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ORIGINAL ARTICLE

Complications of Endovenous Ablation vs. Surgical Stripping of Varicose Veins

Hossam Ahmed Tawfiq, Ahmed M. Tawfik, Mina Sameh Sabry Hanna*, Mahmoud A. Soliman
Vascular Surgery Department, Faculty of Medicine, Zagazig University, Egypt.

***Corresponding Author:**
Mina Sameh Sabry Hanna

E-mail:
minasameh16@gmail.com

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Abstract

Background: The goals of varicose vein treatment include symptom relief, enhanced quality of life, and complication prevention. Two primary treatment options for varicose veins are endovenous ablation and surgical stripping. This research aimed to compare between endovenous ablation and surgical stripping for varicose veins. **Patients and methods:** We carried out this prospective cohort research on 36 patients with symptomatic varicose vein admitted to vascular surgery department, Zagazig University Hospitals. The patients were divided into 2 groups according to management technique: Endo-venous ablation group (21 patients): undergone Endovenous Ablation of varicose veins. Surgical Stripping group (15 patients): undergone Surgical Stripping of varicose veins. Pre- post-operative duplex scans were assessed using duplex ultrasonography (DUS). **Results:** Postoperative hematoma was observed in the Stripping surgical site in 14.3% of cases while it was absent in Endo-Venous ablation. Postoperative Tingling was present in 19% of Endo-venous Ablation surgical site and in 6.7% of stripping surgical site. Residual Varicose vein was observed in 13.3% of stripping surgical site cases and in 9.5% of Endo-venous Ablation surgical site cases. Both groups showed no recurrence. Patient satisfaction was significantly higher (p=0.023) among most cases of Endo-Venous ablation Group (95.2%) versus 66.7% of stripping surgical site cases. **Conclusion:** In the early and mid- postoperative period, the effectiveness of endo-venous ablation was comparable to that of the conventional therapy. Complications and recovery time were also comparable. In the management of primary varicose veins in the lower limbs, endo-venous ablation yields better results than conventional stripping surgery in terms of patient satisfaction.

Keywords: Endovenous Ablation, Surgical Stripping, Varicose Veins, Complications.

INTRODUCTION

The legs and feet are the most common places to have varicose veins, which are twisted, dilated veins. The weakening or damage to the veins' valves—which ordinarily aid in keeping blood flowing in one direction coincides with vein enlargement to produce varicose veins. Because of this, the veins take on their distinctive look when blood pools in them [1]. Depending on the severity of symptoms and any complications, a medical evaluation and appropriate treatment may be required for varicose veins of the lower extremities. These veins can range from being a cosmetic issue with no symptoms at all to a serious medical emergency like a venous ulcer [2,3].

The exact cause of varicose veins is not fully understood, but several factors contribute to their development. Varicose veins are more common in women than in men. This heightened risk is a result of hormonal changes that occur throughout adolescence, pregnancy, and menopause; it is also caused by hormonal contraceptives. The likelihood of developing varicose veins is higher in occupations or activities that require standing or sitting for a long period of time. The lack of movement hampers blood circulation in the legs and contributes to vein dilation [4]. The goals of varicose vein treatment include symptom relief, enhanced quality of life, and complication prevention. Two primary treatment options for varicose veins are endovenous ablation and

surgical stripping. Endovenous ablation involves the use of minimally invasive techniques, such as laser ablation (Endo-Venous laser Ablation, EVLA) or radiofrequency ablation (RFA), to close off the affected veins. On the other hand, surgical stripping is a more traditional approach that involves the surgical removal of the diseased veins through incisions [5].

The choice between Endo-Venous ablation and surgical stripping depends on various factors, including the severity of the varicose veins, anatomical considerations, patient preferences, and the expertise of the treating physician. Both techniques have been widely used and studied, but there is ongoing debate regarding their comparative effectiveness, safety, and outcomes [6]. This literature review aims to critically examine the existing evidence comparing endovenous ablation and surgical stripping for managing the varicose veins. [7]. So, in this research we aimed to compare between endovenous ablation and surgical stripping for varicose veins at Zagazig University Hospitals.

