Management of Varicose Veins

RICHARD H. JONES, MD, MSPH, *Naval Health Clinic, Quantico, Virginia*
PETER J. CAREK, MD, MS, *Medical University of South Carolina, Charleston, South Carolina*

Varicose veins are twisted, dilated veins most commonly located on the lower extremities. Risk factors include chronic cough, constipation, family history of venous disease, female sex, obesity, older age, pregnancy, and prolonged standing. The exact pathophysiology is debated, but it involves a genetic predisposition, incompetent valves, weakened vascular walls, and increased intravenous pressure. A heavy, achy feeling; itching or burning; and worsening with prolonged standing are all symptoms of varicose veins. Potential complications include infection, leg ulcers, stasis changes, and thrombosis. Some conservative treatment options are avoidance of prolonged standing and straining, elevation of the affected leg, exercise, external compression, loosening of restrictive clothing, medical therapy, modification of cardiovascular risk factors, reduction of peripheral edema, and weight loss. More aggressive treatments include external laser treatment, injection sclerotherapy, endovenous interventions, and surgery. Comparative treatment outcome data are limited. There is little evidence to preferentially support any single treatment modality. Choice of therapy is affected by symptoms, patient preference, cost, potential for iatrogenic complications, available medical resources, insurance reimbursement, and physician training. (*Am Fam Physician.* 2008;78(11):1289-1294.

Varicose veins are generally identified by their twisted, bulging, superficial appearance on the lower extremities. They also can be found in the vulva, spermatic cords (varicoceles), rectum (hemorrhoids), and esophagus (esophageal varices).[1] Varicose veins are a common problem, with widely varying estimates of prevalence. In general, they are found in 10 to 20 percent of men and 25 to 33 percent of women.[2,3]

Etiology

The etiology of varicose veins is multifactorial and may include: increased intravenous pressure caused by prolonged standing; increased intra-abdominal pressure arising from tumor, pregnancy, obesity, or chronic constipation; familial and congenital factors; secondary vascularization caused by deep venous thrombosis; or less commonly, arteriovenous shunting.[4] Shear forces and inflammation have recently been recognized as important etiologic factors for venous disease.[5]

Venous disease resulting in valve reflux appears to be the underlying pathophysiology for the formation of varicose veins. Rather than blood flowing from distal to proximal and superficial to deep, failed or incompetent valves in the venous system allow blood to flow in the reverse direction. With increased pressure on the local venous system, the larger affected veins may become elongated and tortuous. Although no specific etiology is noted, 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.[6]

Diagnosis

CLINICAL PRESENTATION

The clinical presentation of varicose veins varies among patients.[7] Some patients are asymptomatic. Symptoms, if present, are usually localized over the area with varicose veins; however, they may be generalized to include diffuse lower extremity conditions. Localized symptoms include pain, burning, or itching. Generalized symptoms consist of leg aching, fatigue, or swelling. Symptoms are often worse at the end of the day, especially after periods of prolonged standing, and usually disappear when patients sit and elevate their legs. Women are significantly more likely than men to report lower limb symptoms, such as heaviness or tension, swelling, aching, restless legs, cramps, or itching.[8] No correlation between the severity of the varicose veins and the severity of symptoms has been noted. Established risk factors for varicose veins include chronic cough, constipation, family history of venous disease,

SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	*Evidence rating*	*References*
Conservative therapy (e.g., elevation, external compression devices, butcher's broom, horse chestnut seed extract, weight loss) for varicose veins may be helpful, but there are few clinical trials.	C	13-16
There is insufficient evidence to preferentially recommend any specific treatment or combination of treatments for varicose veins.	B	12, 13, 15, 22, 29
Sclerotherapy may be used to improve the symptoms and cosmetic appearance of varicose veins.	B	29

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to http://www.aafp.org/afpsort.xml.

female sex, obesity, occupations associated with orthostasis, older age, pregnancy, and prolonged standing.[9]

Although varicose veins may cause varying degrees of discomfort or cosmetic concern, they are rarely associated with significant medical complications. Skin pigmentation changes, eczema, infection, superficial thrombophlebitis, venous ulceration, loss of subcutaneous tissue, and a decrease in lower leg circumference (lipodermatosclerosis) are possible complications. Although rare, external hemorrhage resulting from the perforation of a varicose vein has been reported.[10]

