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RESEARCH ARTICLE
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A PROSPECTIVE CASE CONTROL STUDY COMPARING SHORT-TERM AND LONG-TERM OUTCOMES OF SUBFASCIAL ENDOSCOPIC PERFORATOR SURGERY AND OPEN SUBFASCIAL PERFORATOR LIGATION IN THE MANAGEMENT OF VARICOSE VEINS

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INTRODUCTION

Varicose veins are dilated, elongated, and tortuous superficial veins of the lower limbs, primarily caused by venous valve incompetence and resulting in venous hypertension. Persistent reflux leads to progressive chronic venous insufficiency (CVI), stasis eczema and chronic non-healing ulcers. [1][2] Homans in 1916, first described the key role of perforator veins (PVs), in the pathophysiology and severity of CVI and venous ulceration. [3][4][5]

Diagnosis is by clinical evaluation, Duplex Doppler imaging. [1] Clinical Aetiologic Anatomic Pathophysiologic (CEAP) classification, established in 1994, is a precise diagnostic tool to assess and categorise a chronic venous disease. [6][7]

Ligation of incompetent perforator veins remains a central component in the management of varicose veins, given their significant contribution to the pathophysiology of chronic venous insufficiency. Management approach includes conservative therapy with compression garments, minimally invasive techniques such as sclerotherapy, endovenous laser ablation, radiofrequency ablation, Subfascial Endoscopic Perforator Surgery (SEPS) and traditional open subfascial perforator ligation (OSPL). [2] SEPS provides access to incompetent perforators through limited incisions, enabling precise identification and their ligation, even the ones missed on clinical examination or duplex doppler. [8][9]

AIM AND OBJECTIVES

This study aims to evaluate the effectiveness of SEPS in comparison with conventional OSPL in the management of varicose veins and to compare its clinical outcomes, with emphasis on postoperative complications, recovery, recurrence, and patient satisfaction.

MATERIALS AND METHODS

This prospective case–control study was conducted at the Department of General Surgery, Sri Venkateswara Institute of Medical Sciences (SVIMS), Tirupati, from January 2024 to December 2024. Patients aged >18 years presenting with varicose veins were included in the study. Detailed

clinical evaluation, routine laboratory investigations, chest radiography, ECG, Duplex Doppler was done and CEAP score was assigned. Patients requiring operative management were randomly allocated to either the SEPS or OSPL group by the simple random sampling technique.
Statistical analysis included mean and standard deviation for continuous variables, while categorical variables were compared using the Chi-square test. The Mann–Whitney U test was applied when appropriate. A p-value <0.05 was considered statistically significant.

RESULTS

S.NO.	Variable		SEPS	OSPL	p-value
			n = 40	n = 40	
1.	Age groups (years)	≤ 50	32	25	0.083
		> 50	8	15	
2.	Gender	Male	34	33	0.06
		Female	6	7	
3.	Laterality	Right	23	28	0.074
		Left	12	4	
		Bilateral	5	8	
4.	Mean hospital stay (days)		3.56 ± 0.8	7.12 ± 0.9	< 0.001
5.	Postoperative ambulation	6 hours (without pain)	14	1	< 0.001
		1 day (without pain)	33	9	< 0.001
6.	Resuming routine work	≤ 2 weeks	31	3	< 0.001
		2weeks – 1 month	5	28	
		≥ 1 month	4	9	
7.	Post operative opioids need		3	18	< 0.001
8.	Pain at 1 year follow up	Much better	5	28	< 0.001
		Cured	35	12	
9.	Pigmentation at 1 year follow up	Same	2	9	< 0.001
		Much better	15	24	
		Cured	23	7	
10.	Swelling of the leg at 1 year follow up	Much better	1	4	0.364
		Cured	11	9	
		NA	28	27	
11.	Ulcer healing at 1 year follow up	Much better	16	21	0.262
		Cured	24	19	
12.	Cosmetic appearance at 1 year follow up	Bad	1	17	< 0.001
		Good	14	21	
		Very good	25	2	
13.	Ability to do work at 1 year follow up	Same	2	8	0.113
		Good	24	22	
		Excellent	14	10	
14.	Recurrence at 1 year	Yes	1	6	0.047
		No	39	34	

15.	Overall opinion of the surgery at 1 year follow ups	Not satisfied	1	7	<0.0001
		Satisfied	21	32	
		Excellent	18	1	

This study was conducted on a total of 80 patients, with 40 undergoing SEPS and 40 treated by OSPL. The majority of individuals in both groups were aged ≤50 years, accounting for 80% (n = 32) in the SEPS group and 62.5% (n = 25) in the OSPL group (p = 0.083). Male predominance noted in both categories, representing 85% (n = 34) of the SEPS group and 82.5% (n = 33) of the OSPL group (p = 0.06). Right-sided and bilateral disease were more frequently observed in the OSPL group (p = 0.074). Overall, the demographic variables between the two groups, showed no statistically significant differences.