METHODS

We performed this prospective study on prospective cohort study on 36 patients with symptomatic varicose vein admitted to vascular surgery department, Zagazig University Hospitals in the period from August 2023 to February 2024.Written informed consent was collected from all parents of the participants. The approval for the study was obtained from the Institutional Review Board (#10762/9-5-2023) and the research was conducted in accordance with the Helsinki Declaration.

We included patients aged more than 18 years, who experienced symptomatic varicose vein: clinically from C2 to C4 from Clinical, etiological, anatomical and pathological (CEAP) classification, patients with refluxing sapheno femoral junction (SFJ) and/or refluxing sapheno popliteal junction by colored duplex, and patients with intact deep vein system [5].

The patients were divided into two groups; **the Surgical Stripping group (n=15)** patients with great saphenous vein (GSV) disease or small saphenous vein (SSV) disease underwent conventional surgery, which included high ligation of the saphenofemoral junction, short stripping to just below the knee or till the medial malulous, and ligation of the saphenopopliteal junction.

The Endo-venous ablation Group (n=21) had endovenous radiofrequency ablation performed under duplex scan guidance utilizing a ClosureFast system from Medtronic.

We excluded all cases who had any of the following conditions: active superficial thrombophlebitis, deep vein thrombosis (DVT), a very tortuous GSV that makes the vein unsuitable for catheter entrance, a low ankle brachial index (0.8 or below) or lower limb artery disease, had a history of adverse reactions to polidocanol or any of its ingredients, secondary varicose veins, pregnant females as well as patients who refused to participate or to provide a consent.

Complete history taking including: A detailed history including pain, edema, heaviness and affecting quality of life or cosmetic purposes. General examination in addition to local examination were done focusing on the size, location, in addition to the distribution of varicose veins. Complete pulse examination was done for exclusion of the peripheral arterial disease. Clinical, etiological, anatomical and pathological (CEAP) classification was used for clinical severity of venous disease.

Laboratory investigations: included Fasting blood sugar (FBS), (HbA1C) among diabetic patients, Complete blood count (CBC), Serum urea, creatinine, and bleeding profile.

All patients underwent a DUS examination, during which the superficial, deep, and perforator systems were assessed for patency and abnormal reflux in the deep system, and the SFJ, GSV, saphenopopliteal junction (SPJ), perforators, reflux time, and vein diameter in the superficial system. Significant retrograde flow was defined as flow that lasted more than half a second.

Intraoperative

The first group: (Surgery) (Figure 1 A).

In order to ensure that the skin incision was placed precisely and that extremely small incisions could be made, DUS was utilized to preoperatively mark the saphenofemoral. The entire group underwent their procedures under spinal anesthesia. Starting above the palpable femoral artery and extending medially to provide sufficient vision of the saphenofemoral confluence and its tributaries, an oblique incision 1 cm above and parallel to the groin crease was used to approach the GSV. The GSV was ligated at a high level near the femoral vein. It was common practice to use a suture ligature for the second ligation while working on a proximal stump.

The conventional procedure for varicose veins primarily involved GSV stripping. Stab avulsion of superficial tributary varices and ligation of

pathological perforators were done at the same setting. The leg wrapped with a compressive dressing after closure of the incisions and the GSV stripped groin incision with the limb elevated to reduce the venous bleeding and ecchymosis associated with stripping, then closure of groin incision and dressing was done. Postoperatively, the patient was advised to ambulate as soon as possible.

The second group: Endo-Venous ablation (Figure 1 B).

