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Original Research Article

The Endovenous Laser Ablation (EVLA) and Traditional Vein Stripping (TVS) for the Treatment of Varicose Veins in Forearm: A Comparative Analysis

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Abstract:

Background: Varicosis is a common venous condition, which is typically treated surgically. However, selection of the optimal surgical approach can be challenging. It is far more common to experience varicose veins, or spider veins, in your legs; many people do suffer from varicose veins in their arms. Luckily, there are treatment modalities available that have proven to be extremely effective and have minimal side effects. In this , randomized controlled trial, the endovenous laser ablation (EVLA) was compared with conventional surgery with stripping for the treatment of varicose veins of forearm.

Aim and objectives: Compared the preoperative and postoperative outcomes of EVLA and Traditional surgery with vein stripping (TVS) in the patients with vein varicosis in forearm.

Materials and Methods: The present study was a single-center, prospective comparative study conducted on patients admitted with varicose veins in the surgical wards of Hind Institute of Medical Sciences and Hospital, Ataria, Sitapur, UP. From March 2022 to August 2023. A total of 56 varicose veins patients admitted in ward were divided into the two groups of 28 patients in each group who underwent EVLA or TVS surgery as per patients consent. Patients were included in this study based on the inclusion and the exclusion criteria.

Result: A total of 56 patients were divided into the EVLA group (n=28; 20 males, 8 females) and the TVS group (n=28; 22 males, 6 females). The mean age of the patients was 42.21± 10.24 years in the EVLA group and 41.9± 9.31 years in the TVA group (P =0.788). The left arm was affected in 71.42 % of the EVLA group and 64.28% of the TVS group (P =0.640). According to AVVSS (Aberdeen varicose vein symptom severity), in the EVLA group was 4.7±3.1 and 4.8± 2.7 in the TVS group, the differences were also found significant at 6, 12 and 24 hours (P=0.05). Pain severity in 6, 12 and 24 hours after the procedures were significantly different between the two groups . The pain severity score was found more in TVS group as compared to EVLA; at 24 hours it was 6.58 ±1.026, in TVS; whereas 4.17 ± 1.011 in EVLA. (p=0.05). Chronic pain (seventh day, 3, 6, and 12 months after the procedures) was present 14.28% in EVLA group and 25% in TVA group. It was found significant (P ≤0.05). According to NRS, the mean chronic pain severity in the EVLA group was 3.50 ± 0.657 and 5.99 ± 0.754 in the TVA group, and the difference was significant (P= 0.05). The length of the operation was 41.3±10.6 minutes in the EVLA group and 52.3±11.8 minutes in the TVA group that was also found significant (P=0.14). At 3 months, the recurrence rate of the EVLA and TVA groups was 3.5 and 6.7% respectively. The Post-VDS score was significantly lower in all EVLA patients as compared to TVS. The mean pre–post difference in the VDS scores in TVS was found higher and also found significantly different (EVLA-0.89±0.14 vs. TVS-1.33± 0.91, P < 0.01).It was also observed that the return to normal activities (days) was better in EVLA group as compared to TVS, it was 2.1±02 (Days) in EVLA whereas, 3.2± 1.6 in TVA. (p=0.05).

Conclusion: The TVS group was the increased incidence of hematoma formation and the movement of arms on the first postoperative day was very painful. The results of this study indicated the higher efficacy of EVLA for upper extremity varicosis treatment as compared to TVS. It has also been observed that the two methods were significantly different in length of procedure, complications, and pain. The cosmetic outcome of TVA method was not acceptable, as the one-year follow-up results indicated difference in there recurrence rate and pain with

other complications. In this study the sample size was very small. Hence, these findings have to be further validated with large sample size of forearm before concrete recommendations.

Introduction

Varicose veins are a common clinical problem in vascular surgery that may significantly affect quality of life, with involvement as high as 10% to 46% of the population worldwide [1]. Varicose veins are twisted, dilated veins most commonly located on the lower extremities. The exact pathophysiology is debated, but it involves a genetic predisposition, incompetent valves, weakened vascular walls, and increased intravenous pressure.

Risk factors include family history of venous disease; female sex; older age; chronically increased intra-abdominal pressure due to obesity, pregnancy, chronic constipation, or a tumor; and prolonged standing. Symptoms of varicose veins include a heavy achy feeling and an itching or burning sensation; these symptoms worsen with prolonged standing. Potential complications include infection, ulcers, stasis changes, and deep venous thrombosis causing damage to valves and secondary revascularization; and arteriovenous shunting [2]. Conservative treatment options include external compression; lifestyle modifications, such as avoidance of prolonged standing and straining, exercise, wearing non-restrictive clothing, modification of cardiovascular risk factors, and interventions to reduce peripheral edema; elevation/hanging of the affected leg/arm; weight loss; and medical therapy. There was not enough evidence to determine if compression stockings were effective in the treatment of varicose veins in the absence of active or healed venous ulcers [3].

Interventional treatments include external laser thermal ablation, endovenous thermal ablation, endovenous sclerotherapy, and surgery with stripping. Although surgery was once the standard of care, it largely has been replaced by endovenous thermal ablation, which was performed under local anesthesia and was better outcomes and fewer complications than other treatments [4].

Varicose veins are subcutaneous veins dilated to at least 3 mm in diameter when measured with the patient in an upright position. They are part of a continuum of chronic venous disorders ranging from fine telangiectasias, also called spider veins, (less than 1 mm; Figure 1) and reticular veins (1 to 3 mm; Figure 1) to chronic venous insufficiency, which may include edema, hyperpigmentation, and venous ulcers[5].

