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# Varicose veins: Newer, better treatments available

## ABSTRACT

Varicose veins are not only a cosmetic annoyance: they can lead to complications that result in lost time from work and lost wages. Treatment has improved with the use of minimally invasive techniques that reduce recovery time and complications and offer better long-term results—encouraging news, considering that the problem affects 10% to 20% of adult men and 25% to 33% of adult women.

## KEY POINTS

Risk factors include family history, an occupation that necessitates standing, older age, obesity, and pregnancy.

Pain and swelling are common symptoms. The pain may be aching, tingling, throbbing, or cramping. Fatigue, restlessness, burning, itching, or heaviness in the legs are also reported.

Laser therapy is available for isolated small telangiectasias without underlying associated varicosities, or as adjunctive treatment of telangiectasias after sclerotherapy, endovenous procedures, or surgery of larger veins.

VARICOSE VEINS ARE often considered merely a cosmetic problem, but they affect physical appearance and quality of life and may also result in lost time from work and lost wages. Insurance companies may be hesitant about paying for their treatment.

In the past, many patients who presented to their physicians because of varicose veins left the office dissatisfied, owing in part to the limited diagnostic and treatment options available and the poor understanding on the part of many physicians of the pathophysiology of venous disorders. Now, with the latest developments in technology, we can offer patients more convenient and less invasive options for managing their varicose veins.

## MORE THAN COSMETIC

One quarter to one third of all adults in Western countries have varicose veins.[1–3] They are more common in women than in men (the prevalence ranges from 25% to 33% in women vs 10% to 20% in men).[4] They increase in frequency with age (**TABLE 1**). They are rare in childhood but, when present, they are more commonly associated with an underlying vascular malformation (eg, Klippel-Trénaunay syndrome).

Generally identified by their tortuous, twisted, bulging, superficial appearance, varicose veins are usually found on the legs, but they also can be found in the vulva, spermatic cords (varicoceles), rectum (hemorrhoids), and esophagus (esophageal varices).[5] Smaller varicose veins, known as reticular veins, are identified by their blue-green, flat, less tortuous appearance. Telangiectasias are the small-

est vessels, generally less than 1 mm in diameter, and are blue-black, purple, or red.

## HOW AND WHERE THEY DEVELOP

The venous system of the legs is divided into deep and superficial vessels. The deep veins lie within the muscular system and fascia, and they transport most of the deoxygenated blood from the legs toward the heart. The superficial veins run parallel to the deep system, but are outside the muscles. They drain the venules of the skin, transporting approximately 10% of the blood toward the heart.

Perforator veins connect the two systems and contain one-way check valves. Blood flows from the superficial to the deep veins via perforator veins during muscle relaxation when pressure in the deep veins falls below that of the superficial vessels.

Varicose veins are more likely to develop where the superficial and deep vein systems communicate: for example, at the saphenofemoral or saphenopopliteal junctions, or where perforator veins connect the two systems.

### Primary vs secondary

Varicose veins are the result of structural or functional defects in the venous system and can be classified as either primary (idiopathic) or secondary (due to thrombosis or another identifiable obstruction). These defects cause ambulatory venous hypertension, resulting in weakened vein walls with abnormal distensibility of their surrounding connective tissue.[6] This leads to separation of the valve cusps within the vein, resulting in valvular incompetence or reflux and venous dilatation.[5,6]

Primary varicose veins are more common in women and patients with a strong family history of varicosities. Secondary defects are generally the result of an acute or previous venous thrombosis.[6]

## CLINICAL FEATURES

Patients with varicose veins may present without symptoms, seeking medical attention for cosmetic reasons or simply for reassurance about their condition.

More common are complaints of heaviness, fatigue, or throbbing pain in the legs.

