VARICOSE VEINS AFFECT from 10% to 30% of all men and women, with rates increasing with advancing age. Many people consider varicose veins a purely cosmetic condition, but they’re more than just unsightly bulges. Over time, they can produce debilitating signs and symptoms.

Most likely to develop in the lower extremities, varicose veins are elongated superficial veins that have become dilated to a diameter of 3 mm or more. Failure of the veins’ one-way valve system allows blood to pool in the lower extremities, which can significantly decrease venous return. This article explores the etiology, diagnosis, and treatment of varicose veins, starting with the anatomy of the lower extremities.

**Anatomy and physiology**

The lower extremity venous system is divided into the deep and superficial systems. Larger than superficial veins, the deep veins (such as the femoral, popliteal, and tibial veins) are found in deep muscle compartments and surrounded by muscle fascia. (See Major lower extremity veins: Anterior view.)

The deep venous system is primarily responsible for venous return to the heart.

The major veins of the superficial venous system, which includes the great and short saphenous veins, are located in a superficial space between muscle fascia and the dermis. Communicating veins connect veins within the same system; for example, veins of the superficial venous system connect to other veins in the superficial venous system. Perforating veins connect superficial veins to deep veins.

The lower extremity veins are lined with efficient one-way valves. With assistance from skeletal muscles that intermittently compress the leg veins (muscle pump), these venous valves normally keep blood moving forward to the heart and prevent retrograde blood flow. (See Venous valves maintain forward flow and Skeletal muscles pump it up.)

Venous reflux results when valves fail due to trauma, the effects of venous thrombosis, or factors placing excessive stress on the valves, such as prolonged standing. Reflux lets blood pool in lower extremity veins, which can cause significant circulatory problems. Disease severity varies depending on whether reflux is present in isolated areas only or throughout the superficial and/or deep venous systems. (See Comparing healthy and damaged veins.)
Telangiectasias (spider veins) are dilated intradermal veins less than 1 mm in diameter. Reticular veins are dilated bluish subdermal veins from 1 to 3 mm in diameter. Visible on the skin surface, these venous abnormalities are more common but less severe than varicose veins.1,2

Risk factors for varicose veins include advanced age, history of deep vein thrombosis (DVT), genetics, excessive standing or sitting, heavy physical activity, high estrogen states, pregnancy, and obesity. Any activity that increases pressure on the valves, including high-impact sports, can cause valves to fail. Many women develop their first varicose veins during pregnancy while many men inherit them.3

Clinical signs and symptoms
In a healthy venous system, superficial veins are minimally visible, and the saphenous veins aren’t always palpable. The appearance of telangiectasias or reticular veins indicates minor chronic venous disease.1 Although people may consider them unattractive, they may not cause significant symptoms and they don’t necessarily progress to more serious chronic venous disease such as varicose veins. Many people experience them for years without seeking medical advice.

More advanced disease causes excessive venous bulging, pain, edema, feelings of heaviness and fatigue in the lower extremities, and pruritus. Signs and symptoms of chronic venous insufficiency (severe venous disease) include venous stasis ulcers, DVT, and pigmentation, also known as skin staining. A brownish darkening of skin, pigmentation is caused by hemosiderin deposits from extravasated red blood cells. Most common at the ankle, it can also appear on the leg or foot.2

Several tools are available to classify the severity of chronic venous disease. Among them is the Clinical-Etiology-Anatomy-Pathophysiology (CEAP) system. If a patient’s medical record includes a statement such as, “patient exhibits C3 vascular disease,” it refers to the clinical classification portion of the CEAP classification for chronic venous disorders.4

- C0: no visible or palpable signs of venous disease
- C1: telangiectasias, reticular veins, corona phlebectatica, also called malleolar or ankle flares (fan-shaped patterns of small intradermal veins on the foot or ankle)
- C2: varicose veins
- C3: edema without skin changes
- C4: skin changes ascribed to venous disease, such as pigmentation, venous eczema, or lipodermatoscle-
rosis (localized chronic skin inflammation and fibrosis on the lower leg)
• C4: pigmentation or eczema
• C5: lipodermatosclerosis or atrophy blanche (a localized region of whitish skin surrounded by dilated capillaries and possibly hyperpigmentation)
• C6: skin changes as defined above with healed ulceration
• S: symptomatic, including aching, pain, feelings of heaviness or tightness skin irritation, and muscle cramps
• A: asymptomatic.

