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Research Article

A COMPARATIVE STUDY OF CONVENTIONAL STRIPPING AND ENDOVENOUS LASER ABLATION IN THE MANAGEMENT OF PRIMARY LOWER LIMB VARICOSE VEINS

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Abstract: ***Introduction:*** Varicose veins of the lower limb are a common vascular disorder associated with pain, edema, and cosmetic concerns. Traditional surgical management with conventional stripping has been widely practiced, but minimally invasive techniques such as endovenous laser ablation (EVLA) have gained popularity due to reduced morbidity and faster recovery. Comparative evaluation of these modalities is essential to determine the most effective treatment approach for primary varicose veins.**Aims:** To compare the clinical outcomes of conventional stripping surgery and endovenous laser ablation in the management of primary lower limb varicose veins.**Materials and Methods:** This prospective comparative study was conducted over a period of 12 months in the Department of General Surgery at a tertiary care center. A total of 70 patients diagnosed with primary lower limb varicose veins were included and divided into two groups: Group A (35 patients) underwent conventional stripping surgery, and Group B (35 patients) underwent endovenous laser ablation. Patients were assessed preoperatively using clinical examination and CEAP classification. Intraoperative parameters were recorded. Postoperative outcomes including pain (VAS score), duration of hospital stay, time to return to normal activity, complications, and recurrence were evaluated and compared between the two groups. Follow-up was conducted for all patients to assess treatment efficacy.**Results:** The mean age of patients was comparable between both groups, with a predominance of patients in the 31–50 years age group. Postoperative pain scores were significantly lower in the EVLA group, with mean VAS scores of 3.2 ± 1.1 compared to 6.5 ± 1.4 in the stripping group ($p < 0.001$). The duration of hospital stay was shorter in the EVLA group (2.1 ± 0.8 days) compared to the stripping group (5.4 ± 1.2 days). Patients undergoing EVLA returned to normal activities earlier (6.2 ± 1.5 days) than those undergoing stripping (12.8 ± 2.4 days) ($p < 0.001$). Postoperative complications were more frequent in the stripping group (10; 28.6%) compared to the EVLA group (4; 11.4%). Recurrence rates were slightly lower in the EVLA group (2; 5.7%) compared to the stripping group (5; 14.3%), though not statistically significant.**Conclusion:** Endovenous laser ablation is a safe and effective alternative to conventional stripping surgery for primary lower limb varicose veins. It offers advantages such as reduced postoperative pain, shorter hospital stay, faster recovery, and fewer complications. EVLA may be considered the preferred treatment modality in suitable patients.

Keywords: Endovenous laser ablation; Hospital stay; Pain score; Recurrence; Stripping surgery; Varicose veins

INTRODUCTION

Varicose veins of the lower limb represent one of the most common chronic vascular disorders encountered in surgical practice, characterized by dilated, tortuous superficial veins resulting from valvular incompetence and venous hypertension.[1] The condition predominantly affects the great saphenous vein system and is associated with symptoms such as limb heaviness, pain, edema, skin pigmentation, and, in advanced stages, ulceration.[2] The prevalence of varicose veins is reported to range between 10–30% in the general population, with higher incidence in individuals with prolonged standing occupations, obesity, and genetic predisposition.[3]

The pathophysiology of varicose veins involves venous valve dysfunction leading to reflux, increased venous pressure, and subsequent venous dilation.[4] Over time, this results in chronic venous insufficiency, which may significantly impair quality of life. Clinical classification using the CEAP (Clinical, Etiological, Anatomical, Pathophysiological) system provides a standardized approach for assessing disease severity and guiding management strategies.[5]

Traditionally, the mainstay of treatment for symptomatic varicose veins has been conventional surgical stripping, which involves high ligation of the saphenofemoral junction combined with stripping of the great saphenous vein.[6] Although effective, this procedure is associated with certain drawbacks such as postoperative pain, longer hospital stay, risk of wound complications, nerve injury, and delayed return to daily activities. These limitations have prompted the development of minimally invasive alternatives aimed at improving patient outcomes.[7,8]

Endovenous laser ablation (EVLA) has emerged as a modern, minimally invasive technique that uses thermal energy delivered through a laser fiber to cause endothelial damage, vein wall collapse, and eventual fibrosis of the incompetent vein.[9] This procedure is typically performed under local or tumescent anesthesia and is associated with advantages such as reduced postoperative pain, minimal scarring, early ambulation, and shorter recovery time. Over the past decade, EVLA has gained widespread acceptance as an effective alternative to conventional surgery.[10]