Prior to the procedure, the operator studied the venous anatomy map created using DUS and took measurements of the vein, made note of any tortuosity areas, and located any tributaries or perforators. For the GSV ablation, the patient lay supine on the ClosureFastTM Radiofrequency Ablation System. For the SSV ablation, the patient lay prone with one leg down. The entire group underwent their procedures under spinal anesthesia. Standard tumescent solution was a very dilute mixture of local anesthesia (0.1% lidocaine) with epinephrine (1:2000 000), which was injected under ultrasound guidance to surround the truncal vein to be ablated. Improving GSV and/or SSV visualization necessitated positioning patients in the inverted Trendelenburg posture. Using a 6F, 11-cm-long sheath, we introduced the catheter to reach the GSV and/or SSV percutaneously using the Seldinger approach, which involves utilizing an 18-gauge needle. The GSV's ideal entry point was at a level below knee. The catheter tip was positioned approximately 1.5 cm below the SFJ, slightly below the level of the superficial epigastric vein, after the GSV had been catheterized. The tumescent solution used for the procedure was a combination of lactated Ringer's or saline with Ephedrine. Patient was positioned in Trendelenburg position. Using ultrasound guidance, this solution was introduced percutaneously into saphenous compartment around the vein guided by duplex until collapse of the GSV with the goal to create a target diameter of fluid around the vein of 10 mm and 2 cm distance from the skin. External compression was achieved during treatment either manually or by using the ultrasound probe.

For ineffective perforators and superficial varicosities, polidocanol (Aethoxysklerol 1% or 2%) foam injection sclerotherapy was administered as an adjunctive procedure using percutaneous ultrasound guidance.

To make the sclerosing foam, the Tessari method was employed. Two syringes were connected by a three-way stopcock and 2 milliliters of 2% Aethoxysklerol and 8 milliliters of air were combined in a one-to-four ratio. In order to make the foam solution, the air and chemical were quickly mixed using the two syringes that were passed back and forth.

Twenty milliliters (mL) of foam each session was the maximum safe amount. In order to prevent dyspnea and retinal artery thrombosis, two potential risks of foam embolization, patients were instructed to elevate their legs throughout the procedure. Several weeks of compression stockings and a post-procedure crepe bandage were recommended methodically. There were no restrictions on the patients' ability to move around after the surgeries because they were all ambulatory. All patients were administered prophylactic low molecular weight heparin (LMWA), and NSAIDs and analgesics were given to them as needed. The same day as the procedure, patients were discharged.

Post-operative

Dressings were applied to all wounds and treated limbs were covered in crepe bandages as part of the routine postoperative regimen. Patients were advised to take a shower after one week, remove all dressings, and wear full-length class II compression socks for three months.

Statistical Analysis:

We used (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.) to gather, tabulate, and analyze all of the data. Number and percentage were used to represent qualitative data, whereas mean ± SD and range were used for quantitative data. To compare paired ordinal variables, the marginal homogeneity test was utilized. When comparing two normally distributed variables, paired t was employed. The tests were all bi-directional. To determine the difference between quantitative variables in the same group at least twice using non-normally distributed data, the two-way Friedman test was employed. Long Rank test and Kaplan Meier graph was used to compare disease free survival among the two studied groups.

RESULTS

Table (1) shows non statistically significant differences between the two studied groups as regards sex and age ensuring matching of the studied groups, laterality ensuring matching of the studied groups ($p>0.05$). The affected limb of most of cases in both groups were unilateral while only 9.5% of Endo-Venous ablation group and 20% of Stripping surgery group had bilateral affected limbs.

Table (2) illustrates non statistically significant difference between the two studied groups regarding operation side ensuring matching of the studied groups. (p>0.05). The affected limb of half of Endo-Venous ablation cases 42.6% was the right side whereas the left side was affected in 52.9% of cases. In surgical stripping group the right limb was affected in 75% of cases whereas the remaining 25% had left limb varicose veins, ten cases (27.8%) needed injection sclerotherapy, and one case needed injection of lesser Saphenous Vein.

As illustrated in (Table 3), one case 2.8% showed concurrent GSV and LSV incompetence, and IP was ligated in one case (2.8%). Sapheno-popliteal junction ligation with multiple stab avulsion was done to one case (2.8%). Stab avulsion of blowouts only was done to 13.9% of cases.

Table (4) shows that postoperative hematoma was observed in the Stripping surgical site in 14.3% of cases while it was absent in Endo-Venous ablation. Both groups showed no, Hemorrhage, or DVT.