Assessing reflux with duplex ultrasonography
Besides obtaining a health history, which includes documentation of risk factors for chronic venous disease, and performing a physical assessment with a focus on the lower extremities, clinicians rely on ultrasonography for a definitive diagnosis. A bilateral venous reflux exam identifies blood vessels and the direction of blood flow and is the standard diagnostic tool for assessing venous reflux or obstruction.  

Duplex ultrasonography is usually performed with the patient upright and the affected leg non-weightbearing. BP cuffs placed at the thigh, calf, and ankle are serially inflated and rapidly deflated while the scanner tests for reflux. A reflux time greater than 0.5 second in a saphenous vein is abnormal.5 If reflux time in the saphenous vein is normal, a perforator may be causing the patient’s symptoms.

Informal assessments of venous reflux can be made with the patient lying down. Using ultrasound guidance, a clinician can determine the direction of flow within a vein by simply compressing and relaxing a distal segment. This easy exam is used at the author’s facility, the University of California Davis (UC Davis) Vascular Center Vein Program in Sacramento, for a quick assessment of treatment outcome at follow-up appointments.

Conservative treatment first
The overall treatment goals for patients with varicose veins are to improve and maintain optimal venous return to the heart, improve signs and symptoms, and prevent disease progression. Daily management with conservative treatment consists of a combination of care called the three E’s: *exercise, elevation of the legs, and most important, elastic compression hose*. Because no drugs are available to help increase venous return, patient self-care is vital to managing the disease.

Exercise increases venous return via the muscle pump. Patients should keep active to support forward venous circulation, but avoid high-impact sports. Daily walks and performing ankle flexion exercises while sitting are simple strategies most patients can use.6 Elevation allows gravity to work with, not against, the valves, increasing venous return and reducing edema. As directed by the healthcare provider, encourage patients to elevate their feet to at least heart level for a half-hour several times a day.6 Elevation can be a great source of pain relief after prolonged activity.

Compression has been used in one form or another as treatment for varicose veins for several hundred years. Graduated compression stockings (GCS) rely on graduated external pressure, with the highest pressure at the ankle and progressively less pressure applied upward to the calf or thigh muscle. This raises interstitial pressure, decreases blood volume and superficial venous pressure, and improves venous return.7 GCS are available in many grades or strengths of compression, ranging from 8 to 50 mm Hg.

GCS provide counter pressure against the muscles. This prevents venous bulging and supports the valves, encouraging venous return. GCS also reduce pain and edema and, most important, help prevent progression of venous valve dysfunction.

GCS are available in many styles and materials to encourage patients to maintain the prescribed therapy. Many people, including athletes, wear compression hose prophylactically to prevent venous reflux from strenuous activity. GCS can be challenging for patients to put on, but with donning devices, dedication, and guidance, they can conquer the task. (For more on compression therapy, see “Understanding Compression for Venous Leg Ulcers” in the January issue of Nursing2013.)

A prescription for GCS should specify the type of stocking, grade or strength of compression, and length. Clinicians in the UC Davis Vascular Center Vein Program in Sacramento, for a quick assessment
The Center Vein Program find that prescribing a compression strength of 20 to 30 mm Hg provides a good compromise between strong support and patient comfort.

For years, clinicians prescribed the three E’s for only a short time while patients healed from varicose vein treatments. But patients treated over 10 years ago are now returning to their healthcare providers claiming that their treatment failed. A recurrence rate of 52% to 65% has been documented at 5 years after varicose vein surgery. Clinicians now know that adhering to the three E’s must be a lifetime commitment to prevent disease progression.

More invasive treatments
The second component of varicose vein treatment involves invasive interventions to improve venous return in the lower extremities by diverting blood from nonfunctioning to competent veins. This is done by eliminating the broken pathway, either by removing the varicose veins or destroying them.

