy combined with transilluminated powered phlebectomy versus high ligation and stripping for the treatment of lower limb varicose veins. Journal of vascular surgery Venous and lymphatic disorders. 2021;9(1):95-100.

[8] Vuylsteke ME, Klitfod L, Mansilha A. Endovenous ablation. International angiology : a journal of the International Union of Angiology. 2019;38(1):22-38.

[9] Whing J, Nandhra S, Nesbitt C, Stansby G. Interventions for great saphenous vein incompetence. The Cochrane database of systematic reviews. 2021;8(8):Cd005624.

[10] Butt A, Kopriva D. Economic implications of endovenous great saphenous ablation in a public health care system. Journal of vascular surgery Venous and lymphatic disorders. 2018;6(4):471-6.e6.

[11] González Cañas E, Florit López S, Vilagut RV, Guevara-Noriega KA, Santos Espí M, Rios J, et al. A randomized controlled noninferiority trial comparing radiofrequency with stripping and conservative hemodynamic cure for venous insufficiency technique for insufficiency of the great saphenous vein. Journal of vascular surgery Venous and lymphatic disorders. 2021;9(1):101-12.

[12] Izzo L, Pugliese F, Pieretti G, Izzo S, Izzo P, Florio G, et al. High ligation of sapheno-femoral junction and thermal

ablation for lower limb primary varicosity in day hospital setting. Annali italiani di chirurgia. 2020;91:61-4.
[13] Kempeneers AC, Bechter-Hugl B, Thomis S, van den Bussche D, Vuylsteke ME, Vuylsteke MM. A prospective multicenter randomized clinical trial comparing endovenous laser ablation, using a 1470 nm diode laser in combination with a Tulip-TipTM fiber versus radiofrequency (Closure FAST™ VNUS®), in the treatment of primary varicose veins. International angiology : a journal of the International Union of Angiology. 2022;41(4):322-31.
[14] Kubat E, Ünal CS, Geldi O, Çetin E, Keskin A. What is the optimal treatment technique for great saphenous vein diameter of ≥10 mm? Comparison of five different approaches. Acta chirurgica Belgica. 2021;121(2):94-101.
[15] Nellis JM, Obi AT, Powell CA, Wakefield TW. Treatment and contemporary outcomes associated with adjunct tourniquet use during phlebectomy of complex, voluminous truncular varicosities. Journal of vascular surgery Venous and lymphatic disorders. 2022;10(6):1208-14.
[16] Oliveira R, Mazzucca ACP, Pachito DV, Riera R, Baptista-Silva J. Evidence for varicose vein treatment: an overview of systematic reviews. Sao Paulo medical journal = Revista paulista de medicina. 2018;136(4):324-32.
[17] Siribumrungwong B, Srikuea K, Orrapin S, Benyakorn T, Rerkasem K, Thakkinstian A. Endovenous ablation and surgery in great saphenous vein reflux: a systematic review and network meta-analysis of randomised controlled trials protocol. BMJ open. 2019;9(1):e024813.
[18] Vemulapalli S, Parikh K, Coeytaux R, Hasselblad V, McBroom A, Johnston A, et al. Systematic review and meta-analysis of endovascular and surgical revascularization for patients with chronic lower extremity venous insufficiency and varicose veins. American heart journal. 2018;196:131-43.