Table (5) shows that postoperative Tingling was present in 19% of Endo-venous Ablation surgical site and in 6.7% of stripping surgical site. Both groups showed no anesthesia complications, ulcers, burn, or infection. Residual Varicose vein was observed in 13.3% of stripping surgical site cases and in 9.5% of Endo-venous Ablation surgical site cases. Both groups showed no recurrence.

Table (6) shows that patient satisfaction was significantly higher (p=0.023) among most cases of Endo-Venous ablation Group (95.2%) versus 66.7% of stripping surgical site cases.

Table (1): Basic characteristics, and laterality of the affected limbs among of the studied groups.

Variable			Type of operation		tests	
			Endo-venous ablation Group (n=21)	Surgical Stripping group (n=15)	*t*	*P* value
Age (years) Mean±SD Rang			34.62±10.94	38.33±13.56	-0.909	0.370
Variable					x^2	P value
Sex	**Female**	N	11	8	0.003	0.955
		%	52.4%	53.3%		
	Male	N	10	7		
		%	47.6%	46.7%		
Laterality	**Bilateral**	N	2	3	2.598	0.458
		%	9.5%	20.0%		
	Unilateral	N	19	12		
		%	90.5%	80%		

Independent t-Test (t) Chi square test (X^2)

Table (2): Operation side of unilateral cases, and Operation data regarding injection among the studied groups.

Variable			Type of operation		tests	
			Endo-Venous ablation Group (n=19)	Stripping surgery group (n=12)	x^2	*P* value
Unilateral limbs side	**Left**	**N**	9	3	1.5	0.2112
		%	42.3%	25%		
	Right	**N**	10	9		
		%	52.6%	75%		

Category	No.	Endo-venous ablation	Surgical stripping	%
Injection of IP	10	7	3	27.8
injection of lesser Saphenous	1	1	0	2.8

Chi square test (X^2)

Table (3): Ligation and stab avulsion among the studied group.

Category		No.	Endo-venous ablation	Surgical stripping	%
operation notes	GSV & LSV	1	0	1	2.8
	ligation of IP	1	0	1	2.8
	LSV ligation+ stab avulsion (recurrent)	1	0	1	2.8
	stab avulsion	5	0	5	13.9

The Greater Saphenous Vein (GSV), The Lesser Saphenous Vein (LSV), Incompetent Perforators (IP), Sapheno-popliteal junction (SPG).

Table (4): Vascular complications from Endovenous Ablation and Surgical Stripping among studied groups.

Variable		Type of operation		tests	
		Endo-Venous ablation Group (n=21)	Stripping group (n=15)	x^2	*P* value
Hemorrhage	N	0	0	-----	--------
	%	0	0		
Hematoma	N	0	3	2.338	0.126
	%	0.0%	14.3%		
DVT	N	0	0	-----	--------
	%	0.0%	0.0%		

Chi square test (X^2)

Table 1: Comparing other complications (anesthesia complications, ulcer, infection, burn and tingling), Residual Varicose veins, during and and recurrence after Endovenous Ablation and Surgical Stripping.