Figure-1: Preoperative photo of varicose veins on posterolateral aspect of left forearm of 23-year-old man. Accompanying ascending phlebogram illustrates multiple superficial varicosities, segmental areas of dilation, and patent deep system [8].

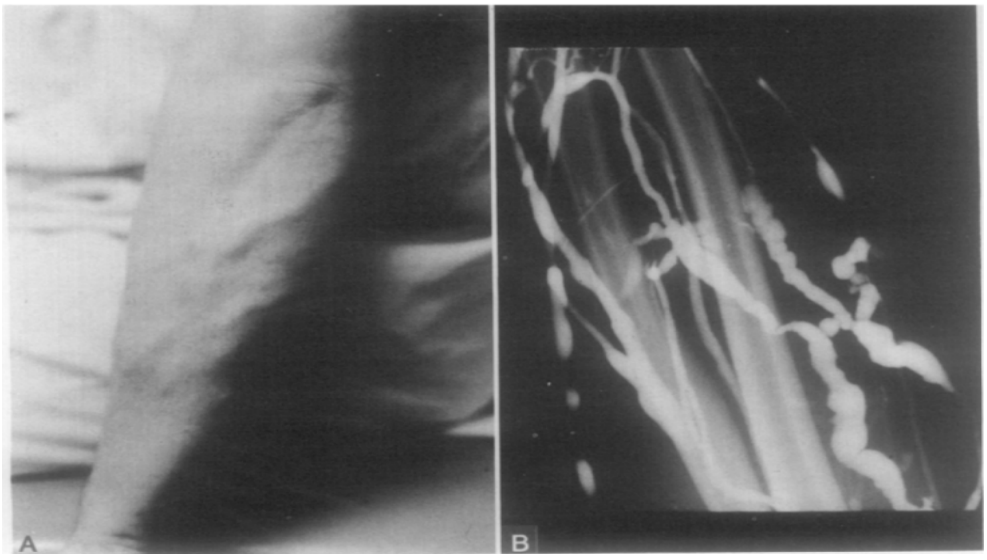

Figure 1:

Chronic venous disease is most commonly described using the CEAP (clinical, etiologic, anatomic, pathophysiologic) classification system. CEAP classification guidelines are as follows (Table-1):

Table 1: The Basic CEAP Classification System for Chronic Venous Disease [8]

Classification	Description
Clinical*	
C_0	No visible or palpable signs of venous disease
C_1	Telangiectasias or reticular veins
C_2	Varicose veins
C_3	Edema
C_{4a}	Pigmentation or eczema
C_{4b}	Lipodermatosclerosis or atrophie blanche
C_5	Healed venous ulcer
C_6	Active venous ulcer
Etiologic	
Ec	Congenital
Ep	Primary
Es	Secondary (postthrombotic)
En	No venous cause identified
Anatomic	
As	Superficial veins
Ap	Perforating veins
Ad	Deep veins
An	No venous location identified
Pathophysiologic	
Pr	Reflux
Po	Obstruction
Pr,o	Reflux and obstruction
Pn	No venous pathophysiology identifiable

Varicose veins of the upper extremity are rare, whose etiology seems to be common with those of the lower extremity. Before veins become varicose veins, they can protrude due to certain lifestyle pressures [6]. Having a low percentage of body fat may cause the veins to protrude from your hands.

Also, exercise raises blood pressure and pushes veins towards the skin – although this typically goes away, regular exercise may make bulging veins become permanent [7]. Patients with lower limb varicosities are more prone to develop varicosities in upper limb as well. Patients who lift heavy weights, those with congenital disorders such as Klippel–Trenaunay syndrome, and those with arteriovenous fistulae for hemodialysis are more prone to upper limb varicosities [8].

Etiology:

Venous disease resulting in valvular reflux appears to be the underlying cause of varicose veins [8]. In most cases, the valvular dysfunction is presumed to be caused by a loss of elasticity in the vein wall, with failure of the valve leaflets to fit together.

Rather than blood flowing from distal to proximal and superficial to deep, failed or incompetent valves allow blood to flow in the reverse direction. With increased pressure on the affected venous system, the larger veins may become elongated and tortuous. Shear stress on venous endothelial cells due to reversed or turbulent blood flow and inflammation are also important etiologic factors for venous disease [9].

Varicose Veins Causes and Symptoms [10]:

- Blue or dark purple coloured veins.
- Veins that appear to be bulging or twisting beneath the skin.
- Chronic aching or heaviness in the arms.
- Swelling, throbbing, burning or cramping in the arms and hands.
- Redness, discolouration or itching around prominent veins.
- Skin hardening or ulcers that are localized to one area (this may indicate more serious vascular diseases)

Varicose veins in arms may look similar across a range of patients, and the common causes include:

- A family history of varicose veins or spider veins
- Natural ageing that weakens the veins and their ability to control blood flow.
- Pressure on the midsection or abdomen that pushes blood to the extremities, this may be caused by excess weight or pregnancy.
- Menopause can cause hormonal and physical changes to the body.

Treatment options available for upper limb varicose veins are more or less similar to those of lower limb varicosities. However, different treatment methods have different results [10]. In 1997,

Bergan first applied endovenous laser treatment (EVLT) for varicose veins management [11,12].

