Treatment of Varicose Veins

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Opinion statement

Varicose veins (VVs) are the most common manifestation of chronic venous insufficiency, affecting 25% of women and 15% of men. Reticular veins and telangiectasias (spider veins) are found in more than 80% of the general population. VVs produce symptoms of pain, swelling, heaviness, fatigue, and pruritus and predispose patients to complications including bleeding, superficial thrombophlebitis, and ulcerations that interfere with activities of daily living and result in lost time from work. Current treatments for VVs include conservative measures, and when these are unsuccessful, more invasive surgical and endovenous interventions primarily aimed at reducing venous hypertension and preventing progression to chronic inflammation and ulcerations. Surgical procedures including saphenous vein stripping, ligation of the saphenofemoral junction, and ambulatory phlebectomy are effective in the treatment of VVs but are associated with a high complication rate and recovery time. Emerging endovenous therapies, including endovenous laser therapy, radiofrequency ablation, and endovenous foam sclerotherapy, have shown similar efficacy in the treatment of VVs compared with more invasive surgical procedures, with lower complication rates and less time lost from work.

Introduction

Varicose veins (VVs) are the most common manifestation of chronic venous insufficiency (CVI), affecting up to 25% of women and 15% of men [1]. Risk factors include female gender, advancing age, family history, pregnancy, prolonged standing, obesity, vascular malformations, and hormone therapy [2•,3].

VVs are tortuous, dilated, bulging, superficial veins measuring more than 4 mm [3]. Reticular veins represent smaller veins, measuring 1 to 4 mm and identified by their flat, blue-green, less tortuous appearance [3]. Telangiectasias, or spider veins, are the smallest veins, measuring less than 1 mm and identified by their blue-black, purple, or reddish appearance [3].

VVs may be categorized according to their underlying etiology. Primary VVs result from idiopathic structural or functional defects in the venous system. Secondary VVs result from underlying venous obstruction, most commonly deep vein thrombosis (DVT), or underlying deep venous insufficiency [3]. These defects result in venous hypertension, weakened venous walls, abnormal distention of the surrounding connective tissue, and separation of valve cusps. Prolonged venous hypertension ultimately leads to venous valvular incompetence or reflux and venous dilatation [3].

Although VVs have traditionally been regarded as simply a cosmetic problem, more commonly they produce symptoms of heaviness, fatigue, pain, swelling, restlessness, burning, and pruritus, which interfere with activities of daily living and result in lost time from work [2•,3]. VVs are associated with several complications, including spontaneous varix rupture with hemorrhage, superficial thrombophlebitis, DVT, and venous ulceration [2•,3]. Although the true incidence of these complications is unknown, they are estimated to occur in approximately 5% of patients with VVs [4]. Venous ulcerations affect approximately 1% of the general population, with a US health care cost of $3 billion per year [2•]. Venous ulcerations can take more than 9 months to heal, with 66% of ulcers lasting longer than 5 years [2•].

In addition to improving cosmetic appearance, current treatments for VVs are aimed at reducing venous hypertension and the resultant chronic inflammation that leads to ulceration [2•,5•]. Treatment options include conservative measures (lifestyle modification, medications, and compression therapy), and if these are unsuccessful, surgical and, more recently, endovascular procedures, in which the vein is removed, ligated, or sclerosed [3,5•]. These treatments may be used alone or in combination to improve the appearance and the lifestyle-limiting manifestations of VVs.

Treatment

Conservative therapies

- Conservative treatments for VVs and subsequent CVI include lifestyle modifications, compression therapy, and pharmacotherapy.
- The following treatments are discussed in detail in "Treatment of Chronic Venous Insufficiency" in *Current Treatment Options in Cardiovascular Medicine*, volume 9, number 2 [5•].

Diet and lifestyle changes

- Patients with VVs are advised to avoid prolonged standing or sitting, elevate the legs above the level of the heart as much as possible, lose excess weight, and exercise to minimize swelling and improve calf muscle function [3,5•].