**TABLE 1**

**Risk factors for varicose veins**

**Commonly cited factors**
- Female gender
- Hormones (oral contraceptives or hormone replacement therapy)
- Heredity
- Obesity
- Occupations that require prolonged standing
- Older age
- Pregnancy (increase with parity)

**Less commonly cited factors**
- Constipation
- Diet (fiber-deficient)
- Diverticular disease, inguinal hernias, hemorrhoids, pelvic surgery
- Hematologic factors
- High heels
- Immobility (confined to bed, plaster cast)
- Long flights or automobile journeys
- Sedentary lifestyle
- Sports that increase intra-abdominal pressure (weight lifting)
- Tight clothing (underwear, corsets)

Pain and swelling are common. Patients usually describe the pain as aching, tingling, throbbing, or cramping. They may also complain of restlessness, burning, or itching in their legs.

Symptoms usually disappear when they elevate their legs or get off their feet. Pain is usually absent in the morning after sleeping; it is typically aggravated by standing and often becomes worse as the day progresses.

**Varicose veins affect 25% to 33% of women and 10% to 20% of men**

Women are more likely to complain of symptoms than men. The most common symptom reported by Bradbury et al in the Edinburgh vein study in women was aching, whereas cramping pain was more frequent in men.[1,7] Varicose veins may be exacerbated during menses or first noted with pregnancy. Women may also complain of pelvic pain or dyspareunia due to vulvar varices.

Symptoms do not always correlate with the size or number of veins affected and at times may seem inconsistent with the physical examination. Patients with small varicose veins (telangiectasia and reticular veins) may complain of a severe burning pain, heaviness, or swelling, whereas patients with larger varicose veins may have no symptoms.

### Other findings

Other clinical findings that accompany varicose veins include edema, ulceration, dermatitis, hyperpigmentation, lipodermatosclerosis,

atrophie blanche, hemorrhage, and superficial thrombophlebitis.

Hyperpigmentation and ulceration are more common on the medial side of the ankle. These conditions develop as a result of venous hypertension. Pigmentation is due to extravasation of red blood cells into the skin, and it develops gradually over time.

**Venous ulcers** may be difficult to heal in some patients, but they generally respond to compression therapy and appropriate dressings. Unfortunately, they tend to recur, often due to poor compliance with treatment.

**Lipodermatosclerosis** and **atrophie blanche** are painful complications of prolonged venous insufficiency and are often seen in patients with varicose veins. Lipodermatosclerosis, also known as stasis cellulitis, is characterized by edema, erythema, pain, increased warmth, and skin that is thickened and firm.

Atrophie blanche refers to star-shaped ulcerations that develop in patients with chronic venous insufficiency. The ulcerations are small and extremely painful and typically heal with great difficulty. In our experience, these ulcers are different than the typical venous stasis ulcer mentioned above.

**Symptoms do not always correlate with the size or number of varicose veins**

**Hemorrhage** in patients with varicose veins is often spontaneous, or can occur after minor trauma such as shaving the legs. Bleeding is often profuse, may be mistaken as arterial because of high venous pressure, and often prompts the patient to seek medical attention. It can usually be controlled by applying pressure and elevating the leg.

**Superficial thrombophlebitis** is occasionally seen. It may be spontaneous, associated with trauma, or a result of an underlying hypercoagulable condition. Patients usually complain of pain, and physical examination reveals warmth, swelling, and erythema over the varicosity. The greater saphenous vein is most frequently involved. Deep vein thrombosis and pulmonary embolism are potential adverse effects if superficial thrombophlebitis extends into the deep venous system. Treatment depends on the location of the thrombosis but usually consists of anti-inflammatory medications if the vessel involved is distal to the deep vein system. Anticoagulant therapy or surgery is reserved for superficial

thrombophlebitis that is more proximal (within 10 cm of the saphenofemoral junction) and threatens to propagate into the deep venous system.

## DIAGNOSIS

### History

The history should include questions about:

- Personal or family history of varicose veins, deep vein thrombosis, or superficial thrombophlebitis
- The age of onset and circumstances that may have aggravated the problem
- Work that may require prolonged standing
- Constipation or straining
- Wearing of tight or constricting clothing
- The habit of sitting with legs crossed
- In women, exacerbation of varices during pregnancy and the use of oral contraceptives or hormone replacement therapy
- Swelling, skin changes, or a history of ulceration or pain
- Any new symptoms or recent increase in the size or number of varicose veins.