Treatment:

Treatment options for varicose veins included conservative management and interventional therapies such as thermal ablation, endovenous sclerotherapy, and surgery with stripping [13,14]. The decision to proceed with treatment and the choice of treatment are based on symptoms and patient preferences. Other considerations included cost, potential for complications, and availability of resources, insurance reimbursement, and physician training. The presence or absence of deep venous insufficiency and the characteristics of the affected veins can also guide treatment [15]. Over the past 10 years, there has been a significant change in the recommendations for treatment of symptomatic varicose veins. This is in large part because of the lack of evidence supporting the use of compression stockings and the rise of minimally invasive endovascular techniques [16,17].

Conservative Management:

Conservative treatment options included external compression; lifestyle modifications, such as avoidance of prolonged standing and straining, exercise, wearing non-restrictive clothing, modification of cardiovascular risk factors, and interventions to reduce peripheral edema; elevation of the affected leg/arm; weight loss; and phlebotonics. These measures are recommended for patients who are not candidates for endovenous or surgical management, do not desire intervention, or are pregnant [18].

Compression has long been recommended as initial therapy for varicose veins. However, there is not enough evidence to determine if compression stockings are effective in the treatment of varicose veins in the absence of active or healed venous ulcers. The 2020 National Institute for Health and Care Excellence clinical guidelines recommend offering external compression only if interventional treatment is ineffective and as first-line therapy only in pregnant women[18]. In some cases, a trial of external compression may be required by insurance companies before approval of interventional treatments. Although the optimal length and pressure for effective treatment has not been determined, typical recommendations include wearing 20 to 30 mm Hg elastic compression stockings with a gradient of decreasing pressure.

Phlebotonics are oral and topical therapies that may increase venous tone, improve capillary hyperpermeability, and decrease blood viscosity with the goal of decreasing symptoms of chronic venous insufficiency [19]. it included flavonoids or other compounds often extracted from plants, such as rutin (also called rutoside), diosmin, hidrosmin, disodium flavodate, French maritime pine bark extract (Pycnogenol), grape seed extract, and horse chestnut seed extract (Aesculus hippocastanum). Diosmiplex (Vasculera) is the only prescription formulation available in the United States.[20]. Diosmiplex is derived from orange rinds and is categorized as a medical food, not a drug. The usual dosage is 630 mg daily. Horse chestnut seed extract appears to be safe and effective in reducing pain, edema, and pruritus from chronic venous insufficiency when used for two to 16 weeks. The common dosage is 300 mg twice daily or 50 mg of escin, the active compound.[21] There is moderate-quality evidence that other phlebotonics may improve edema and possibly decrease symptoms such as cramps, restless legs, and paresthesia. Most phlebotonics are available as dietary supplements in the United States, and many formulations contain multiple phlebotonics in a single supplement. Long-term studies of the safety and effectiveness of phlebotonics for the treatment of varicose veins are lacking [22].

Interventional Treatment:

Thermal Ablation

Thermal ablation destroys damaged veins using an external laser or via endovenous catheter using a laser (endovenous laser ablation) or radio waves (radiofrequency ablation). External laser thermal ablation works best for telangiectasias. In this therapy, hemoglobin absorbs the laser light leading to thermo coagulation. Endovenous thermal ablation can be used for larger vessels, including the great saphenous/Cephalic vein. Under ultrasound guidance, a laser optical fiber or radiofrequency catheter electrode is inserted into the vein. Heat from the laser or radio waves coagulates the blood in the vein, resulting in closure of the vein and redirection of blood flow to functional veins [23].

Endovenous thermal ablation is performed after a local anesthetic is injected around the vein. Patients can walk after the procedure and may be discharged home the same day. Patients may return quickly to work and other activities. There is a risk (approximately 7%) of surrounding nerve damage attributed to thermal injury; however, most nerve damage is temporary [24]. Endovenous thermal ablation is recommended as first-line treatment for nonpregnant patients with symptomatic varicose veins and documented valvular reflux, and need not be delayed for a trial of external compression.

Endovenous Sclerotherapy:

Endovenous sclerotherapy involves using ultrasound guidance to inject superficial veins with an agent that causes inflammation of the endothelium, resulting in fibrosis and occlusion in the vein.27 Sclerotherapy is typically used for

small (1 to 3 mm) and medium (3 to 5 mm) veins or to treat recurrent varicose veins after surgery; however, there is not a precise diameter used to make treatment decisions [25].A needle is inserted into the vein and the sclerosing agent is injected, often with air tocreate a foam. The foam displaces the blood and reacts with the vascular endothelium, sealing and scarring the vein. A variety of agents may be used, including hypertonic saline, sodium tetradecyl (Sotradecol), and polidocanol (Varithena). There is no evidence that any of these agents is superior to the others in terms of effectiveness or patient satisfaction [26].

Surgery: (ligation and Stripping) Historically, surgery with ligation and stripping of the great or small saphenous/Cephalic vein has been the standard of care for the treatment of varicose veins after the failure of conservative therapy.

However, a growing body of literature does not consistently support surgery as the best interventional treatment option, and the 2020 National Institute for Health and Care Excellence clinical guidelines recommend surgery as thirdline therapy after endovenous thermal ablation and sclerotherapy [Updated surgical techniques use small incisions to reduce scarring, blood loss, and complications and limit removal of the veins from the groin to knee/elbow. Some of these procedures can be performed under regional or local anesthesia.

Ligation and stripping of the great and small saphenous/Cephalic vein are probably the best known procedures, and smaller veins can be removed via phlebectomy, during which a scalpel or large-gauge needle is used to create punctures every 2 to 3 cm along a varicose vein. Segments of the damaged vein are removed using forceps or small hooks [28].