Compression

- External compression garments and devices have been the mainstay of therapy for VVs. Compression therapy, including graduated elastic compression stockings and short-stretch bandages, is effective in reducing lower-extremity pain and swelling and preventing progression of the disease to venous ulceration [3,4,5•]. However, effectiveness may be limited by patient compliance [4,5•].

Pharmacotherapies

Diuretics

Low-dose diuretics often are prescribed in patients with significant edema but are often minimally effective in reducing the symptoms of pain and discomfort [3,5•].

Topical corticosteroids

Patients with evidence of stasis dermatitis may be treated with a topical corticosteroid to reduce inflammation [5•].

Antibiotics

Antibiotics with good gram-positive coverage for *Staphylococcus* and *Streptococcus* are used for treating cellulitis or infected ulcerations [5•]. Antibiotic coverage should include gram-negative and anaerobic organisms in diabetic patients [5•].

Herbal supplements

Several short-term studies have shown the efficacy of horse chestnut seed extract, which includes the active ingredient aescin, in reducing edema, ankle and calf circumference, and symptoms of CVI [3,5•]. Other herbal medications, including micronized purified flavonoid fraction, French maritime pine bark extract, and rutosides, have demonstrated inconsistent results and are not considered first-line therapy for treatment of CVI [5•].

Surgical procedures

- Surgical interventions have traditionally been the alternative treatment for VVs when conservative management has been unsuccessful. Surgical treatments of VVs include saphenous vein stripping, ligation of the saphenofemoral (SF) junction, and ambulatory phlebectomy [3,4,5•]. Incompetent perforator veins in patients with venous ulcerations can be treated with the open Linton procedure or subfascial endoscopic perforator surgery (SEPS) [4,5•].

Saphenous vein stripping

- First performed in 1844, saphenous vein stripping represents the earliest known surgical treatment for VVs [6]. The great or small saphenous vein and its branches are removed from the ankle to the SF or saphenopopliteal junction, respectively [3]. Patients with incompetent great or small saphenous veins, reflux through the SF or saphenopopliteal junctions, or superficial thrombophlebitis identified by duplex ultrasound are candidates for this procedure [3].

Efficacy

Success for saphenous vein stripping is defined as persistent obliteration of the VVs, absence of recurrent or new VVs, and absence of venous reflux by duplex ultrasound [7••]. A recent meta-analysis reported an overall efficacy of 80.4% (95% CI, 72.3–86.5) at 3 months, 79.7% (95% CI, 71.8–85.8) at 1 year, 77.8% (95% CI, 70.0–84.0) at 3 years, and 75.7% (95% CI, 67.9-82.1) at 5 years for saphenous vein stripping (Table 1) [7••]. Multiple cohort and randomized studies have reported the recurrence rate, defined as emergence of symptomatic VVs clinically and on duplex ultrasound, of 20% to 30% at 5 years [4,8,9]. One study demonstrated evidence of venous incompetence distal to the SF junction in 36% of the limbs at 10 years [10]. Another study of 210 patients reported a recurrence rate of 30% by ultrasound examination 14 years after the procedure, with only 6.9% having clinically significant recurrence of their VVs [11]. The causes of VV recurrence include neovascularization, the presence of superficial and deep venous insufficiency, and the presence of incompetent perforator veins [4,8]. Although saphenous vein stripping improves the quality of life for patients with symptomatic VVs, in one study, the patient satisfaction rate decreased from 86% at 1 year to 74% at 5 years [4].

Procedure

Saphenous vein stripping is performed under general anesthesia [4]. The procedure involves making an incision in the groin and ligating the great saphenous vein (GSV) and its major branches [9,10]. A stiff but flexible wire is inserted into the free end of the GSV and advanced along its length and out through a second incision at the upper calf [9,10]. The vein is tied to the wire in the groin and retrieved through the second incision at the upper calf, stripping the entire GSV [9,10]. The incisions are closed and compression bandages applied [9,10].