Evaluation of patient risk factors, symptoms, and typical physical examination findings help determine a diagnosis. Although a detailed physical examination is sufficient to diagnose most patients with primary varicose veins, it does not provide information about the presence of deep venous insufficiency. Clinical tests used to detect the site of reflux are of limited value *(Table 1)*.[11] A positive tap test and negative Perthes test are most helpful.[11]

IMAGING STUDIES

Imaging studies are generally not necessary for diagnosis, but they may be useful in patients with severe symptoms or in patients who are obese. They also may be helpful for planning procedures, documenting the extent of vascular pathology, or identifying the source of venous reflux. Duplex Doppler ultrasonography is a simple, noninvasive, painless, readily available modality that can assess the anatomy and physiology of the lower extremity venous system. It can evaluate for acute and occult deep venous thrombosis, superficial thrombophlebitis, and reflux at the saphenofemoral and saphenopopliteal junctions. It can also assess the competence and diameter of the greater and lesser saphenous veins and the vascular architecture of the tributary and deeper perforating veins. Other less commonly used studies that may be helpful in select patients include venography, light reflex rheography, ambulatory venous pressure measurements, photoplethysmography, air plethysmography, and foot volumetry.

Treatment

Treatment options for varicose veins include conservative management, external laser treatment, injection sclerotherapy, endovenous interventions, and surgery *(Table 2)*.[12] The indications for treatment are largely based on patient preference. Choice of treatment is also affected by symptoms, cost, potential for iatrogenic complications, available medical resources, insurance reimbursement, and physician training, as well as the presence or absence of deep venous insufficiency and the characteristics of the affected veins. Vascular surgical intervention for venous insufficiency may be indicated in patients with aching pain and leg fatigue, ankle edema, chronic venous insufficiency, cosmetic concerns, early hyperpigmentation, external bleeding, progressive or painful ulcer, or superficial thrombophlebitis.

CONSERVATIVE MANAGEMENT

Conservative treatment options include avoidance of prolonged standing and straining, elevation of the affected leg, exercise, external compression, loosening of restrictive clothing, medical therapy, modification of cardiovascular risk factors,

Table 1. Clinical Tests Used to Detect Venous Reflux in Patients with Varicose Veins

Test	*Description*	*Finding*	*Sensitivity (%)*	*Specificity (%)*	*Positive predictive value (%)*	*Negative predictive value (%)*
Tap test	With the patient standing, a hand is placed over the SFJ, and the LSV is tapped at the level of the knee with the other hand.	A palpable transmitted impulse denotes that the LSV is distended with blood. The SFJ is then tapped and the presence of a retrograde, palpably transmitted impulse at the knee indicates incompetence of valves between the SFJ and the LSV, with reflux in the proximal LSV.	18	92	70	47
Cough test	With the patient standing, a finger is placed on the thigh over the SFJ.	A palpable thrill or impulse on coughing is indicative of an incompetent SFJ.	59	67	64	38
Perthes test	With the patient standing, a tourniquet is applied below the knee. The patient is directed to complete 10 heel raises.	If the varicosities empty, the site of reflux is above the tourniquet. If the veins remain distended, the site of reflux is below the tourniquet.	97	20	55	13
Trendelenburg test	With the patient in the supine position, the affected leg is elevated to 45 degrees to drain the varicosities. A tourniquet is applied just below the SFJ, and the patient is directed to stand.	Failure of the varicosities to fill indicates that the SFJ is the site of reflux.	91	15	52	38

NOTE: *Assume a pretest probability of 50 percent, and use duplex Doppler ultrasonography as the reference standard.*

LSV = long saphenous vein; SFJ = saphenofemoral junction.

Information from reference 11.

reduction of peripheral edema, and weight loss. External compression devices (e.g., bandages, support stockings, intermittent pneumatic compression devices) have been recommended as initial therapy for varicose veins; however, evidence to support these therapies is lacking.[13] Typical recommendations include wearing 20 to 30 mm Hg elastic compression stockings with a gradient of decreasing pressure from the distal to proximal extremity.[14]

Multiple medications have been proposed as treatments for varicose veins. The use of diuretics is not supported by medical literature. Horse chestnut seed extract (*Aesculus hippocastanum*) has been used in Europe and has been shown in randomized, double-blind, placebo-controlled trials to reduce edema.[15] Butcher's broom (*Ruscus aculeatus*) has also been used; however, clinical data to establish its safety and effectiveness are lacking.[16]

EXTERNAL LASER TREATMENT

Multiple laser machines that deliver various wavelengths of light through the skin and into the blood vessels are available to treat varicose veins. The light is absorbed in the