Complications:

Thrombosis: Endovenous health-induced thrombosis occurs when a thrombus extends from the ablated greater saphenous vein into the deep femoral vein.

It is differentiated into four types: type 1 at the junction of a superficial and deep vein; type 2 located in deep vein with partial occlusion (<50%); type 3 occlusion (50%-99%); type 4 complete occlusion. Incidence of endovenous health-induced thrombosis was found to be 1.4%, deep vein thrombosis was 0.3%, and pulmonary embolus was in 0.1% of cases [15].

Hematoma and Ecchymoses: These are listed as complications of the procedure, but the impact on the patient is subjective depending on expectations. Furthermore, the use of higher wavelength lasers has been associated with decreased pain and ecchymoses due to better energy absorption by water and less by hemoglobin.[10].

Skin burns: Ablating superficial veins close to the skin surface can cause full-thickness burns, but the frequency of complication significantly decreases to zero with better application of tumescent anesthesia. It can be treated with local wound care and monitoring for infection.

Nerve damage: GSV ablation can damage the saphenous/Cephalic nerve causing transient cutaneous paresthesia in the medial leg/arm. SSV ablation can damage the nerve causing transient cutaneous paresthesia in the lateral foot/hand. The majority of nerve injuries can be avoided with careful needle placement under ultrasound guidance and better tumescent anesthesia [16].

Recurrence: Meta-analysis showed that the five-year recurrence rate for laser ablation of GSV was found to be 36.6%, which is comparable to radiofrequency ablation and conventional surgery [17].

It has been reported that, nonsurgical therapies may have faster returnto-work and recovery times than surgery. Endovenous laser ablation may be better tolerated than sclerotherapy and surgery, with fewer adverse effects and equal effectiveness. For all three therapies, rates of minor and major complications, including numbness, persistent bruising or tenderness, skin ulceration, skin staining, and lumpiness, are relatively low (1% to 7%). Hematomas occur more often with surgical treatment than with foam sclerotherapy or radiofrequency ablation. Endovenous laser ablation appears to be superior to surgery in terms of technical failure and neovascularization. Although all interventional treatment leads to symptomatic improvement, the improvement at six months may be more significant with endovenous laser ablation and surgery than with foam sclerotherapy [8,15, 29].

Aim and objectives

The study aimed to compare the outcome and associated postoperative complications, including deep venous thrombosis, pulmonary embolism or paresthesia, and ecchymosis, with two modalities (Traditional Vein Stripping (TVS) and Endovenous Laser Ablation (EVLA) in the management of varicose veins of upper extremity. The patients were followed up for post-operative recovery time, ease of intervention, post-operative morbidities if any and data were compared for analytical study.

Materials and Methods

Materials:

Study Site: Hind Institute of Medical Sciences, Mau, Ataria, Sitapur, UP, India.

Study Design: Prospective comparative and analytical study.

Study Periods: 18 months, after obtaining IHEC clearance.

Study Groups: two groups, Arm-I-Traditional Vein Stripping (TVS), Arm-II-EVLA (Endovenous Laser Ablation).

Sample Size: 56 (28 in each Group, both sex)

The present study was a single-center, prospective comparative study conducted on patients admitted with varicose veins in the surgical wards of Hind Institute of Medical Sciences and Hospital, Ataria, Sitapur, UP. From March 2022 to August 2023. A total of 56 varicose veins patients admitted in ward were divided into the two groups of 28 patients in each group who underwent EVLA or TVS surgery as per patients consent. Patients were included in the study based on the inclusion and the exclusion criteria as mentioned below:

Inclusion criteria: Inclusion criteria for current study were; varicose veins of forearms in the age group of 18 to 80 years. (Patients with Grade C1 or higher according to CEAP classification).

Exclusion criteria: Exclusion criteria for current study were; age extremities ≤18 and ≥80 years, patients with deep vein thrombosis, with associated short cephalic vein varicosity, with venous ulcer or other complications and recurrent varicosity.

Procedure: Patients admitted under general surgery with varicose veins were included in the study after taking their consent. Detailed history & thorough physical examination of the patients were included under the study was done and recorded in a proforma for each patient separately.

All patients were subjected to investigations like Doppler study of upper limbs, CBP and other routine blood investigations. Operative procedure like EVLA and TVS (procedure with venous stripping).

Results

In total, 56 patients were included in the study from March 2022 to August 2023. The patients were divided into the EVLA group (n=28; 20 males, 8 females) and the TVS group (n=28; 22 males, 6 females). The mean age of the patients was 42.21± 10.24 years in the EVLA group and 41.9± 9.31 years in the TVA group (P =0.788).

The left arm was affected in 71.42 % of the EVLA group and 64.28% of the TVS group (P =0.640). Patient demographics were shown in Table-2.