Complications

Complications of venous stripping include pain, bleeding, infection, nerve injury, superficial thrombophlebitis, and DVT or pulmonary embolism (PE) [4,12]. Bleeding and hematoma have been reported in up to 24% of patients [4]. Paresthesia, resulting from saphenous nerve injury, has been reported in up to 25% of patients [4]. Wound infections have been reported in 2% to 15% of patients [4]. The reported risk of DVT/PE in patients undergoing venous stripping is less than 2% [4].

Table 1. Current surgical and endovenous treatment options for varicose veins

Parameter	Treatment			
	Saphenofemoral ligation and stripping	Endovenous laser therapy	Radiofrequency ablation	Endovenous foam sclerotherapy
Obliteration rate, % *(± 95% CI)*				
3 mo	80.4 (72.3–86.5)	92.9 (90.2–94.8)	88.8 (83.6–92.5)	82.1 (72.5–88.9)
1 y	79.7 (71.8–85.8)	93.3 (91.1–95.0)	87.7 (83.1–91.2)	80.9 (71.8–87.6)
3 y	77.8 (70.0–84.0)	94.5 (87.2–97.7)	84.2 (75.2–90.4)	77.4 (68.7–84.3)
5 y	75.7 (67.9–82.1)	95.4 (79.7–99.1)	79.9 (59.9–91.5)	73.5 (62.8–82.1)
Complications (rate)	Hematoma (< 30%) Paresthesia (4%–25%) Wound infection (2%–15%) DVT (< 2%)	Pain (50%) Ecchymosis (40%) Hematoma (24%) Phlebitis (12%) Paresthesia (10%) DVT (7%) Hyperpigmentation (< 4%)	Bruising (50%) Paresthesia (4%–20%) Phlebitis (3%–20%) DVT (16%) Hematoma (< 7%) Burns (2%–7%) Infection (< 2%)	Pain (common) Hyperpigmentation (common) Phlebitis (5%) DVT (< 1%) Transient neurologic (< 1%) Skin necrosis (rare)
Setting/anesthesia	Inpatient/outpatient General anesthesia	Outpatient Local anesthesia	Outpatient Local anesthesia	Outpatient No anesthesia required
Recovery time	2–3 wk	3–5 d	3–5 d	24 h

DVT—deep vein thrombosis.
(*Data from* Beale and Gough [4], Bos et al. [7••], and Pannier and Rabe [23•].)

Contraindications

Contraindications include DVT, Klippel-Trénaunay syndrome, and presence of severe peripheral arterial disease (PAD) or neuropathy, which may impede wound healing and increase risk of infection [3,5•,12].

Special points

Venous stripping from ankle to groin is not always necessary [3]. Ligation of the vein at the SF junction in conjunction with removal of the thigh portion of the vein can reduce venous reflux [3]. Venous stripping often is performed in conjunction with ligation of the SF junction, phlebectomy, or endovenous foam sclerotherapy (EFS) [3].

Cost

Saphenous vein stripping has a higher initial cost and results in more time lost from work compared with endovenous procedures [10]. The procedure may be outpatient or require an overnight hospital stay [4]. Recovery time varies from 2 to 3 weeks [4].

Ligation of the saphenofemoral junction

- Ligation of the SF junction can be used in patients with SF reflux [3,4]. Because of the high recurrence rate, ligation of the SF junction is typically performed in conjunction with venous stripping, phlebectomy, or EFS [3,4].

Efficacy

Ligation of the SF junction alone is associated with a high long-term VV recurrence rate, although symptomatic recurrence is less prevalent [3,4]. One study reported a recurrence rate of 5.4% at 1 year and 35.5% at 4 years, a significantly higher rate than that of ligation of the SF junction combined with surgical venous stripping [9]. The relative risk of

recurrence for ligation of the SF junction alone was 2.4 times greater than that of venous stripping [9]. Another study reported a recurrence rate of 65% at 2 years by ultrasound [13]. However, the percentage of patients with symptomatic recurrence of their varicosities was low [13].