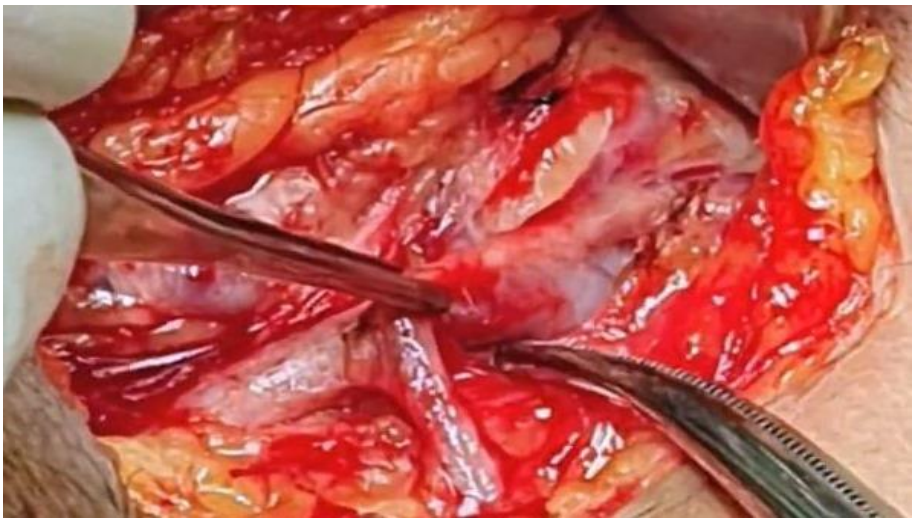
Variable		Type of operation		tests	
		Endo-Venous ablation Group (n=21)	Stripping group (n=15)	x2	*P* value
anesthesia complications	N	0	0	-----	--------
	%	0.0%	0.0%		
Ulcer	N	0	0	-----	--------
	%	0.0%	0.0%		
Burn	N	0	0	-----	--------
	%	0.0%	0.0%		
infection	N	0	0	-----	--------
	%	0.0%	0.0%		
Tingling	N	4	1	1.121	0.290
	%	19.0%	6.7%		
Residual Varicose vein	N	2	2	0.129	0.720
	%	9.5%	13.3%		
Recurrence	N	0	0	-----	--------
	%	0.0%	0.0%		

Chi square test (X^2)

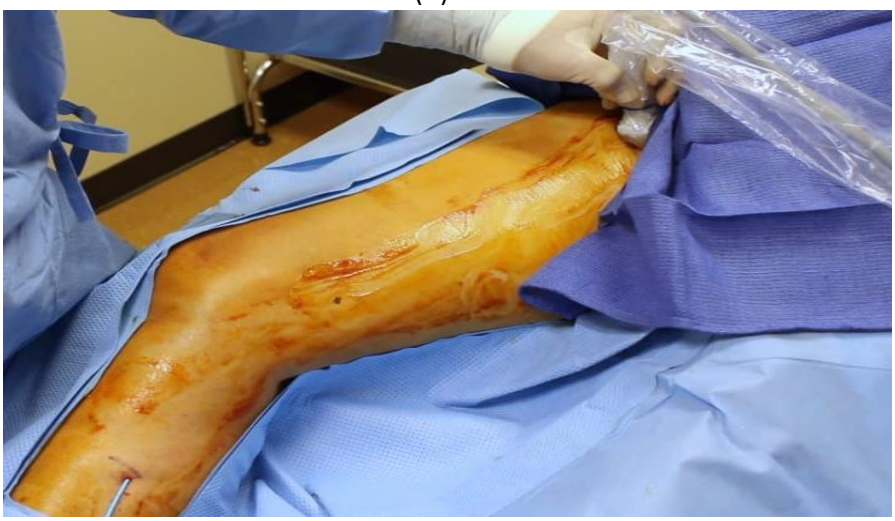
Table 6: Patient satisfaction after Endo-venous Ablation and Surgical Stripping among studied groups.

Variable			Type of operation		tests	
			Endo-Venous ablation Group (n=21)	Stripping group (n=15)	x^2	*P* value
patient satisfaction	Not satisfied	N	1	5	5.14	0.023*
		%	4.76%	33.3%		
	Satisfied	N	20	10		
		%	95.2%	66.7%		

Chi square test (X^2)



(A)



(B)

Figure 1: (A): Sapheno-femoral junction dissection during surgery, **(B):** Radio frequency catheter insertion inside great saphenous vein at below knee level.

DISCUSSION

One of the main causes of varicosis is venous hypertension, while another is valve incompetence. Medical professionals have supported the traditional explanation of descending valve incompetence. The most important investigations for assessing and detecting venous insufficiency and thrombosis involve duplex ultrasonography of the extremities. This imaging modality is currently considered the "gold standard" for superficial venous imaging. In order to do a proper evaluation, it is necessary to check the perforating, tributary, superficial, and deep vein reflux and occlusion [5]. For a long

time, surgical ligation and stripping of the afflicted vessel was the gold standard for varicose veins management. Because the lower limb's venous structure has been better understood in recent decades, the result has been better. But recurrence is common, occurring as often as 20% to 30% of the time [7].