Table 2: Demographic profiles of patients

Variables		TVS (28)	EVLA (28)	P Value
Age		Age 41.9± 9.31	Age 42.21± 10.24	0.788
Age Groups (years) 18-20 21-30 31-40 41-50 51-60 61-70 71-80		 0 2 3 12 7 3 1	 1 2 4 11 6 3 1	0.692
Gender	Male	20(71.42%)	22 (78.57%)	0.864
	Female	8 (28.57%)	6 (21.42%)	
Upper Arms	Left	18 (64.28%)	20 (71.42 %)	0.640
	Right	10 (35.31%)	8 (28.57%)	
BMI kg/m^2				0.691
Normal		8	9	
Overweight		16	15	
Obese		4	4	
(Mean±SD) Range		25.88±3.25 25.72-42.89	26.13±2.86 25.86- 43.13	NS
AVVSS (Mean±SD)		4.8± 2.7	4.7± 3.1	0.079

EVLA: Endovenous Laser Ablation, TVS: Traditional Vein Stripping, AVVSS: Aberdeen Varicose Vein Symptom Severity

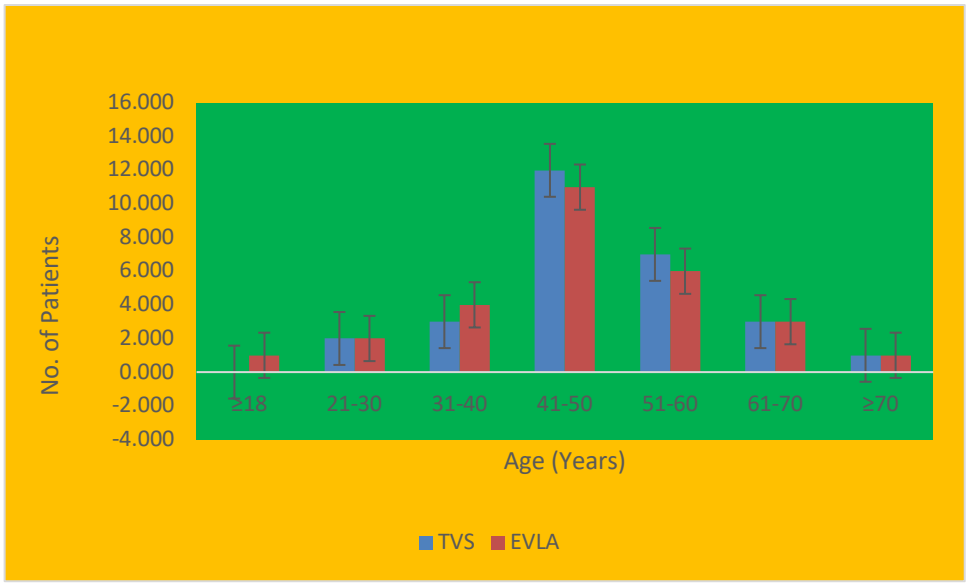

Figure 2: Age distributions of Patients in two groups

Figure-2, revealed that the maximum number of patients were in the age group of 41-50 in both study groups (TVS & EVLA)

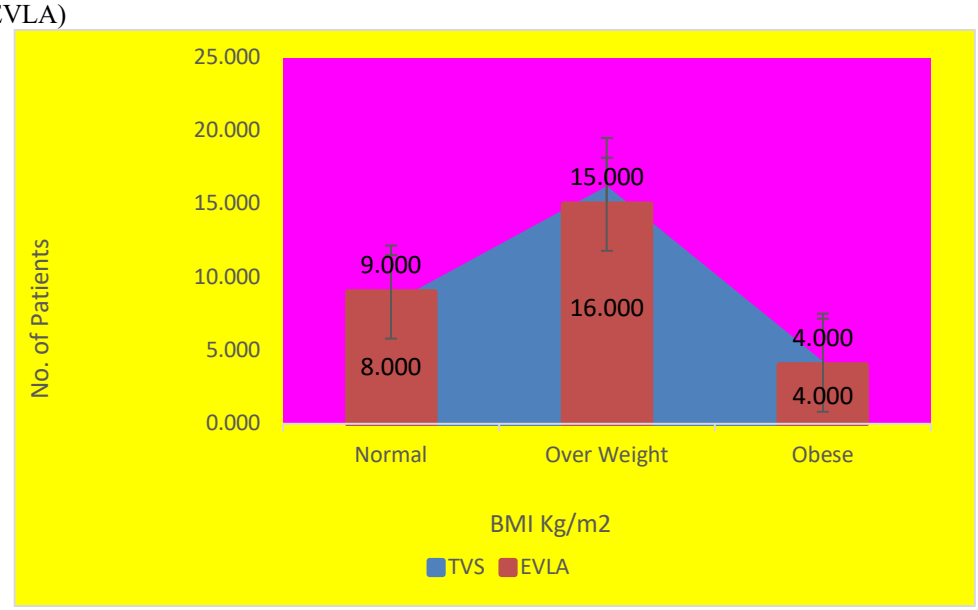

Figure 3: BMI distribution among Patients of two groups

Figure-3, illustrated that the maximum number of patients were in the overweight group of BMI/m^2 in both study groups (TVS & EVLA). Mean±SD and Range, of TVS group was 25.88±3.25; 25.72-42.89 respectively whereas it was 26.13±2.86; 25.86 - 43.13 in EVLA group. It was also found not significant. According to AVVSS (Aberdeen varicose vein symptom severity), in the EVLA group was 4.7±3.1 and 4.8± 2.7 in the TVS group, and the differences were found significant at 6, 12 and 24 hours (P=0.05) [Table-3 & figure-4].