Procedure

The procedure is performed under local anesthesia [3,4]. An incision is made parallel to the inguinal ligament at the site of the SF junction [3,4]. Saphenous vein tributaries are identified and ligated until reaching the SF junction [3,4]. The GSV is ligated at its junction with the femoral vein [3,4]. The incision is then closed and compression garments are applied [3,4].

Complications

Complications of SF ligation include pain, bleeding and hematoma (< 30%), infection (2%–15%), nerve injury (4%–25%), thrombophlebitis, and DVT/PE (< 2%) [4,12].

Contraindications

Contraindications are similar to those for saphenous vein stripping [3,12].

Special points

SF ligation is commonly combined with other surgical and endovenous procedures to reduce recurrence risk [3].

Cost

Ligation of the SF junction was introduced to reduce the cost and avoid venous stripping [9]. However, because of the higher recurrence rate, the cost-effectiveness is unclear [9].

Stab or transilluminated phlebectomy

- Phlebectomy was introduced as a less invasive outpatient alternative to saphenous vein stripping [4]. Transilluminated phlebectomy (TIPP) was proposed in 2000 as a more reliable and faster method to perform avulsion of the GSV [4].

Efficacy

The use of TIPP is associated with fewer incisions compared with conventional stab phlebectomy but with a potentially higher cost, longer operating time, and greater complication rate [4]. A randomized prospective trial comparing stab phlebectomy with TIPP reported a significantly lower number of incisions (5 ± 0.17 vs 29 ± 1.28) and shorter operating time (18 minutes) but a significantly higher recurrence rate at 52 weeks with TIPP (21.2% vs 6.2%) and no significant difference in complication rates, including cellulitis, nerve injury, and bruising [14]. Other studies confirm a reduction in the number of incisions, but a longer operating time and higher complication rate with the use of TIPP [4,15,16].

Procedure

Incision phlebectomy Small incisions are made along the GSV and its tributaries, which are retrieved with the use of a phlebectomy hook and avulsed [3].

TIPP A fiberoptic light channel is inserted into the GSV [3,4]. A mixture of saline and local anesthetic is infused into the subcutaneous tissue to produce tumescence and transilluminate the vein [3,4]. An endoscopic

dissector, with a rotating blade and suction channel, is used to resect the GSV and its tributaries and aspirate them by suction [3,4].

Contraindications

Contraindications are similar to those for saphenous vein stripping [3].

Complications

Complications include pain, hyperpigmentation (< 2%), cellulitis (< 3%), hematoma (5% to 12%), and nerve injury (up to 25%) [4]. There has been no significant improvement in the complication rate with the use of TIPP compared with stab phlebectomy [14–16]. One study of 141 patients (188 limbs) did not detect any difference in postoperative pain, hyperpigmentation, cellulitis, and numbness [14]. In another study, patients who underwent TIPP reported higher rates of pain and bruising and lower quality of life compared with those who underwent stab phlebectomy [15]. TIPP has also been associated with higher rates of hematoma (45% vs. 25%), especially calf hematoma (25% vs 2.5%) compared with stab phlebectomy [16].

Special points

Phlebectomy is useful for larger truncal veins, in which a higher flow limits the use of endovenous procedures, and in younger patients with thicker vein walls [3]. Phlebectomy often is performed in conjunction with ligation of the SF junction [3,4].

Cost

Phlebectomy is a simple outpatient procedure that is potentially more cost-effective than venous stripping. However, physicians who use this method describe it as tedious and time consuming [3].

Surgical treatments of incompetent perforator veins

- Patients who undergo ligation of perforator veins typically have severe CVI complicated by venous ulcerations [4]. The Linton procedure was introduced in the 1950s for treating perforator veins and has largely been replaced by SEPS [4].