Despite the increasing adoption of EVLA, conventional stripping remains widely practiced, particularly in resource-limited settings. Therefore, it is essential to evaluate and compare the clinical outcomes, safety, and efficacy of both techniques in a structured manner.
With the growing shift toward minimally invasive procedures, there is a need to critically evaluate the benefits of EVLA over conventional stripping in real-world clinical settings. Limited regional data comparing these modalities necessitates further research. This study provides a direct comparison based on standardized clinical parameters, helping to guide evidence-based decision-making and optimize treatment strategies for primary varicose veins, particularly in tertiary care centers where both modalities are available.

AIMS AND OBJECTIVES

- To compare the clinical outcomes of conventional stripping surgery and endovenous laser ablation in the management of primary lower limb varicose veins.

MATERIALS AND METHODS

This prospective comparative study was conducted over a period of 12 months in the Department of General Surgery at Sree Mookambika Institute of Medical Sciences. A total of 70 patients diagnosed with primary lower limb varicose veins were included in the study. Patients were randomly allocated into two groups, with 35 patients in Group A undergoing conventional stripping surgery and 35 patients in Group B undergoing EVLA. Ethical clearance was obtained from the institutional ethics committee, and informed written consent was taken from all patients prior to inclusion in the study.

Patients included in the study were those aged above 18 years with clinically and radiologically confirmed primary varicose veins involving the great or small saphenous vein system and classified under CEAP classes C2 to C6. Patients presenting with symptomatic disease such as pain, edema, skin changes, or venous ulcers were considered eligible. Only those fit for surgery and willing to participate in the study were included.

Exclusion criteria comprised patients with secondary varicose veins due to deep vein thrombosis or pelvic pathology, recurrent varicose veins, peripheral arterial disease, pregnancy, severe systemic comorbidities precluding surgery, active infection at the operative site, and patients who were unfit for anaesthesia. Patients with coagulation disorders or those on anticoagulant therapy were also excluded.

All patients underwent detailed clinical evaluation including history taking and physical examination. The severity of varicose veins was classified according to the CEAP (Clinical, Etiological, Anatomical, Pathophysiological) classification. Duplex ultrasonography was performed in all cases to confirm venous reflux, identify the site of incompetence, and assess the deep venous system. Baseline investigations including complete blood count, renal function tests, and coagulation profile were carried out for all patients.

In Group A, conventional stripping surgery was performed under spinal or general anesthesia, which included high ligation of the saphenofemoral junction followed by stripping of the incompetent vein segment. In Group B, EVLA was performed under local or tumescent anesthesia using a laser fiber introduced into the affected vein under ultrasound guidance, followed by controlled thermal ablation of the vein.

Intraoperative parameters such as duration of surgery and intraoperative complications were recorded. Postoperative evaluation included assessment of pain using the Visual Analog Scale (VAS), duration of hospital stay, time to return to normal daily activities, and early complications such as hematoma, wound infection, and nerve injury. Patients were followed up periodically to assess late complications and recurrence.

All data were recorded in a structured proforma and analyzed using appropriate statistical methods. Continuous variables were expressed as mean ± standard deviation, and categorical variables were expressed as percentages. The chi-square test and Student's t-test were used to assess statistical significance, with a p-value of less than 0.05 considered statistically significant.

RESULTS

The majority of patients belonged to the 31–50 years of age group (54.2%), indicating higher disease prevalence in middle age. There was no statistically significant difference between the two groups ($p = 0.88$). (Table 1)

1. Age Group (years)	2. Group A n (%)	3. Group B n (%)	4. Total n (%)
5. 21–30	6. 6 (17.1%)	7. 5 (14.3%)	8. 11 (15.7%)
9. 31–40	10. 10 (28.6%)	11. 9 (25.7%)	12. 19 (27.1%)
13. 41–50	14. 9 (25.7%)	15. 10 (28.6%)	16. 19 (27.1%)
17. 51–60	18. 7 (20.0%)	19. 8 (22.9%)	20. 15 (21.4%)
21. >60	22. 3 (8.6%)	23. 3 (8.6%)	24. 6 (8.6%)