Table 2. Treatment Options for Varicose Veins

Treatment options	*Comments*
Conservative measures	
Compression (e.g., bandages, support stockings, intermittent pneumatic compression devices)	Support stockings can provide relief from discomfort.
Elevation of the affected leg	Elevation may improve symptoms in some patients.
Lifestyle modifications	Examples include avoidance of prolonged standing, exercise, loosening of restrictive clothing, modification of cardiovascular risk factors, and reduction of peripheral edema.
Weight loss	Weight loss may improve symptoms in patients who are obese.
Endovenous or interventional therapy	
Endovenous obliteration External laser therapy Sclerotherapy	Randomized controlled trials comparing clinical effectivenss and cost-effectiveness are lacking.
Surgery	
Ligation Phlebectomy Stripping	Historically, surgery has been the most widely recommended treatment option.

Information from reference 12.

vessels by hemoglobin, leading to thermocoagulation. Types of lasers include pulsed dye, long pulsed, variable pulsed, neodymium-doped yttrium aluminum garnet (Nd:YAG), and alexandrite lasers. Potentially, any small, straight vein branch is amendable to external laser ablation. However, laser therapy has typically been used on telangiectasias and smaller vessels rather than on larger veins. Long-pulsed lasers have been shown to completely clear veins with diameters less than 0.5 mm. For veins with diameters of 0.5 to 1.0 mm, improvement but not clearance is achieved.[17]

SCLEROTHERAPY

Sclerotherapy involves injecting superficial veins with a substance that causes them to collapse permanently. A needle is inserted into the vein lumen and a sclerosing substance is injected. The substance displaces the blood and reacts with the vascular endothelium, sealing and scarring the vein. A variety of products are used, including hyperosmotic solutions (e.g., hypertonic saline), detergent solutions (e.g., sodium tetradecyl sulfate), and corrosive agents (e.g., glycerin). Injections typically work better on small (1 to 3 mm) and medium (3 to 5 mm) veins; however, a precise diameter used to make treatment decisions is lacking. Although sclerotherapy is a clinically effective and cost-effective treatment for smaller varicose veins, concerns about the development of deep venous thrombosis and visual disturbances, and the recurrence of varicosities have been noted.[12,18,19]

ENDOVENOUS OBLITERATION OF THE SAPHENOUS VEIN

A newer treatment for varicose veins is to insert a long, thin catheter that emits energy (most commonly heat, radio waves, or laser energy). The released energy collapses and scleroses the vein. A variety of techniques and protocols are used. Because it is easier to insert a catheter through a vein in the same direction that the valves open, the catheter is most commonly inserted into a more distal portion of the vein and threaded proximally. Energy is released from the catheter tip. As the catheter is pulled out, the vein lumen collapses. Bruising, tightness along the course of the treated vein, recanalization, and paresthesia are possible complications.[20,21]

SURGERY

Historically, surgery is the best known treatment for varicose veins, especially when the greater saphenous vein is involved. However, literature does not consistently support surgery as the definitive treatment option.[22] Most surgical techniques involve using multiple smaller incisions to reduce scarring, blood loss, and complications.

Surgical management may reduce the risk of complications of varicose veins. Surgical correction of superficial venous reflux reduces 12-month ulcer recurrence.[23] In addition, surgical management of venous ulcers leads to an 88 percent chance of ulcer healing, with only a 13 percent risk of ulcer recurrence over 10 months.[24]

The simplest surgical procedure is ligation, which involves tying off the enlarged vein in portions of the leg, thigh, and groin. Potential complications include recurrence and worsening of intravenous pressure in tributary veins.

Phlebectomy and stripping are probably the best known procedures; however, they are more of a collection of procedures than single techniques. For phlebectomy, the varicose vein is mapped and marked on the skin using visual skin changes or duplex Doppler ultrasonography while the patient is standing. The patient is then placed in a supine position, and a series of perpendicular 1- to 2-mm stab incisions are made over the vein several centimeters apart. The saphenous vein is identified in the groin, brought to the surface via a small incision, and ligated. The vein is hooked and brought to the surface at the next incision site. It is then pulled and dissected proximally and distally at each incision site to release it from the surrounding tissues and to sever any connections to tributary or deeper perforating veins. This process is repeated distally. The vein can be removed in a long strip or in multiple smaller pieces depending on the size and shape of the vessels, as well as the patient's vascular pathology.[25,26] Alternatively, the greater saphenous vein can be ligated and incised at the groin. A stripper is inserted into the vein near the knee and moved proximally. The stripper is then attached to the proximal end of the vein and pulled distally, removing it.[5,27]