Efficacy

The efficacy of SEPS in ulcer healing is comparable with that of the Linton procedure, with significantly lower complication rates [17–19]. In one study, the ulcer healing rate with SEPS was 88% with a median time to healing of 30 to 60 days [17]. Approximately 13% of the ulcers recurred, with a mean recurrence time of 21 months [17]. Another study demonstrated ulcer healing rates greater than 90% with SEPS and the Linton procedure, with a recurrence rate of 12% with the Linton procedure and 22% with SEPS [18]. Other studies demonstrate comparable ulcer healing rates, with higher recurrence rates after the Linton procedure [19,20], the underlying cause of which is unknown. Deep and superficial venous incompetence and the number of persistent perforator veins did not influence the recurrence rate [18].

Procedure

The Linton procedure involves making a long incision across the calf including the diseased tissue, forming a skin/soft tissue/fascial flap, and ligating the perforator veins [18].

The SEPS procedure involves making two incisions below the knee and inserting ports into the subfascial space [4,18]. The subfascial plane

is kept open with infusion of carbon dioxide for visualization of the structures [4,18]. The perforator veins are identified and ligated [4,18].

Complications

The Linton procedure largely has been replaced by SEPS because of a higher complication rate, including wound infections (40%–50%), nerve injury (11%), and DVT (4%) [18,20]. Complications associated with SEPS include wound infection (5%–7%), nerve injury (6%), superficial thrombophlebitis (3%), and cellulitis (2.5%) [18,20].

Contraindications

The presence of PAD is a relative contraindication to these procedures because of poor wound healing [19].

Special points

SEPS is performed in conjunction with other surgical and endovenous procedures [4,5•].

Cost

SEPS can be performed in the ambulatory care setting, with less time away from work required [4]. Lower-extremity activity is limited for 5 to 7 days [4].

Endovenous procedures

- Endovenous procedures, including endovenous laser therapy (EVLT), radiofrequency ablation (RFA), and EFS, have emerged as minimally invasive techniques for treating VVs [3,4].

Endovenous laser therapy

- EVLT, introduced in 1999 for treating VVs, results in obliteration, shrinkage, and fibrosis of the GSV and its tributaries over weeks to months [3,4].

Efficacy

A recent meta-analysis demonstrated an overall obliteration rate of 92.9% (95% CI, 90.2–94.8) at 3 months, 93.3% (95% CI, 91.1–95.0) at 1 year, 94.5% (95% CI, 87.2–97.7%) at 3 years, and 95.4% (95% CI, 79.7–99.1) at 5 years (Table 1) [7••]. Multiple studies have demonstrated similar obliteration rates [21••,22,23•,24]. Several studies have reported that EVLT is more effective than venous stripping and other endovenous procedures in terms of obliteration and recurrence rates [7,21••].

Procedure

EVLT is performed using tumescent anesthesia, a mixture of saline and anesthetic infused into the venous sheath [3,4,5•]. A laser-tipped catheter is inserted into the GSV at the level of the knee and advanced to the SF junction under ultrasound guidance [3,4,5•]. The direct action of the laser on the vein wall and heating of the venous blood result in damage to the vein wall and obliteration of the varicosity [3,4,5•].

Contraindications

Tortuous or small veins, those with a diameter ≥ 12 mm and depth less than 1.0 cm from the skin, those located in the calf, and those with residual thrombus are not suitable for EVLT [25].

Complications

Complications include pain, edema, erythema, ecchymoses, hematoma, vesiculation, hypo- or hyperpigmentation, superficial thrombophlebitis, and DVT [4,23•]. Ecchymoses occur in approximately 40% of treated limbs and typically resolve within the first few weeks [23•]. Hematomas have been reported in up to 24% of limbs [23•]. Moderate pain along the treated vein has been reported in up to 50% of the limbs within the first week after EVLT [23•]. Superficial thrombophlebitis has been reported in up to 12% of the limbs [23•]. Transient paresthesia occurs in less than 10% of cases [23•]. DVT occurs in up to 7% of the treated limbs and usually results from extension of thrombus from the saphenous vein into the common femoral vein [23•]. No cases of PE have been reported [23•].