When it comes to managing saphenous reflux, endovenous laser ablation is the way to go because it is both safe and effective. If you have reticular veins, extra-truncal varicose veins, telangiectasias, or both, foam sclerotherapy is the way to go. As an alternative to foam sclerotherapy, endovenous laser ablation may be recommended for the treatment of truncal reflux. Though sclerosing can be applied to veins of varying sizes, the smaller ones, such as reticular veins and telangiectasias, are the most frequently treated [8]. This study aimed to compare between endovenous ablation and surgical stripping for varicose veins.

In the present study we found that non statistically significant differences between the two studied groups as regards sex and age ensuring matching of the studied groups. Endo-venous ablation Group included 11 females (52.4%) and 10 males (47.6%) while, surgical Stripping group included 8 females [53.3%] and 7 [46.7%] males. Patients in both groups were with a mean age of 38.33±13.56 in surgery group and 34.62±10.94 in laser group. In agreement with our findings, Ali *et al*. [9] illustrated that 57.5% of the patients were females. Reasons for this could include the cosmetic perspective, which causes women to seek medical guidance at an earlier stage than men. Almost all of the most recent research has found quite similar results. People are better aware of this disease and its adverse effects, which is a motivating factor for many women to seek medical care, even though men often stand for longer periods of time and exert more effort. These findings, however, contrast those of Basavarajappa *et al*. [10], who found a male-to-female ratio of 3:1 among 222 patients (162 men to 60 females). Various inclusion criteria and study sample sizes could account for this. However, the present study's female sex predominance is consistent with that of Nishibe *et al*. [11]. There was a total of 140 patients, 58 of whom were male and 82 of them were females.

All of our patients were in their forties or older for this study; we didn't find any statistically significant differences between the groups. Previous investigations found a lower value. With 200 cases total, 100 in each group, Christenson *et al*. [12] found that patients undergoing surgical ligation and stripping had a mean age of 46 while those undergoing laser treatment had a mean age of 45.

In the current study we found that ten cases (27.8%) needed injection sclerotherapy of IP, and one case needed injection of lesser Saphenous Vein. Our results were concordant with Mohamed *et al*. [13] who stated that in the conventional group, 5 patients did not require any additional procedures, but 27 individuals in the Radiofrequency ablation (RFA) group did. In the conventional group, 7.3% of patients required foam sclerotherapy, but 26.8% of patients in the RFA group did.

In the present study we found non statistically significant differences between the two studied groups as regards vascular complications that may occur during and after Endo-venous Ablation and Surgical Stripping ensuring matching of the studied groups. Postoperative hematoma was observed in the Stripping surgical site in 14.3% of cases while it was absent in Endo- Venous ablation. Both groups showed no Hemorrhage or DVT. Postoperative tingling was present in 19% of Endo-venous Ablation site and in 6.7% of stripping surgical site. Both groups showed no anesthesia complications, ulcers, burn, or infection. Residual varicose vein was observed in 13.3% of stripping surgical site cases and in 9.5% of Endo-venous Ablation cases. Both groups showed no recurrence.

The findings were corroborated by Siribumrungwong *et al*. [14], who found that hematoma rates were greater in patients treated with surgical ligation compared to those treated with laser ablation. There was less postoperative pain with EVLA compared to surgery. Patients who received surgical ligation of the SFJ and stripping had a 60% higher risk of wound infection than those who underwent laser ablation. From the first to the seventh day after the treatments, EVLA patients reported less pain and hematoma formation, according to this study. In a previous publication, Pronk *et al*. [15] had shown different findings. Laser ablation patients reported much worse postoperative pain on day 14. The researchers attributed this finding to the fact that devices operating within the 810nm-980nm range are known to irritate nearby tissues and increase the risk of problems following surgery. This was in accordance with Shrestha *et al*. [16] who stated that the rate of complications was substantially greater in the surgery group when contrasted with the Endovenous laser ablation (EVLA) group. The EVLA group had a lower risk of postoperative

problems such as bruising, hematoma, sensory disruption, infection, and phlebitis as compared to the ligation and stripping group.