Table 3: Acute pain distribution according to NRS

Pain	Pain Score Mean ±SD		P Value
Pain during procedure (0 hr)	TVS	8.98 ±0.674	0.069
	EVLA	8.75 ± 0.198	
Pain at 6 hours	TVS	8.72 ±1.045	0.05
	EVLA	6.57 ±1.032	
Pain at 12 hours	TVS	7.42 ±1.012	0.05
	EVLA	5.43 ±1.030	
Pain at 24 hours	TVS	6.58 ±1.026	0.05
	EVLA	4.17 ± 0.911	

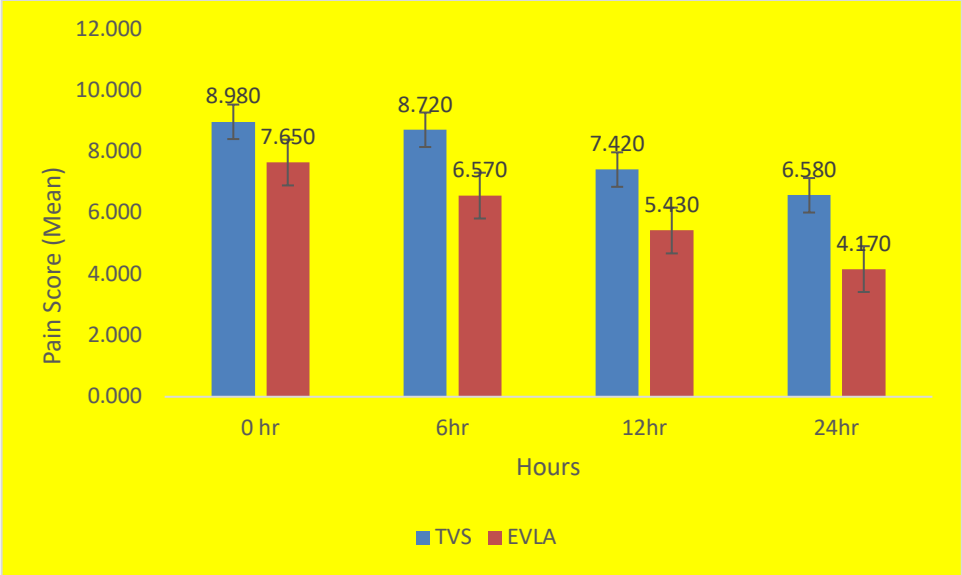

Figure 4: Pre & post-operative pain Score in the patients of two groups

Table-3 and Figure-4, illustrated that Pain severity in 6 ,12 and 24 hours after the procedures were significantly different between the two groups .

The pain score was found more in TVS group as compared to EVLA; at 24 hours it was 6.58 ±1.026, in TVS; whereas 4.17 ± 1.011 in EVLA. (p=0.05).Chronic pain (seventh day, 3, 6, and 12 months after the procedures) was present in 14.28% of the EVLA group and 25% of the TVA group. It was found significant (P ≤0.05; Table 4).

According to NRS, the mean chronic pain severity in the EVLA group was 3.50 ± 0.657 versus 5.99 ± 0.754 in the TVA group, and the difference was significant (P= 0.05).

Table 4: Chronic Pain Distribution in two treatment modality

	TVS (n=28		EVLA (n=28)	P Value
Chronic pain	Yes	7 (25%)	4(14.28%)	0.05
	No	21(75%)	24(85.71%)	
Chronic pain score (NRS)	5.99 ± 0.754		3.50 ± 0.657	0.05

NRS: numerical rating. The length of the operation was 41.3±10.6 minutes in the EVLA group versus 52.3±11.8 minutes in the TVA group that was also found significant (P=0.14; Table 4). At 3 months, the recurrence rate of the EVLA and TVA groups was 3.5 and 6.7% respectively (P=0.05); Table 5).

Table 5: Clinical Results of two treatment modality

	TVS	EVLA	P Value
Length of operation (min)	52.3± 11.8	41.3± 10.6	0.05
Recurrence rate	6.7%	3.5%	0.05
RR At 3 months	18(64.28%)	6 (21.42%)	0.05
Patient satisfaction In follow-up			
At 6 months	16(57.14%)	26(92.85%)	0.05
At 12 months	19(67.85%)	27 (96.42%)	0.05

The prevalence of different side effects and scores is presented in Table 5, which were significantly different in both groups on follow-up. Bruising was found 64.28% at 3 months; 39.28% at 6 months and 21.42% at 12 months in TVS group, whereas it was 21.42%, 10.71% and 0% in EVLA group respectively. No significant difference was observed between the two treatment groups in major adverse events like DVT and pigmentation (Table 6).

Table 6: Prevalence of Side Effects on Follow-up

Symptom	Follow-up	TVA, N (%)	EVLA, N (%)	P value
Bruising	At 3 months	18 (64.28%)	6 (21.42%)	0.05
	At 6 months	11(39.28%)	3 (10.71%)	
	At 12 months	6(21.42%)	0 (0%)	
Pigmentation	At 3 months	13(46.42%)	2 (7.14%)	
	At 6 months	9 (32.14%)	1(3.57%)	0.08

	At 12 months	3 (10.71%)	0(0%)	
Paresthesia	At 3 months	11 (39.28%)	3 (10.71%)	0.05
	At 6 months	7 (25%)	2 (7.14%)	
	At 12 months	4(14.28%)	0 (0%)	
DVT	At 3 months	1 (3.57%)	0 (0%)	0.06
	At 6 months	1 (3.57%)	0 (0%)	
	At 12 months	0 (0%)	0 (0%)	
Superficial vein Phlebitis	At 3 months	6 (21.42%)	3 (10.71%)	0.05
	At 6 months	4 (14.28%)	0 (0%)	
	At 12 months	2 (7.14%)	0 (0%)	
Hematoma	At 3 months	5 (17.85%)	1 (3.57%)	0.05
	At 6 months	3 (10.71%)	1 (3.57%)	
	At 12 months	1 (3.57%)	0 (0%)	
Arm Edema	At 3 months	4 (14.28%)	1 (3.57%)	0.05
	At 6 months	3 (10.71%)	0	
	At 12 months	1 (3.57%)	0	
SSI	At 3 months	4 (14.28%)	1 (3.57%)	0.08
	At 6 months	2 (7.14%)	0	
	At 12 months	0 (0%)	0	