Special points

The energy (joules) per centimeter of vein (J/cm) affects the occlusion rate after EVLT [4]. Higher energy results in increased occlusion rates but is associated with higher complication rates, including paresthesia and thermal injuries [4]. The laser energy can be applied in continuous or pulsed mode [4]. Continuous is more effective than intermittent exposure, resulting in a higher and longer-lasting intravascular temperature [26]. Operator experience may affect outcomes.

Cost

Because EVLT is usually performed in the outpatient setting, it is potentially more cost-effective than surgical treatments for VVs [4].

Radiofrequency ablation

- RFA, introduced in the United States in 1998, results in obliteration of the GSV and its tributaries by delivering controlled heat using radiofrequency energy passed through an endovenous electrode [3,4].

Efficacy

A recent meta-analysis reported an overall occlusion rate of 88.8% (95% CI, 83.6–92.5) at 3 months, 87.7% (95% CI, 83.1–91.2) at 1 year, 84.2% (95% CI, 75.2–90.4) at 3 years, and 79.9% (95% CI, 59.5–91.5) at 5 years (Table 1) [7••]. Symptomatic improvement has been reported in 85% to 94% of limbs with anatomic success and 70% to 80% of limbs with anatomic failures [23•,27].

Procedure

RFA is performed under general or local anesthesia (tumescent anesthesia) [3,4,5•]. Ultrasound is used for catheter placement and guidance during the procedure [3,4,5•]. The GSV is cannulated at the knee, and the catheter is advanced to the SF junction [3,4,5•]. The catheter is retracted, and the venous wall is heated by a bipolar electrode, resulting in immediate shrinkage and occlusion of the vein [3,4,5•]. A compression garment is applied for several days after the procedure [3,4,5•]

Contraindications

Contraindications are similar to those for EVLT [25].

Complications

Complications include paresthesia, hematoma, skin burns, infection, bruising, and thrombophlebitis/thromboembolism [4,23•,27]. One

study reported transient paresthesia in 15%, hematoma in 5%, skin burns in 2.1%, superficial thrombophlebitis in 2.1%, DVT in 16%, and nonfatal PE in 1% of 286 treated limbs [23•].

Special points

DVT may occur from proximal extension of thrombus from the GSV into the common femoral vein [28]. Ultrasound examination is recommended within 72 hours to 1 week after the procedure to evaluate for DVT [28]. Patients with high thromboembolic risk should receive medical thromboprophylaxis after the procedure [27,28]. Obese patients and those with preexisting deep venous insufficiency have a higher risk of anatomic failure, defined as failure to occlude, recanalization, and evidence of reflux at the SF junction of the treated vein [27].

Cost

RFA is more cost-effective and requires less hospitalization and recovery time compared with surgical procedures [29]. RFA requires 3 to 5 days of recovery time [29].

Chemical sclerotherapy

- Liquid sclerosants have been used for treating VVs since 1911. The introduction of EFS in 1944 improved the obliteration rate of VVs, especially when administered under ultrasound guidance [30].

Efficacy

A recent meta-analysis reported an overall obliteration rate of 82.1% (95% CI, 72.5–88.9) at 3 months, 80.9% (95% CI, 71.8–87.6) at 1 year, 77.4% (95% CI, 68.7–84.3) at 3 years, and 73.5% (95% CI, 62.8–82.1) at 5 years (Table 1) [7••]. One study of 100 limbs reported 100% patient satisfaction and greater than 90% improvement in quality of life 2 years after treatment with EFS [31]. EFS also is effective in treating venous stasis ulcers and malformations. One study reported a 99% ulcer healing rate in 29 patients (40 limbs) 6 weeks after treatment with EFS [32].