### Physical examination

Inspect the abdomen and the legs completely with the patient sitting and standing. Record the location, size, color, and configuration of any varicose or reticular vein or telangiectasia. Look for large bulging veins in the thigh and calf, hyperpigmented or ulcerated areas of the calves and ankles, and edema—features that generally signify a more complex problem with the venous system, involving either the deep veins or superficial veins with perforator vein involvement.

Since the veins of the legs empty into the pelvic and abdominal veins, close inspection and palpation of the abdomen and pelvis are very important to rule out an occult mass that may be compressing pelvic venous outflow and causing lower-extremity venous hypertension. Also palpate the femoral, popliteal, dorsal pedis, and posterior tibial pulses.

Specific techniques for assessing varicose veins during the initial physical examination have included maneuvers that increase venous filling, such as the cough test, percussion or Schwartz test, Brodie-Trendelenburg test, and Perthes test. Classically, the Perthes test has been used to assess deep venous patency, and the Brodie-Trendelenburg test has been used to evaluate valvular competence. However, clinical examination is not accurate enough to precisely guide treatment, and noninvasive laboratory tests have now largely replaced these tests.

**TABLE 2**

**Treatments for varicose, reticular, and venous telangiectatic veins**

**Conservative measures**
- Compression (bandages, support hose, external compression devices)
- Diet
- Exercise
- Elevation
- Skin hygiene
- Medications (diuretics)

**Endovenous or interventional therapies**
- Sclerotherapy
- Laser or light therapy
- Endovenous obliteration of the saphenous vein

**Surgery**
- Ambulatory phlebectomy or stab avulsion phlebectomy
- Ligation and stripping
- Transilluminated powered phlebectomy

**Duplex scanning gives adequate information for clinical decision-making**

### Laboratory testing

**Ascending and descending venography** have long been the standard for evaluating the deep venous system, valvular reflux, and incompetency in patients whose varicose veins require surgery. These tests are expensive, painful, and not without complications, including deep vein thrombosis and allergic reactions to the contrast. They have now largely been replaced by noninvasive laboratory testing.

**Continuous-wave Doppler ultrasonography** should be part of the initial examination of patients with varicose veins. It is readily available, noninvasive, and inexpensive, and is most useful in the outpatient setting for screening and detecting reflux at the saphenofemoral and saphenopopliteal junctions.

Patients are asked to stand and face the examiner while a probe is placed over the common femoral vein or just behind the knee

crease. Patients are generally required to cough or perform the Valsalva maneuver. The absence of a detectable signal during these maneuvers indicates there is no reflux present.

**Duplex Doppler ultrasonography** is the most advanced technique currently available and has emerged as the technique of choice for assessing the anatomy and physiology of the venous system. The combination of B-mode real time ultrasonography and pulsed Doppler ultrasonography allows direct visualization and evaluation of flow in the vessels in a simple and painless noninvasive manner.

A complete examination must evaluate for acute or occult deep venous thrombosis, superficial thrombophlebitis, reflux at the saphenofemoral and saphenopopliteal junctions, competence and luminal diameter measurements of the greater and lesser saphenous veins and respective branches, and competence and luminal diameter measurements of perforating veins. Patients are generally examined in the standing or in the reverse Trendelenburg position. The Valsalva maneuver is required to elicit reflux.

**Other tests** that provide a better understanding of the venous system include light reflex rheography, ambulatory venous pressure measurements, photophlethysmography, air plethysmography, and foot volumetry. However, at our institution we do not use these tests routinely in the evaluation of varicose veins, and many of these procedures are better suited for research purposes. We do not use plethysmography at all, since duplex scanning gives adequate information for clinical decision-making.

**Over-the-counter compression stockings are not satisfactory for chronic venous insufficiency**

## CONSIDERING THE TREATMENT OPTIONS

Once the patient has been carefully evaluated as discussed above, the decision to treat is based on the overall health of the patient and on the symptoms. Options include conservative, endovenous or interventional, or surgical treatments (TABLE 2).