Surgical techniques involving ligation and/or removal of veins (vein stripping or phlebectomy) generally require general or spinal anesthesia. This was the primary approach to treatment for many years, but newer, less invasive treatments are more common today. These newer treatments may be less painful and have a shorter recovery time. Depending on disease severity, they can often be done in an outpatient clinic setting.

Endovenous ablation simply occludes the varicose vein. This procedure is typically performed in an outpatient clinic. Most patients don’t require I.V. sedation/analgesia, although it may be helpful for anxious patients. The multiple needle sticks required for the treatment are the usual cause of discomfort during the procedure. Any postprocedure pain can usually be managed with acetaminophen or ibuprofen.

Endovenous ablation can be used to occlude the saphenous vein and some larger perforating veins. The greater saphenous vein is most frequently treated with this procedure. Using ultrasound guidance, the clinician advances a catheter inside the vein, then injects tumescent anesthetic solution around the vessel to numb the area, constrict the vessel, and protect surrounding tissues from the heat.

Tumescent anesthesia is achieved by injecting a dilute local infiltration anesthetic such as lidocaine into tissue for local anesthesia. The solution may also contain other medications, such as bicarbonate or epinephrine to control bleeding. Patients receive between 100 and 500 mL of the analgesic solution. The maximum allowable quantity isn’t usually needed. Once preparation is complete, the vessel is ablated while the catheter is slowly removed.

Turn on the heat
The two modalities for cauterizing the vessel during endovenous ablation are endovenous laser treatment (EVLT) and radiofrequency ablation (RFA). At the tip of the EVLT catheter is a laser that heats to 450º C. As the catheter is removed at a slow, continuous pace, the high heat radiates to the vessel wall, causing thrombosis. The total laser time averages 2 to 4 minutes, depending on the length of vein being treated. No tissue contact with the catheter’s laser tip is necessary.

The last 7 cm of the RFA catheter contains a radiofrequency heating element that heats to 120º C. Because of this lower temperature, the catheter needs to come in contact with the vessel wall to deliver effective treatment. To ensure contact, manual pressure is applied over the treatment area. The vein is treated at 6.5-cm intervals for 20 seconds each. The clinician may treat certain portions of the vein twice to ensure good closure. As with EVLT, the average total ablation time is 2 to 4 minutes.

Skeletal muscles pump it up
The skeletal muscle pump promotes blood return to the heart from the deep and superficial vessels in the calf.
RFA and EVLT are virtually identical. Which is associated with better patient outcomes? A recent study demonstrated occlusion rates of 95% at 10 days postoperatively for both RFA and EVLT. In another study, clinical and quality-of-life improvements were similar after 6 weeks for the two treatments.

An unpublished survey at the UC Davis Vascular Center revealed similar results. When 25 EVLT patients and 23 RFA patients were asked about their pain level the evening after their procedure, those who’d had EVLT rated it at 5 on a 0 to 10 pain intensity rating scale; those who’d had RFA rated it at 3. After 24 hours, the EVLT group rated their pain at 4 and the RFA group at 2. From 75% to 80% of patients in both groups experienced postprocedure ecchymoses.

Even less invasive than RFA and EVLT, sclerotherapy is another technique available to close small varicose veins. A sclerosing agent such as hypertonic saline, polidocanol, or sodium tetradecyl sulfate is injected directly into a vein, causing fibrosis. Practitioners use the smallest dose possible and apply compression to prevent extension of the thrombus into the deep venous system.

Perforators and even some small saphenous veins can be treated with foam sclerotherapy. Polidocanol or sodium tetradecyl is mixed into sclerosing foam for better contact with the vein wall.

### Postprocedure care

The success of treatment depends on postprocedure compression to help ensure permanent closure. GCS and/or another form of compression, such as elastic compression bandages, are applied as prescribed—typically for 24 hours a day, except for showers, for at least the first week after any procedure. Once the largest varicose vein has been closed, other distal connecting vessels start to shrink. Vessels continue to heal for up to a year.

After treatment, the patient is monitored for 6 to 8 weeks to get a clear picture of how the healing has progressed. Incompetent perforators can cause reflux in other areas that may not have been connected to the initially treated vein. This will

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continue to compromise venous return. Many patients require multiple treatments at different sites over time to control symptoms and maintain optimal venous return.