Procedure

A chemical sclerosant (polidocanol, sodium morrhuate, or sodium tetradecyl sulfate [STDS]) is combined with carbon dioxide (Co_2) and air to produce foam (concentration 1%–3%; volume 6–8 mL) using the Tessari or Monfreux method [30]. Co_2 reduces the risk of microbubble embolization because it is more soluble in blood and water than the nitrogen in room air [33]. The Tessari method generates foam by pumping the contents of two disposable syringes, one containing the liquid sclerosant and the other containing air, backward and forward through a two-way stopcock [30]. The Monfreux method generates foam by drawing air into a sealed glass syringe that contains liquid sclerosant [30].

In most cases, ultrasound is performed before the procedure to localize the most superficial, accessible segment of the varicosity in which the catheter can be inserted easily [30]. The foam is prepared immediately before the procedure and injected into the GSV and its tributaries under ultrasound guidance, followed by compression of the SF junction to prevent microbubble entry into the deep venous system [30]. The leg is elevated 45°, and the foam is massaged distally to fill the tributaries [30]. A compression garment is applied to the treated leg [30]. The foam displaces the blood in the vein, resulting in sclerosis and obliteration of VVs over 1 to 2 weeks [30].

Complications

The most common complications include mild to moderate pain and hyperpigmentation [3,4,34]. Hyperpigmentation typically resolves within 6 to 12 months [31]. Less common adverse events include superficial thrombophlebitis, DVT/PE, trapped coagulum, hematoma, skin necrosis, transient neurologic events (migraines, visual disturbance), and pulmonary symptoms (cough) [34]. Trapped coagulum resulting in superficial thrombophlebitis occurs in less than 5% of treated veins [34]. DVT results from propagation of foam into the deep venous system and typically involves the popliteal and calf veins [34]. The reported incidence of DVT/PE is less than 1% [34]. Transient neurologic events, most commonly visual disturbance, headache, and dizziness, have been reported in less than 1% of patients [34]. Transient neurologic events typically occur with the use of large amounts of foam in patients with a patent foramen ovale (PFO) [34]. To date, there have been three cases of major neurologic events (transient ischemic attack and cerebrovascular accident) after treatment with EFS worldwide [35,36]. All three cases resulted in resolution of symptoms within 2 weeks and were associated with the presence of PFO [35,36].

Contraindications

Contraindications include acute DVT, acute infections, allergy to the sclerosant, pregnancy, and breast feeding [3]. According to the European Consensus Meeting on Foam Sclerotherapy, the presence of PFO is not considered an absolute contraindication, and screening for PFO is unnecessary before performing EFS, although guidelines limit the amount of foam used [30].

Special points

Although the use of liquid sclerosant (STDS) has been approved by the US Food and Drug Administration for treating VVs, the foam preparation has not received approval because of the lack of randomized trials. However, foam sclerosant is more effective than the liquid form in obliterating VVs and is widely used in Europe and South America [30]. Currently, a phase 3 trial using a commercially prepared microfoam is under way in the United States. EFS can be used alone or in conjunction with other surgical and endovenous procedures for treating VVs [3,4,5•]. EFS is effective for treating VVs above and below the knee [3,4,5•].

Cost

EFS is performed in the outpatient setting without anesthesia. The cost of EFS is less than that of surgery and other endovenous procedures, and EFS requires less time away from work [10]. Most patients resume their normal daily activities within 24 hours of the procedure [10]. However, EFS has a higher recurrence rate than surgery and may require more than one injection session [10]. A formal cost-effectiveness analysis of the procedure has not been performed.