In our practice, we attempt to identify the pathophysiology in each patient and address that process first. We follow with adjunctive procedures to improve clinical and cosmetic results.

### External compression

External compression devices (bandages, support stockings, or intermittent pneumatic compression devices) remain the mainstay of therapy for varicose veins. They are extremely effective in relieving swelling, pain, and ulcers and can be used alone or in conjunction with any of the other therapies.

Contraindications for compression therapy are[8]:

- Arterial insufficiency (ankle/arm index < 0.6 and/or ankle pressure < 65 mm Hg)
- Active skin disease
- Allergy to any of the stocking components.

Compression therapy is less expensive than other treatments. Unfortunately, however, many patients find compression hose difficult to put on and uncomfortable to wear, and compliance is often poor.

The many different brands of compression stockings vary in their amount of compression, which ranges from 20 to 50 mm Hg. Most patients with varicose veins and signs of chronic venous insufficiency (hemosiderin deposition, swelling, stasis ulceration) require compression of 30 to 40 mm Hg. Over-the-counter compression stockings tend to offer much less compression and so are generally not satisfactory for these patients. Stockings may need to be custom fitted for certain patients, and correct measurement is essential. Compression garments need to be replaced from time to time because they lose their elasticity or are torn or damaged.

### Drug therapy

Very few drugs help with varicose veins. Diuretics are commonly prescribed for edema but generally do little to relieve the pain or discomfort.

Horse chestnut extract has been shown to decrease edema by increasing venous tone and venous flow. It is derived from the seeds of the horse chestnut (*Aesculus hippocastanum*) and has been used in Europe for the treatment of varicose veins.[9] In a randomized, placebo-controlled study,[10] horse chestnut extract was compared with compression stockings. Patients wearing compression hose or taking the horse chestnut extract had a greater reduction in their lower leg volume compared

with placebo after 12 weeks of therapy. The horse chestnut extract was well tolerated and no adverse events were noted, although gastrointestinal irritation has been reported. It is available in the United States.

### Sclerotherapy

Sclerotherapy, ie, injection of a substance that obliterates the vein, is one of the most common treatments for venous telangiectasias, reticular veins, and small varicose veins. In general, the smaller the vein, the better the response to sclerotherapy.

Sclerotherapy is also useful for larger nonsaphenous varices or after surgery to remove residual varicose veins, and it is used to treat larger saphenous varicose veins in patients who refuse surgery. However, randomized trials have demonstrated a higher rate of recurrence with sclerotherapy than with surgery.

Sclerotherapy can eliminate the pain and discomfort of varicose veins, and it helps prevent complications such as venous hemorrhage and ulceration. It is also frequently used cosmetically. A thorough history and physical examination should precede sclerotherapy, and any suspected underlying reflux should be identified and corrected before the procedure begins.

**Sclerosing agents** available in the United States include hypertonic saline in 11.7% to 23.4% solutions, saline 10% plus dextrose 25% solution, sodium morrhuate 5% solution, and ethanolamine oxalate. Sodium tetradecyl sulfate is no longer available in the United States, and polidocanol is not yet approved by the Food and Drug Administration. We treat most patients with hypertonic saline 23.4% solution because it is readily available, has minimal allergic risk, and gives satisfactory results with minimal side effects, such as staining, blistering, and skin necrosis.

**Foam sclerotherapy.** The Irving technique involves a foaming agent and a sclerosing agent, which are mixed prior to injection into the vein. Once injected, the foam displaces blood from the vein, allowing for better contact of the sclerosant with the vein wall. Reportedly, this results in better inflammation and nonthrombotic occlusion of the injected vein.[11] Foam sclerotherapy has been found to be safe and effective. It is used with ultrasound guidance.