Typically, surgical procedures are done in a hospital operating room or in an outpatient surgical center. These procedures are associated with significant cost and risk of complications from anesthesia. Potential postsurgical complications include bleeding, bruising, and infection. In addition, a new blood vessel may form after the procedure, with the risk of neovascularization estimated to be as high as 15 to 30 percent.[5]

COMBINATION THERAPY

Combinations of conservative measures and more invasive techniques may be appropriate, depending on the patient's symptoms, the extent of vascular pathology, and the available resources. For example, 12-month ulcer recurrence rates are significantly reduced in patients treated with compression and surgery compared with those treated with compression alone.[23] A specific combination or standard protocol cannot currently be recommended.

Studies of treatments for varicose veins are limited by small numbers of study participants, short follow-up, and inconsistent end points.

Outcome Data

Studies of treatments for varicose veins are limited by small numbers of study participants, short follow-up, and inconsistent end points (e.g., resolution of symptoms, ultrasonography measurements, appearance as judged by the patient or physician).

Three Cochrane systematic reviews of varicose vein treatment exist.[22,28,29] The first compared surgery and sclerotherapy. Although nine randomized controlled trials (RCTs) fulfilled inclusion criteria, there was insufficient evidence to recommend any single therapy. A trend of better results with sclerotherapy after one year was noted. Beyond one year, and especially after three to five years, better outcomes were noted with surgery.[22]

The second Cochrane systematic review evaluated the use of a tourniquet during surgery to minimize blood loss. It included three small RCTs. Differences in study design, outcome measures, and analysis precluded pooling the data for a meta-analysis. The authors concluded that a tourniquet appeared to reduce blood loss during surgery.[28]

The third Cochrane systematic review compared sclerotherapy and graduated compression stockings or observation. Complication and recurrence rates were reviewed, as were improvements in symptoms and cosmetic appearance. Sclerotherapy was effective in reducing symptoms and appearance of varicose veins. However, the RCTs that were included showed that the type of sclerosant, local pressure dressing, or degree and length of compression had no significant impact on the effectiveness of sclerotherapy.[29]

The Authors

RICHARD H. JONES, MD, MSPH, is a private health care consultant in Alexandria, Va. At the time of writing this article, he was a family physician at the Naval Health Clinic in Quantico, Va. Dr. Jones received his medical degree from the University of North Carolina at Chapel Hill School of Medicine and a master of science in public health degree from Tulane University School of Public Health and Tropical Medicine in New Orleans, La. He completed a family medicine residency at the Medical University of South Carolina (MUSC) in Charleston.

PETER J. CAREK, MD, MS, is the director of the Trident/MUSC Family Medicine Residency Program and a family medicine professor at MUSC. He received his medical degree from MUSC and a master of science degree from the University of Tennessee in Knoxville. Dr. Carek also completed a family medicine residency at MUSC and a sports medicine fellowship at the University of Tennessee Graduate School of Medicine.

Address correspondence to Richard H. Jones, MD, MSPH, 106 W. Howell Ave., Alexandria, VA 22301. Reprints are not available from the authors.

Author disclosure: Nothing to disclose.