Telangiectasia/reticular vein treatment

Laser and pulsed light therapy

Surface laser therapy has been used for treating telangiectasias and reticular veins since the 1970s. Laser obliterates the vein by heating the hemoglobin within the vessel and injuring the endothelium [3]. New advances in laser technology have allowed delivery of sufficient energy to achieve pan-endothelial necrosis without affecting structures in the epidermal layer [3]. High-intensity pulsed light therapy was developed in 1990 for treating small VVs. It differs from laser by emitting a spectrum of light, rather than a wavelength, to obliterate the vein [3].

Efficacy Reports of effectiveness are based on case series reporting small numbers of patients. One study evaluated 20 women (54 patches of telangiectasias and reticular veins) after one laser treatment session and reported 50% to 75% clearance of veins in approximately 60% of the limbs at 4 weeks and in more than 80% of the limbs at 12 weeks [37]. Another study involving 50 women undergoing up to three treatment sessions at 6-week intervals reported that more than 80% achieved greater than 75% obliteration of their telangiectasias and reticular veins, with 76% patient satisfaction [38]. A third study with 40 female patients undergoing up to three treatment sessions 6 weeks apart reported patient satisfaction rates of 42.5% at 6 months and 75% at 12 months and objective improvement rates, based on photographic results, of 57% at 6 months and 82.5% at 12 months [39].

Procedure Patients undergo skin cooling with water-cooled chambers applied to the skin, cooling coupling gel, air-blowing cooling devices, or refrigerated cooling sprays before and after the procedure to provide comfort during the procedure and to minimize postprocedure side effects [40]. The amount of precooling depends on the patient's skin type (those with higher amounts of melanin in their skin require longer precooling) [40]. The amount of postcooling depends on the size of the vessels to be treated (smaller vessels require longer postcooling) [40].

The laser is applied to the surface of the skin and targets a wavelength of light to the hemoglobin within the vessel, resulting in heating and obliteration of the vessel [40]. Small (< 1-mm) superficial vessels with higher oxygenated hemoglobin content are treated with shorter wavelengths (580–1064 nm), shorter pulse durations (15–30 ms), higher fluences (350–600 J/cm^2), and smaller spot sizes (< 2 mm) [40]. Larger, deeper vessels with lower oxygenated hemoglobin content are treated with longer wavelengths (800–1064 nm), longer pulse durations (30–50 ms), moderate fluences (100–350 J/cm^2), and larger spot sizes (2–8 mm) [40].

Pulsed light therapy delivers a high-intensity spectrum of light to the vessel, resulting in its obliteration. Pulsed light therapy generally is used for longer vessels [3].

Complications Postprocedure pain is a common side effect of laser and light therapy [3]. Topical anesthesia and cooling agents are used during the procedure to decrease postprocedure pain [3]. Other complications include edema, erythema, bruising, vesiculation, hypo/hyperpigmentation, transient hemosiderin staining, telangiectatic matting, and scarring [3].

Contraindications Contraindications include pregnancy, tanned or dark skin, history of photosensitivity disorder, and keloidal scarring [3].

Special points Typically, one to three laser treatments are scheduled at 6- to 12-week intervals [3]. Patients are advised to avoid tanning before the procedure to avoid absorption of shorter wavelengths from the laser by sun-induced melanin, resulting in blistering and hyperpigmentation [3]. Sunscreen is advised after treatment with laser [3].

Cost Laser and light therapies are more expensive than liquid sclerotherapy because of the cost of equipment [3,5•].

Chemical sclerotherapy

Sclerotherapy for treating telangiectasias and reticular veins is generally performed using liquid sclerosant (hypertonic saline, polidocanol, and STDS) rather than foam, although foam can be used in lower volumes [30]. It has been shown that foam of the same concentration and amount as the liquid sclerosant is more effective but is associated with more adverse events [30]. To decrease side effects, a reduced amount of foam per injection (0.5 mL) and per treatment session (Tessari method: 6–8 mL; Monfreux method: 4 mL) is recommended for telangiectasias and reticular veins [30].

Disclosures

No potential conflicts of interest relevant to this article were reported.

References and Recommended Reading

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