**TABLE 3**

**Contraindications to sclerotherapy**

- Acute deep vein thrombosis
- Acute infections including cellulitis
- Allergy to the sclerosant
- Bedridden or immobile patient
- Blood dyscrasias or thrombophilia
- Breast-feeding
- Cancer patient undergoing chemotherapy
- Pregnant patient
- Uncontrolled diabetes
- Use with caution with arterial disease
- Use with caution in women on oral contraceptives or hormone replacement therapy

**Complications of sclerotherapy** include pain, hyperpigmentation, telangiectatic matting, necrosis, superficial thrombophlebitis, and deep vein thrombosis. Anaphylaxis has rarely been reported with the detergent sclerosant sodium tetradecyl sulfate (no longer available in the United States) and sodium morrhuate. Pain or cramping is reported to occur with the hypertonic solutions (saline and dextrose). Urticaria, blistering, and edema are seen occasionally.

**Follow-up care.** After sclerotherapy, the treated area should be placed in a compression stocking immediately to decrease the incidence of pigmentation, reduce the incidence of telangiectatic matting, improve the efficacy of the solution, and more rapidly dilute the sclerosing agent, thereby reducing the risk for deep vein thrombosis. Most physicians recommend at least 2 to 3 weeks of compression therapy.

**Contraindications.** Sclerotherapy is contraindicated (TABLE 3) in patients with acute deep vein thrombosis and in patients who are bedridden or immobile, have an acute infection (including cellulitis), or have a history of hypersensitivity to the sclerosant. In addition, patients with uncontrolled diabetes, blood dyscrasias, hypercoagulable conditions, and cancer patients undergoing chemotherapy are not candidates for sclerotherapy. Sclerotherapy should be used with caution in patients with

**The smaller the vein, the better the response to sclerotherapy**

underlying arterial disease, and those taking oral contraceptives should be advised of the increased risk for thrombophlebitis. Pregnant patients should postpone sclerotherapy until after their pregnancy, and sclerotherapy should not be performed during breast-feeding.

### Laser and pulsed-light therapy

Lasers have been used to treat leg telangiectasias since the early 1970s. Early results were often unsatisfactory, and pain, scarring, hypopigmentation, hyperpigmentation, and recurrence after treatment were common.[12–15] The development of newer lasers over the last 20 years has eliminated many of these problems and allows for safer, more effective treatment.

**Indications.** Laser therapy and pulsed-light therapy are the first choice for isolated small telangiectasias without underlying associated varicosities, or as adjunctive treatment of telangiectasias after sclerotherapy, endovenous procedures, or surgery of larger veins. Lasers are also being used for endovenous ablation of larger varicose veins (see discussion of surgical treatment below).

Candidates for laser or light treatment include patients who are afraid of needles, those who are allergic to sclerosants, those who have had undesirable side effects from sclerotherapy, those in whom sclerotherapy has been ineffective, those with matted telangiectasias, and those with fine superficial telangiectasias below the ankles.[15] Abnormal underlying venous physiology (reflux), including larger "feeder" vessels, should be treated prior to laser or light therapy.

Laser treatment of leg telangiectasia usually requires more than one laser session, scheduled at 6-week to 12-week intervals. Patients should not be tanned at the time of treatment, because the increased sun-induced melanin in the epidermis may absorb some of the shorter wavelengths of the vascular lasers, causing blistering and dyspigmentation. Patients should use sunscreens after treatment. Protective eyewear must be worn by the patient and physician to avoid eye injury.

Pain is a common side effect of laser and light treatment; therefore, topical anesthesia and cooling (for example, using a water-based gel) are needed when treating larger vessels. Other side effects include edema, erythema, bruising, vesiculation, hypopigmentation, hyperpigmentation, transient hemosiderin staining, telangiectatic matting, and, rarely, scarring. New lasers with longer wavelengths and longer pulse durations have eliminated many earlier problems and have improved outcomes.

In general, vascular lasers work by heating the hemoglobin in the ectatic vessels, which injures the endothelium, resulting in sclerosis of the vessel.