In consistent with our findings, Mohamed *et al*. [13] cleared that RFA significantly reduced post-operative discomfort and the need for analgesics. After the first week, RFA was still the preferred method for pain scores. After ablation, seven patients reported no pain (a score of 0 on the pain VAS), and ten of those patients did not need pain medication. Alternatively, aside from one patient, every single patient needed post-operative analgesia due to the pain that ensued following CS. After receiving RFA, patients were able to resume their regular domestic activities, drive, and return to work much faster than they did after receiving CS.

Our current findings clearly revealed that patient satisfaction was significantly higher (p=0.023) among most cases of Endo-Venous ablation Group (95.2%) versus 66.7% of stripping surgical site cases. These results were compatible with Ali *et al*. [9] who cleared that when comparing the two groups, the amount of time required to resume regular activities was significantly different. The duration in the surgical group varied from 5 to 8 days, with an average of 5.9±1.3 days, whereas in the laser group it varied from one to four days, with an average of 2.3±0.9 days. Patients believed that procedures with surgical wounds required a long period of recovery and rest, which might be accounted for by differences in socioeconomic status, the nature of their occupations, and cultural factors. Our findings are in line with those of Gloviczki *et al*. [17], who found that compared to patients undergoing conventional surgery, those undergoing laser ablation were able to resume their regular routine three days earlier. Unlikely, Kalteis *et al*. [18] documented that the ability to resume regular activities following surgery was highly appreciated by patients. The time it takes to get back to their pre-surgery routine is frequently a major concern. Surgical closure of the saphenofemoral junction and stripping allowed patients to return to daily activities more quickly than individuals who received laser ablation. Sick leave could not be used as a true measure of clinical result because, even though consequences after laser ablation were less severe, there was a notable difference in the amount of time it took to ambulate after the procedure.

However, conflicting findings were reported in a 2010 study by Pronk *et al*. [15]. They found no statistically significant difference between the groups who underwent surgical intervention and those that underwent laser ablation. The average amount of time it took for patients who had traditional surgery to get back to their regular routine was 3.2 days (SD 4), but the same number of patients who had laser ablation only needed 3.2 days (SD 4.3). In terms of ambulation time, Assadian *et al*. [19] found no statistically significant difference between the two groups, with the laser ablation group showing an insignificant advantage.

According to research by Winterborn et al. [20], laser ablation and surgical ligation may both leave some patients dissatisfied with the results in the long run. However, according to Nesbitt *et al*. [21], cosmetic outcomes were slightly better with laser ablation, but both procedures were associated with comparable postoperative quality of life and acceptable rates. According to Sandhya *et al*. [22], over 90% of patients expressed their willingness to refer friends and family to endovenous ablation operations. Shrestha *et al*. [16] reported that procedure time, recovery time, recurrences at1,2, and 5 years, and clinical severity score were also unaffected. By the end of the second year, the surgical group had 4.35 times the statistically significant chance of having achieved technical success.

The limited number of our sample size is one of the limitations of our investigation. Furthermore, not all historical information and events that could affect the conclusion have been thoroughly recorded. It is important to exercise caution when interpreting connections because of these limits. For a more accurate comparison between endovenous ablation and surgical stripping for varicose veins, future research should be more extensive and involve a larger number of patients.

Declaration of interest:

The authors report no conflicts of interest.

Funding information:

This study was not supported by any source of finding.

CONCLUSION

In the early and mid- postoperative period, the effectiveness of endo-venous ablation was comparable to that of the conventional therapy. Complications and recovery time were also comparable. In the management of primary varicose veins in the lower limbs, endo-venous ablation yields better results than conventional stripping surgery in terms of patient satisfaction.

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