The mean duration of hospital stay was shorter in the SEPS group, 3.56 ± 0.8 days compared with the OSPL group, 7.12 ± 0.9 days (p < 0.001). The SEPS group showed 14 patients achieving pain-free early ambulation within 6 hours, in contrast to only 1 patient in the OSPL group (p < 0.001). By 24 hours, 33 SEPS patients were ambulating comfortably, compared to 9 patients following OSPL (p < 0.001).

Return to normal activities was achieved earlier in the SEPS group, 31 individuals had resumed work within 2 weeks, whereas only 3 patients in the OSPL group were able to do so (p < 0.001). The requirement for postoperative opioid analgesia was also considerably lower after SEPS (3 patients) than after OSPL (18 patients; p < 0.001).

At the one-year follow-up, pain relief outcomes in 35 patients treated with SEPS reported complete resolution and 5 with substantial improvement. In contrast, only 12 OSPL patients reported complete relief, while 28 experienced partial improvement (p < 0.001).

Pigmentation outcomes showed complete resolution among 23 SEPS patients, and 15 with significant improvement, compared to 7 and 24 patients respectively in the OSPL group (p < 0.001). Limb swelling did not differ significantly between groups (p = 0.364). Ulcer healing at one year was comparable, with complete healing documented in 24 SEPS patients and 19 OSPL patients (p = 0.262).

Cosmetic outcomes were significantly better in the SEPS group; only one patient rated the appearance as poor, 14 as good and 25 as very good. The OSPL group demonstrated markedly poorer cosmetic satisfaction, with 17 patients reporting poor outcomes and only 2 rating their result as very good (p < 0.001).

Functional recovery at one year, assessed by ability to return to work, was similar across both groups (p = 0.113). Recurrence rates were lower in the SEPS group, with only one recurrence compared to six in the OSPL group (p = 0.047).

Overall satisfaction at one year in the SEPS group, 18 patients rated their outcomes as excellent, 1 patient expressed dissatisfaction, whereas 7 patients in the OSPL group were dissatisfied, and 1 patient reported excellent satisfaction (p < 0.0001).

DISCUSSION

In this study, most patients were ≤50 years of age and male gender. Similar demographic trends were reported by Jain SK et al. [10] and Teja et al.,[11] who also observed a predominance of younger and male patients, which were statistically insignificant.

Shorter hospital stay, earlier ambulation, and reduced analgesic requirement in SEPS patients corresponds with the results of Sybrandy et al. [12] and Teja et al., [11] reinforcing the minimally invasive benefits of this approach.

Cosmetic outcomes, improvement in pigmentation, faster ulcer healing, and reduced recurrence rates further support SEPS, consistent with the improved aesthetic acceptability from Lin et al., [13] Tenbrook et al., [14] and Nelzen et al. studies. [15]

Functional outcomes at one year, based on the ability to resume work, showed no statistically significant difference between SEPS and OSPL in the present study, Kianifard et al. [16] reported better functional recovery when SEPS was combined with conventional venous procedures.
Overall patient satisfaction at one year strongly favoured SEPS, with high rates of excellence similar to observations in studies by Lin et al. [13] and Nelzen et al. [17][18] These findings confirm SEPS as a reliable, patient-preferred alternative to traditional open subfascial perforator ligation.

CONCLUSION

SEPS is a minimally invasive technique, offering greater patient comfort, better symptom resolution, superior cosmetic outcomes, and lower recurrence rates compared with the open approach. While ulcer healing was comparable between the two methods, the SEPS group reported markedly higher satisfaction at the one-year follow-up.
SEPS is a safe, effective, and minimally invasive option for managing incompetent perforators, producing dependable clinical results, greater patient acceptance and improved quality of life. SEPS may be considered the preferred treatment modality, especially for patients seeking early functional recovery.

STRENGTHS AND LIMITATIONS

A major strength of this study lies in its comprehensive assessment of efficacy, outcomes, enabling a strong comparison between SEPS and OSPL. The comparison of clinically relevant outcomes, such as postoperative complications, wound healing rate contributes valuable evidence to the relative benefits of minimally invasive surgery.
Limitations of the study were, single-centre study, a relatively smaller sample size, restricting the broader relevance of the findings and statistical power to detect differences of short and long-term outcomes in both groups.

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