Both laser and light therapy are generally more expensive than sclerotherapy, owing to the cost of the equipment. A number of different lasers are available, and the effectiveness of each type varies. Physicians interested in laser therapy should thoroughly familiarize themselves with these devices prior to initiating therapy.[16]

### Light therapy

High-intensity pulsed light was developed in the 1990s to treat varicose veins. This technique differs from laser therapy by emitting a spectrum of light, rather than a single wavelength. Venous telangiectasias respond well to this technology, although hyperpigmentation, blistering, and superficial erosions have been reported. In our experience, however, results of treating leg telangiectasias are less predictable than with laser therapy or sclerotherapy.

**Laser sessions are scheduled at intervals of 6 to 12 weeks**

## SURGICAL OPTIONS

Treatment of varicose veins is one of the most common procedures performed by vascular surgeons. Indications for surgery include advanced skin changes, ulceration, bleeding, pain, and swelling. Surgery also is often performed for cosmetic reasons.

According to Fedor et al,[17] the goals of surgery should include the elimination of the need for support hose, the prevention of recurrent ulcers and skin changes, and returning the patient to a near-normal lifestyle. Goals also include relief of pain and improved cosmetic appearance.

Relative contraindications to surgery are deep vein thrombosis, deep venous insufficiency with or without ulcers, or a history of

Klippel-Trénaunay syndrome.[18,19] (Surgery may, however, be beneficial in selected cases of deep venous insufficiency and Klippel-Trénaunay syndrome.)

**Current techniques.** Reflux, not obstruction, is the primary cause of most varicose vein disorders, and surgical management addresses this etiology. Surgical approaches include saphenous vein stripping from ankle to groin; ligation of the saphenofemoral or saphenopopliteal junction, plus or minus the addition of sclerotherapy or stab avulsions; short stripping of the greater saphenous vein in the thigh segment; and ambulatory phlebectomy. Newer, less invasive procedures include endovenous occlusion using radiofrequency closure or laser, or transilluminated power phlebectomy.

## Saphenous vein ligation

The gold standard surgical therapy for varicose veins remains stripping of the greater or lesser saphenous veins and ligation of the saphenofemoral or saphenopopliteal junctions combined with multiple stab avulsions or phlebectomy of branch vein varices. Patients are candidates for this procedure if they have incompetent greater or lesser saphenous veins, reflux through the saphenofemoral or saphenopopliteal junctions, or superficial thrombophlebitis identified by duplex Doppler ultrasonography. Furthermore, the deep venous system must be competent, with no evidence of deep vein thrombosis.

**Vein stripping from ankle to groin is not always necessary**

In the past it was believed that stripping of the saphenous vein from ankle to groin was necessary to correct the reflux problem that led to the formation of truncal varicose veins. Today it is recognized that ligation of the saphenous vein at the saphenofemoral junction, in conjunction with removal of the thigh portion of this vein, corrects most of these problems.

Saphenous vein ligation and division has been used successfully in conjunction with sclerotherapy: sclerotherapy is useful after endovenous ablation to control residual varicosities.

## Ambulatory or stab phlebectomy

Ambulatory phlebectomy is a relatively easy, effective, and inexpensive way to remove varicose veins and can be performed in the office. It may be particularly useful for larger truncal varicosities, in which higher flow limits the effectiveness of sclerotherapy, and in younger individuals in whom vein walls may be thicker.[20] Ambulatory phlebectomy is less effective if reflux is present at the saphenofemoral or saphenopopliteal junctions and is generally used in combination with saphenous ligation and division when reflux is present.

With these procedures, the varicosity is hooked and pulled through a small ("stab") surgical incision or "stab," then excised in tiny pieces. Clinicians who use this method often describe it as a tedious procedure that requires much time, but they find it allows for satisfactory removal of varicose veins.

Complications are unlikely but include bleeding and hematomas. Transient hyperpigmentation, infection, pain, and telangiectatic matting occur occasionally.

## Endovenous saphenous vein obliteration

New venous surgical techniques have been developed in an effort to reduce the number and size of lower-extremity incisions and hematomas, to eliminate postoperative discoloration, and to reduce the recuperation time.