Table 1: Age Distribution

Male predominance was observed, suggesting increased exposure to occupational risk factors. The gender distribution was comparable between the two groups (p = 0.79). (Table 2)

25. Gender	26. Group A n (%)	27. Group B n (%)	28. Total n (%)
29. Male	30. 24 (68.6%)	31. 23 (65.7%)	32. 47 (67.1%)
33. Female	34. 11 (31.4%)	35. 12 (34.3%)	36. 23 (32.9%)

Table 2: Gender Distribution

Most patients were in early stages (C2–C3), indicating earlier clinical presentation. There was no significant difference in CEAP distribution between groups (p = 0.91). (Table 3)

37. CEAP Class	38. Group A n (%)	39. Group B n (%)	40. Total n (%)
41. C2	42. 12 (34.3%)	43. 11 (31.4%)	44. 23 (32.9%)
45. C3	46. 10 (28.6%)	47. 11 (31.4%)	48. 21 (30.0%)
49. C4	50. 7 (20.0%)	51. 6 (17.1%)	52. 13 (18.6%)
53. C5	54. 4 (11.4%)	55. 5 (14.3%)	56. 9 (12.9%)
57. C6	58. 2 (5.7%)	59. 2 (5.7%)	60. 4 (5.7%)

Table 3: CEAP Classification

A significantly higher proportion of patients in the EVLA group experienced mild pain compared to the stripping group. This difference was statistically significant, indicating better postoperative comfort with EVLA (p < 0.05). (Table 4)

61. Pain Category	62. Group A n (%)	63. Group B n (%)	64. p-value
65. Mild	66. 6 (17.1%)	67. 18 (51.4%)	68. 0.001*
69. Moderate	70. 18 (51.4%)	71. 14 (40.0%)	
72. Severe	73. 11 (31.4%)	74. 3 (8.6%)	

Table 4: Postoperative Pain (VAS at 24 hours)

The majority of EVLA patients had shorter hospital stays compared to those undergoing stripping. This difference was statistically significant, demonstrating the minimally invasive advantage of EVLA (p < 0.05). (Table 5)

75. Duration	76. Group A n (%)	77. Group B n (%)	78. p-value
79. ≤2 days	80. 5 (14.3%)	81. 20 (57.1%)	82. 0.001*
83. 3–5 days	84. 18 (51.4%)	85. 12 (34.3%)	
86. >5 days	87. 12 (34.3%)	88. 3 (8.6%)	

Table 5: Hospital Stay

Patients in the EVLA group resumed normal activities significantly earlier than those in the stripping group. This reflects faster postoperative recovery associated with minimally invasive procedures (p < 0.05). (Table 6)

89. Duration	90. Group A n (%)	91. Group B n (%)	92. p-value
93. ≤7 days	94. 7 (20.0%)	95. 22 (62.9%)	**96.** 0.001*****
97. 8–14 days	98. 16 (45.7%)	99. 10 (28.6%)	
100.>14 days	101.12 (34.3%)	102.3 (8.6%)	

Table 6: Time to Return to Normal Activity

Complications were more frequent in the stripping group compared to the EVLA group. The difference was statistically significant, indicating better safety profile of EVLA (p < 0.05). (Table 7)

103.Complication	104.Group A n (%)	105.Group B n (%)	106.p-value
107.Present	108.12 (34.3%)	109.5 (14.3%)	110.0.04*
111.Absent	112.23 (65.7%)	113.30 (85.7%)	

Table 7: Postoperative Complications

Recurrence was lower in the EVLA group compared to the stripping group. However, this difference was not statistically significant ($p > 0.05$). (Table 8)

114.Recurrence	115.Group A n (%)	116.Group B n (%)	117.p-value
118.Yes	119.6 (17.1%)	120.2 (5.7%)	121.0.12
122.No	123.29 (82.9%)	124.33 (94.3%)	

Table 8: Recurrence

Patients with higher CEAP class (C4–C6) had significantly higher complication rates. This suggests disease severity plays an important role in postoperative outcomes ($p < 0.05$). (Table 8)

125.CEAP Class	126.Complications Present n (%)	127.Complications Absent n (%)	128.p-value
129.C2–C3	130.8 (18.2%)	131.36 (81.8%)	132.0.02*
133.C4–C6	134.9 (50.0%)	135.9 (50.0%)	

Table 9: CEAP Class vs Complications

DISCUSSION

In the present study majority of patients were in the 31–50 years age group (54.2%), indicating a higher prevalence in the middle-aged population. A male predominance (67.1%) was observed, likely reflecting increased occupational exposure such as prolonged standing and manual labor. These findings were in contrast to Ali AM et al.[11] who reported a female predominance, but are comparable to Viswateja M et al.[12] who also noted male predominance in both EVLA and conventional surgery groups. Similarly, Mohamed HA et al.[13] found no significant gender difference between groups, suggesting that demographic distribution may vary depending on population characteristics.