Patients may require continued treatments for many years depending on the severity of their disease. Taking photographs before and between treatments help clinicians evaluate their progress.

**Complications and follow-up care**

Three to 5 days after endovenous ablation with EVLT or RFA, duplex ultrasonography is performed to rule out DVT and ensure that the treated vein is closed. Veins can reopen, especially if patients don’t adhere to compression therapy.

The nurse should assess for signs and symptoms of DVT and other possible complications such as wound infection, although research indicates that the risk of infection associated with endovenous ablation is low compared with surgery. The nurse should compare the treated and untreated extremity and assess for edema, pain, paresthesias, or changes in color and temperature. Ecchymoses is hard to predict and not necessarily abnormal; it can range from none to a 5 to 6 cm (about 2 to 2.5 in.) radius along the entire treated vein.

DVT is a concern for about 3% of patients who undergo surgical ligation and/or removal of veins. Postprocedure DVT or thrombus extension occurs in 0.7% of patients treated with RFA and 0.2% of those treated with EVLT. If either is discovered after any treatment, patients typically are prescribed either enoxaparin or warfarin and undergo duplex ultrasonography to monitor the thrombus, which may not resolve for weeks to months.

Nerve damage presenting as mild paresthesias in the treated extremity is usually minimal and resolves within a few months.

Despite use of tumescent anesthesia, subdermal tissue surrounding the treated vein may be burned. Skin burning can occur during treatment of an extremely superficial saphenous vein with endovenous ablation. This causes dark pigmentation that will lighten up over a long period of time.

The treated areas may also become hard and tender. With larger vessels such as the saphenous veins, the entire length of the vessel could feel like a small rope under the skin. This resolves over time.

Thrombophlebitis causing edema, erythema, and a burning sensation can be triggered if vessels are hard to access during treatment. Smaller injected veins may become hard or dark but these changes will improve as the thrombus dissolves.

Injection of a sclerosing agent can leave a permanent brownish stain on the skin’s surface. Patients considering sclerotherapy for cosmetic reasons need to know that they may be trading an ugly but small varicose vein for skin staining.

Areas around the knee or hip that were injected may be tender with motion due to hard scar tissue pressing against parts of a joint. This is to be expected during the healing process, and patients should be made aware of it.

**Nursing considerations**

Postoperative instructions vary greatly by provider but will focus on activity and the consistent use of compression therapy. The vein may fail to permanently close in patients who don’t adhere to the compression regimen.

Before the procedure, make sure patients can put on GCS and can tolerate them for at least 5 days. Inform them not to schedule their procedure until they can commit to wearing GCS consistently for an extended period as required for both closure and removal treatments.

Patients usually need either thigh- or waist-high GCS after treatment for vascular disease above the knee, especially if the greater saphenous vein was treated. Knee-high GCS are useful for managing short saphenous reflux but can be uncomfortable if they cut into tender areas in the popliteal space.

Patients should try to maintain good circulation postprocedure by taking one or two 30-minute walks a day. Clinicians at the UC Davis Vascular Center ask patients to avoid heavy muscular activity, such as running or heavy lifting, for a week after the procedure because pressure generated by strenuous activity can cause the vessel to reopen. To avoid infection, instruct patients to avoid swimming or soaking in water for the first week.

Inform your patients that the thrombosed vein can be hard and tender to the touch, but it will slowly soften over time.
Teach patients that varicose veins are a lifelong condition and may require multiple treatments, but that treatment is elective. Your patient may choose to be conservative and continue only with the three E’s. In rare instances, the three E’s alone can repair a marginally compromised varicose vein.

Patients who choose not to continue with the three E’s are putting themselves at a greater risk for future problems. Teach patients that if they don’t help support their veins with compression, venous stasis ulcers and other complications may develop.

Because GCS are extremely difficult to put on, spend time teaching your patients about techniques and tools that are available to help. For patients who can’t wear GCS, inform them about the different options for compression that are available.

Varicose veins are manageable. The earlier they’re diagnosed and the three Es applied, the better the chance of avoiding disease progression. Providing your patients with this valuable information will help them understand and manage their disease.

REFERENCES

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INSTRUCTIONS
Stop the reflux: An update on treatment for symptomatic varicose veins