Endovenous thermal ablation of the greater or lesser saphenous veins employs either a laser or high-frequency radio waves to produce intense local heat. The laser applies heat to the blood in the lumen, thereby transmitting it to the vessel wall. The radiofrequency catheter applies the heat directly to the wall of the vein, thereby reducing the residual hemosiderin in the lumen and theoretically reducing the risk of staining. Both forms of local heat obliterate the lumen of the targeted vessel.

Many physicians feel that, for maximal benefit, this procedure should be performed in combination with saphenofemoral ligation, although there is debate as to whether the addition of this surgical procedure is necessary.[18] Tumescent anesthesia, in which xylocaine in normal saline is instilled around the vein with a spinal needle, is an important component of endovenous saphenous vein obliteration and allows the potential for this procedure to be done in the office setting in many cases.

The major advantage of endovenous saphenous vein obliteration is that the vein is

ablated and left intact, therefore eliminating the risk of hematoma and markedly reducing the amount of skin discoloration and pain. Its use, however, requires preoperative and intraoperative duplex Doppler ultrasonography. Preoperatively, the vein diameter cannot exceed 12 mm, and the entire vein must be more than 1.0 cm from the skin surface, even if tumescence is necessary to deepen a superficial vein. Because of the depth requirement and the proximity to the saphenous nerve, this method cannot be used in the calf and ankle.[21]

Access to the greater saphenous vein is just below the knee crease via venous cutdown or direct puncture with a large-bore needle. Saphenous vein puncture at the ankle is also possible with the newer 100-cm-long catheters.

**Results.** Short-term data comparing endovenous thermal ablation against stripping of the greater saphenous vein show reduced postoperative pain scores, a shorter absence from work, and a faster return to normal activity. The incidence of postoperative paresthesias and hematomas was also less than with saphenous vein stripping. The major difference in short-term complication rates between the two groups was in the incidence of thermal injury and thrombophlebitis, which were both 7%, vs none with saphenous vein stripping. These complications are more representative of the early part of the learning curve in using the thermal ablation device and are likely to be rare events as experience increases.

Two-year success rates (defined as a lack of recanalization or patients seeking further treatment) are between 70% and 90%.[21,22] Adverse effects include skin burns, paresthesias due to saphenous nerve injury, hematoma, burning or stinging pain, and superficial and deep vein thrombosis.

## Transilluminated power phlebectomy

Transilluminated power phlebectomy targets varices below the knee and secondary varicosities of the thigh. Stab phlebectomy frequently results in numerous incisions, pain, hematomas, and scarring, and varices can be easily missed, resulting in unsatisfactory cosmetic results and recurrences. Trans-illuminated power phlebectomy reduces these complications by reducing the number of incisions and completely excising the varices.

The procedure involves inserting a fiberoptic light channel with a side port for simultaneous pressure infusion of a saline and local anesthetic mixture to produce tumescence in the subcutaneous space and transillumination. This produces a silhouette of the veins, allowing for guided placement of the powered tissue resector, which "morselizes" the varices and aspirates them by suction. The tumescent anesthesia is excellent in reducing bleeding, hematoma formation, and postoperative pain. Finally because of the small number of incisions needed, postoperative scarring is markedly reduced.[18]

Early data from 58 unilateral procedures and 1 bilateral operation showed lower pain scores than those for stab phlebectomy. Cosmetic results and satisfaction scores were also better with the new procedure. Postoperative complications included cellulitis and small hematomas in 6.7% of patients; however, all of these events were self-limiting and required no further treatment.[23]

The addition of punch holes over the excised vein with a 1.5-mm or 2.0-mm dermatologic punch helps to decrease the incidence of hematomas and hyperpigmentation. The postoperative use of support hose also helps reduce these complications and improves the rate of healing, as well as long-term symptomatic and cosmetic results.

Stab phlebectomy will always have a role in the management of secondary varicosities. However, with continued refinement, power phlebectomy may eventually replace stab phlebectomy in more extensive cases.

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