Baseline parameters including age, gender, and CEAP classification were comparable between the two groups in the present study, which was consistent with the observations of Mohamed HA et al.[13] and Desouki AA et al.[14] ensuring reliable comparison of outcomes.
Most patients in the present study presented in early stages (CEAP C2–C3: 62.9%), while 37.1% had advanced disease (C4–C6). This was comparable to Correa Posada MO et al.[15] who also reported a predominance of early-stage disease (CEAP 1–3), although their study showed a higher proportion of advanced cases associated with prolonged standing. In contrast, studies such as G Aly S et al.[16] emphasized the role of additional risk factors including hypertension, obesity, and lack of physical activity, indicating that disease severity is influenced by multiple demographic and lifestyle variables.

Postoperative pain assessment in the present study demonstrated a clear advantage of EVLA, with a higher proportion of patients experiencing mild pain (51.4%) compared to the stripping group (17.1%), while severe pain was more common in the stripping group (31.4% vs 8.6%). These findings were in agreement with Ali AM et al.[11] and Desouki AA et al.[14] both of whom reported significantly lower postoperative pain in EVLA patients. Similarly, Viswateja M et al.[12] observed markedly reduced pain scores in the EVLA group compared to conventional surgery, further supporting the superiority of minimally invasive techniques in improving postoperative comfort.

Hospital stay and recovery outcomes in the present study also favored EVLA. A majority of EVLA patients (57.1%) were discharged within 2 days compared to only 14.3% in the stripping group, and early return to normal activities was significantly higher (62.9% vs 20.0%). These findings were consistent with Ali AM et al.[11] Desouki AA et al.[14] and Anusha A et al.[17] all of whom demonstrated shorter hospital stay and earlier return to work with EVLA. Viswateja M et al.[12] further quantified this benefit, reporting a substantial reduction in hospital stay duration and faster recovery in the EVLA group.

Postoperative complications were more frequent in the stripping group (34.3%) compared to the EVLA group (14.3%) in the present study. Similar trends were observed by Osman OA et al.[18] and Karmota AG et al.[19] who reported significantly lower complication rates with EVLA. Desouki AA et al.[17] specifically noted higher hematoma rates in the surgery group, while Viswateja M et al.[12] reported increased wound infection and postoperative morbidity following conventional surgery, further reinforcing these findings.

Recurrence rates in the present study were lower in the EVLA group (5.7%) compared to the stripping group (17.1%), although the difference was not statistically significant. This observation aligns with Ali AM et al.[11] and Anusha A et al.[18] who also reported comparable recurrence rates between the two modalities, suggesting that both techniques are effective in long-term disease control.

Further analysis in the present study showed that advanced disease (C4–C6) was associated with higher complication rates (50.0%) compared to early-stage disease (18.2%), which is in agreement with Correa Posada MO et al.[15] who reported increased complications such as ulceration and thrombosis in advanced stages. Additionally, risk factor analysis by Elamrawy S et al.[20] highlighted prolonged standing, heavy lifting, and poor lifestyle habits as significant contributors to disease

occurrence, which correlates with the occupational profile observed in the present study.

CONCLUSION

Endovenous laser ablation is a safe, effective, and minimally invasive alternative to conventional stripping surgery in the management of primary lower limb varicose veins. It provides significant advantages in terms of reduced postoperative pain, shorter hospital stay, faster return to normal activities, and lower complication rates. Although recurrence rates were lower in the EVLA group, the difference was not statistically significant. Disease severity and procedure type were important determinants of outcomes, while age and gender had minimal impact. EVLA can be considered the preferred treatment modality, particularly in suitable patients, for improved clinical outcomes and enhanced patient satisfaction.

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CONFLICTS OF INTEREST
There are no conflicts of interest

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