Despite an initial increased in the first hours, the AVVSS score significantly declined in both groups after treatment. it was significantly different between the groups at 12 months of follow-up. We observed a maximum declined in symptoms between one week and three months postoperative in both groups. Patient satisfaction was not similar in both groups at 3, 6, and 12 months of follow-up (Table 7).

Table 7: AVVSS Score Measured at Each Follow-up

Visit	EVLA Mean ± SD	TVA Mean ± SD	P Value
Screening	8.5± 2.9	8.3± 2.8	0.690
8 hours	6.9± 1.6	8.9± 2.5	0.05
24 hours	5.2± 1.5	7.8± 2.0	0.89
3 months	3.0± 1.8	6.6± 1.2	0.05
6 months	2.7± 2.2	5.1± 1.5	0.05
12 months	0.5± 1.0	1.8± 2.0	0.05

AVVSS: The Aberdeen Varicose Vein Symptom Severity,

Table 7a: Paired Comparisons between mean Aberdeen Varicose Vein Questionnaire (AVVQ) Scores in two treatment groups

Variables		Mean ±SD		Paired Differences			t	P value
		Pre	Post	Δ=Pre-and post-mean± SD	95% CI of the Difference			
					Lower	Upper		
AVVQ	EVLA	82.32±4.83	9.86±3.22	69.32±5.31	71.03	74.96	118.71	≤0.001
	TVS	81.93±3.97	18.65±3.21	76.03±4.98	75.33	81.39	126.32	≤0.001

It also observed that the Post AVQQ score was significantly lower in all EVLA operation [Table-7a]. VCSSS score was also significantly lower in all EVLA operation [Table-8 & 8a].

Table 8: Paired Comparisons of mean Venous Clinically Severity Score (VCSS) obtained in two treatment procedures.

Variables		Mean ±SD		Paired Differences			t	P
		Pre	Post	Δ= Pre-& Post (Mean±SD)	95% CI of the Difference			
					Lower	Upper		
VCSS	EVLA	28.34±2.43	4.03±0.58	11.03±1.64	14.98	19.06	48.71	≤0.05
	TVS	28.01±1.98	6.76±1.06	13.33± 2.11	13.69	21.82	56.32	≤0.05

P Value ≤0.05, statistically Significant, CI: Confidence Interval.

Table 8a: Comparisons of mean Venous Clinically Severity Score (Pre-and Post-difference) In two treatment groups

Variables		Δ= Pre & Post (Mean±SD)	Mean±SD Error of difference	95% CI		P
				Lower Bound	Upper Bound	
VCSS	EVLA	18.63±2.43	-10.03±0.04	-11.08	-8.79	≤0.001
	TVS	19.47±3.98	-12.33± 0.41	-11.96	-10.51	≤0.001

Table 9: Paired Comparisons of mean Venous Disability Scores (VDS) in different treatment groups

Variables		Mean ±SD		Paired Differences			t	P
		Pre	Post	Δ= Pre-& Post (Mean±SD)	95% CI of the Difference			
					Lower	Upper		
VDS	EVLA	2.19±0.42	0.43±0.38	0.89±0.14	1.26	1.88	28.31	≤0.01
	TVS	3.61±0.98	0.89±0.66	1.33± 0.91	2.09	2.02	31.02	≤0.01

Table 9a: Comparisons between mean Venous Disability Score (VDS) scorses in different treatment group

Variables		(Mean±SD)	Mean±SD of difference	95% CI		P
				Lower Bound	Upper Bound	
VDS	EVLA	1.63±0.43	-0.02±0.03	1.01	-0.09	≤0.05
	TVS	2.27±1.08				

Table-8,8a & 9, 9a illustrated that the Post-VDS score was significantly lower in all EVLA patients as compared to TVS. The mean pre–post difference in the VDS scores was higher in TVS and also found significantly different (EVLA-0.89±0.14 vs. TVS-1.33± 0.91, P < 0.01).It was also observed that the return to normal activities (days) was better in EVLA group as compared to TVS, it was 2.1±02 (Days) in EVLA whereas, 3.2± 1.6 in TVA. (p=0.05).

Discussion:

Although there are several possible causes for varicose veins, the most accepted theory is a congenital defect in the structure of the vein wall. Abnormalities demonstrated in varicose veins include increased collagen deposition in an irregular fashion, separation and thinning of smooth muscle bundles, decreased elastin with a net increase in the colla gen/elastin ratio and vacuolated endothelial cells with pylmoticnuclei [29].

These changes in the vein wall can occur segmentally and also develop to a lesser extent in veins that have not yet become varicose in those patients with other overt varicosities. Varicose veins shown decrease contraction and relaxation when compared with normal veins. Other factors may also play a secondary role in the development of varicose veins. Primary valvular incompctence, caused by floppy valve cusps, is well recognized as a cause of deep venous reflux. This condition likely exists in the superficial system as well with the resulting reflux leading to venous dilation [30].