REFERENCES

1. London NJ, Nash R. ABC of arterial and venous disease. Varicose veins. *BMJ*. 2000;320(7246):1391-1394.
2. Callam MJ. Epidemiology of varicose veins. *Br J Surg*. 1994;81(2):167-173.
3. Bergan JJ, Sparks SR, Owens EL, Kumins NH. Growing the vascular surgical practice: venous disorders. *Cardiovasc Surg*. 2001;9(5):431-435.
4. Sadick NS. Advances in the treatment of varicose veins: ambulatory phlebectomy, foam sclerotherapy, endovascular laser, and radiofrequency closure. *Dermatol Clin*. 2005;23(3):443-455.
5. Bergan JJ, Schmid-Schönbein GW, Smith PD, Nicolaides AN, Boisseau MR, Eklof B. Chronic venous disease. *N Engl J Med*. 2006;355(5):488-498.
6. Clarke GH, Vaskedis SN, Hobbs JT, Nicolaides AN. Venous wall function in the pathogenesis of varicose veins. *Surgery*. 1992;111(4):402-408.
7. Teruya TH, Ballard JL. New approaches for the treatment of varicose veins. *Surg Clin North Am*. 2004;84(5):1397-1417.
8. Bradbury A, Evans C, Allan P, Lee A, Ruckley CV, Fowkes FG. What are the symptoms of varicose veins? Edinburgh vein study cross sectional population survey. *BMJ*. 1999;318(7180):353-356.
9. Beebe-Dimmer JL, Pfeifer JR, Engle JS, Schottenfeld D. The epidemiology of chronic venous insufficiency and varicose veins. *Ann Epidemiol*. 2005;15(3):175-184.
10. Racette S, Sauvageau A. Unusual sudden death: two case reports of hemorrhage by rupture of varicose veins. *Am J Forensic Med Pathol*. 2005;26(3):294-296.
11. Kim J, Richards S, Kent PJ. Clinical examination of varicose veins—a validation study. *Ann R Coll Surg Engl*. 2000;82(3):171-175.
12. Campbell B. Varicose veins and their management. *BMJ*. 2006;333(7562):287-292.
13. Bartholomew JR, King T, Sahgal A, Vidimos AT. Varicose veins: newer, better treatments available. *Cleve Clin J Med*. 2005;72(4):312-314, 319-321, 325-328.
14. Lam Ey, Giswold ME, Moneta GL. Venous and lymphatic disease. In: *Schwartz's Principles of Surgery*. 8th ed. New York, NY: McGraw-Hill, 2005:823-825.
15. Diehm C, Trampisch HJ, Lange S, Schmidt C. Comparison of leg compression stocking and oral horse-chestnut seed extract therapy in patients with chronic venous insufficiency. *Lancet*. 1996;347(8997):292-294.
16. Mashour NH, Lin GI, Frishman WH. Herbal medicine for the treatment of cardiovascular disease: clinical considerations. *Arch Intern Med*. 1998;158(20):2225-2234.
17. Reichert D. Evaluation of the long-pulse dye laser for the treatment of leg telangiectasias. *Dermatol Surg*. 1998;24(7):737-740.
18. Gibson KD, Ferris BL, Pepper D. Endovenous laser treatment of varicose veins. *Surg Clin North Am*. 2007;87(5):1253-1265.
19. Weiss MA, Weiss RA. Sclerotherapeutic agents available in the United States and elsewhere. In: Goldman MP, Bergan JJ. *Ambulatory Treatment of Venous Disease: An Illustrative Guide*. St. Louis, Mo.: Mosby;1996:37-48.
20. Merchant RF, DePalma RG, Kabnick LS. Endovascular obliteration of saphenous reflux: a multicenter study. *J Vasc Surg*. 2002;35(6):1190-1196.
21. Min RJ, Khilnani N, Zimmet SE. Endovenous laser treatment of saphenous vein reflux: long-term results. *J Vasc Interv Radiol*. 2003;14(8):991-996.
22. Rigby KA, Palfreyman SJ, Beverley C, Michaels JA. Surgery versus sclerotherapy for the treatment of varicose veins. *Cochrane Database Syst Rev*. 2004;(4):CD004980.
23. Barwell JR, Davies CE, Deacon J, et al. Comparison of surgery and compression with compression alone in chronic venous ulceration (ESCHAR study): randomised controlled trial. *Lancet*. 2004;363(9424):1854-1859.
24. Tenbrook JA Jr, Iafrati MD, O'Donnell TF Jr, et al. Systemic review of outcomes after surgical management of venous disease incorporating subfascial endoscopic perforator surgery. *J Vasc Surg*. 2004;39(3):583-589.
25. Ricci S, Georgiev M, Goldman M. Phlebectomy. In: *Ambulatory Phlebectomy: A Practical Guide for Treating Varicose Veins*. St. Louis, Mo.: Mosby;1995:79-122.
26. Bergan JJ. Ambulatory surgery of varicose veins. In: Goldman MP, Bergan JJ. *Ambulatory Treatment of Venous Disease: An Illustrative Guide*. St. Louis, Mo.: Mosby;1996:149-154.
27. Angle N, Bergan JJ. Varicose veins: chronic venous insufficiency. In: Moore WS, ed. *Vascular Surgery: A Comprehensive Review*. 5th ed. Philadelphia, Pa.: Saunders;1998:800-807.
28. Rigby KA, Palfreyman SJ, Beverly C, Michaels JA. Surgery for varicose veins: use of tourniquet. *Cochrane Database Syst Rev*. 2002;(4):CD001486.
29. Tisi PV, Beverley C, Rees A. Injection sclerotherapy for varicose veins. *Cochrane Database Syst Rev*. 2006;(4):CD001732.