Small arteriovenous fistulas have been suggested as an etiologic factor by causing increased flow resulting in varicose veins, because anastomoses between arterioles and varicosc veins have been demonstrated both angiographically and by microsurgical dissection. Incompetent perforating veins have been implicated in the development of lower extremity varicose veins. However, in the arm, the valves in the perforating veins are oriented toward the superficial veins, thus excluding this as a cause of upper extremity varicose veins. Congenital vascular anomalies are a rare cause of upper extremity varicose veins [31].

The KlippelTrenaunay syndrome is comprised of soft tissue hypertrophy, cutaneous hemangioma, varicose veins and affects the upper extremity in only 5% to 15% of reported series [32].The Parkes-Weber syndrome, which adds a functional arteriovenous fistula to the Klippel-Trenaunay syndrome triad, is another rare cause of arm varicose veins. Congenital arteriovenous fistulas, which may be diffuse or localized and are usually not associated with cutaneous hemangiomas, may affect the arm in up to 50% of cases.

Arteriovenous fistulas for hemodialysis may cause venous hypertension leading to dilation, ulcerations, and chronic venous stasis in the arm and hand [33]. Position plays a predominant role in the formation of varicosities. The diagnosis of upper extremity primary varicose veins can be highly suspected with a good history and physical examination. Absence of venous thrills, pulsations, bruits, limb hypertrophy, portwine hemangiomas, and previous surgery can exclude congenital or acquired vascular anomalies. Noninvasive testing,

particularly duplex scanning, is useful in diagnosing patency, reflux and possible obstruction [34]. Given the rarity of the condition, invasive phlebograms and arteriograms, although probably not necessary, may be obtained to exclude vascular anomalies with certainty. Treatment of upper extremity varicosities was similar to that of varicose veins in the leg. The Traditional surgical technique, combined with stripping of longer segments, provides excellent cosmetic and functional results. Surgery was performed with local, regional, or general anesthetic [35].In this study two procedures (EVLA & TVS) were used in our patients. Primary varicose veins of the upper extremity was a very rare occurrence, but presents similarly to lower extremity varicosities and likely have the same cause. Diagnosis was readily made, but excluded vascular anomalies, because surgery could worsen symptoms in those patients [6]. The salient features of upper extremity varicose veins are presented in Table 10.

Table 11: Characteristic features of primary upper limb varicose veins.

Incidence of upper extremity varicose veins was very less	
Etiology	• Primary ◦ Rare as the valves in the perforating veins of upper extremities are oriented toward the superficial veins • Congenital ◦ Klippel–Trenaunay syndrome ◦ Parkes Weber syndrome • Secondary ◦ Venous outflow obstruction caused by deep vein thrombosis or arteriovenous fistulae
Pathophysiology	• Collagen defects in the vein wall resulting in weakness and dilation is most accepted theory of upper extremity primary varicose veins, which is alsapplicable for lower extremity varicosities
Diagnosis	• Noninvasive investigations ◦ Color Doppler ultrasound • Invasive tests ◦ Phlebography ◦ Arteriography (when congenital and anatomical variations are suspected)
Treatment	• Same as lower limb varicosities ◦ Ligation and stripping ◦ Multiple ligation and excision of localized varicose vein segments ◦ Sclerotherapy ◦ Surgical division of the fistula (for arteriovenous fistulae)

All scores referable to pain and tenderness were not statistically similar between the two groups at 8 hours, 24 hours, 1 week, 6, and 12 months. Minor complications were more prevalent in the TVA group (P = 0.05); there were no major complications in EVLA. It was found similar with previous pilot studies and case reports [2,7,8].Treatment for varicose veins encompassed open surgeries with stripping and endovenous laser techniques (EVLA] which shown comparative results in clinical improvement, complications, and postoperative stay in hospitals in our study which was agreeable with previous studies, conducted for VV of upper extremity [9,10] .

Both VCSS and VDS are sensitive tools for the measurement of clinical outcomes of treatments of venous disease. However, the choice of appropriate tool is dependent upon the type of treatment, the surgeon's personal experience, availability of resources, durations of hospital admission, and cost of treatment [35].

In this study, the AVVSS score, VDS, VCSS, AVVQ scores were calculated for all patients on each follow-up visit and compared the results. All parameters for post-inflammatory sequelae, recovery timing, complications, demonstrated the differences in two study groups, TVA versus EVLA. It was observed that the patient's recovery with better tolerance were in the EVLA procedure because controlled heating avoided the vein perforations often seen with TVA with other adverse effect. Similarity was also reported in previous studies, conducted for forearms [10,33,34].

Hence, Traditional surgery with Stripping was not considered even, although it was proposed in the past for VVs of the upper limb [3,10].

Conclusion

Primary varicose veins of the upper extremity are a diagnostic and therapeutic challenge. The combination of a good history, accurate clinical examination and color flow Doppler ultrasound is the cornerstone of diagnosis and treatment.

The observations have shown that the TVS has increased incidence of hematoma formation and the movement of arms on the first postoperative day was very painful. The results of this study indicated the higher efficacy of EVLA for upper extremity varicosis treatment as compared to TVS. It has also been observed that the two methods were significantly different in length of procedure,

complications, and pain. The cosmetic outcome of TVA method was not acceptable, as the one-year follow-up results indicated difference in there recurrence rate and pain with complications between the two groups. In this study the sample size was very small. Hence, these findings have to be further validated with large sample size of forearms before concrete recommendations.

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