

What Is New and Better in the Treatment of Chronic Venous Insufficiency

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Chronic venous insufficiency (CVI) is quite common and its prevalence rises steeply with age. The overall incidence of venous stasis syndrome is 76 per 100,000 person-years, and venous ulceration is 18 per 100,000 patients-years. Varicose veins are the most common manifestation of CVI, and have been estimated to affect between 10 to 30% of the adult population. The incidence is higher in women than in men, and the prevalence increases with age. The economic impact is significant with an estimated \$200 million to \$1 billion per year being spent on their treatment in the United States. Chronic venous insufficiency results from previous deep venous thrombosis in 20 to 30% of cases and the remaining cases are due to a hereditary (and less frequent congenital) venous causes. Associated factors include age, race, height, obesity, work, diet, geographic location, social class and lifestyle, contraceptives, pregnancy, and most importantly female gender and family history.

Nonoperative Management of CVI

The goals of nonoperative management of CVI are symptom control, prevention of ulceration, and promotion of ulcer healing. Patient education is extremely important and emphasis should be placed on the fact that uncontrolled lower extremity edema may result in skin ulceration and increased morbidity. There are currently no effective pharmacologic agents for the prevention of venous ulceration used in our country. The mainstay of preventative treatment therefore, is compression therapy.

The recommended compression stockings for patients with CVI apply 30 to 40 mm Hg pressure at the ankle with graded compression up the leg. A randomized clinical trial comparing compression stockings to no compression stockings in patients following acute DVT revealed that approximately 60% of patients with a first episode DVT develop post-thrombotic syndrome within 2 years. Sized-to-fit compression stockings reduced this rate by approximately one-half. Compression stockings can be difficult to apply and compliance is often a problem. If patients need assistance putting on their stockings, devices are available to aid in their application. Alternatively, nonelastic compression such as the CircAid orthosis can be used as an effective alternative with easier application.

Once the patient has active ulceration adequate compression is still the foundation for healing. The most common methods for applying topical wound treatments and compression include Unna boots, compression hose with wound covers, and multilayer compression bandages. Unna boots are made with a paste containing zinc oxide, gelatin, sorbitol, magnesium sulfate and glycerine, and this mixture dries to a semi-rigid consistency when wrapped. If compression hose and wound coverings are utilized, patients typically require intermittent leg elevation until the edema is lessened enough to allow appropriately fitting graded compression hose. The combination of wound cover-

ing and compression allows for frequent ulcer healing, up to 90% by approximately 5 months.

It should be emphasized that meticulous local wound care and careful attention to the skin surrounding the ulcer is paramount in allowing ulcer healing. Multiple topical wound care agents are available. In most situations, combinations of local wound dressings (especially occlusive dressings) with support are most useful. We have found the topical silver dressings to be very effective in venous ulcer healing. For large venous ulcers expected to have slow rates of healing, cultured human skin equivalent or split-thickness skin grafting can be considered. In general, the care for venous ulcers should be in the setting of a skilled wound care provider with regular patient contact to aid in compliance and ongoing patient education. Also, the best prevention for recurrent ulceration, once healing has occurred, is ongoing control of lower extremity edema with graded compression stockings.

Endovascular Treatment of Chronic Venous Occlusion

Percutaneous treatment of chronic venous occlusion is most commonly performed in the setting of the May-Thurner syndrome, in which left-sided iliofemoral venous obstruction is caused by the repetitive pulsatile trauma of the crossing right common iliac artery. This is most common in young women, especially after pregnancy. Midterm follow-up of treated patients reveals freedom from symptoms of venous obstruction and ongoing patency in the majority of cases, with a low incidence of neointimal hyperplasia. In the largest series reported of approximately 450 limbs, about one-half of patients were completely relieved of pain, one-third were completely relieved of swelling, and greater than one-half of ulcerated limbs healed despite approximately half of the patients presenting with obstruction and reflux. Patients had good outcomes both with and without the presence of reflux.

Sclerotherapy

An excellent technique for the treatment of superficial venules (venous spiders/telangiectasis) and small varicosities (1 to 3 mm diameter) is sclerotherapy. There are several US Food and Drug Administration-approved sclerosing agents available. Graduated external compression is then applied to produce apposition of the inflamed vein walls to avoid thrombus formation. Potential complications include pigmentation, pain, skin necrosis, DVT (rare) and anaphylactic reactions (extremely rare). Foam sclerotherapy has recently gained favor.

General Principles of Surgical Approaches

All patients should be categorized with their CEAP (clinical presentation, etiology, anatomy, and pathophysiology) classification prior to any operative interventions. Additionally, the venous clinical severity scoring system allows for the assessment of changes in the patient's venous condition with therapy.

Superficial Vein Resection

Vascular surgeons have variable degrees of enthusiasm for superficial vein resection, but most would agree that short and mid-term results are good. The objectives of these operations are to limit gravitational reflux into the superficial venous system and treat locally advanced varicose veins. Stab avulsion is performed using small 2 to 3 mm incisions over the individual varicosities followed by removal of the varicose vein clusters. This can be performed as an isolated procedure or in concert with treatment of the greater saphenous system. Endovascular laser treatment or radiofrequency ablation of the saphenous vein have shown great promise to treat saphenous vein reflux and new systems (such as Trivex) can treat varicosities. Complications from these procedures include recurrence of varicose veins (early and late), ecchymosis, lymphocele, wound infection, and transient numbness in the saphenous nerve distribution due to stab avulsion over the nerve.

Perforator Ligation

Linton developed a technique for ligating perforating veins using a medial calf incision in the 1930s. This operation has since been employed with several modifications, variable success, and significant morbidity. More recently, a less invasive approach to perforator ligation has become popularized. Subfascial endoscopic perforator surgery (SEPS) has been shown to be effective in combination with saphenous vein surgery. The identification of bidirectional flow and location of the perforating veins are identified preoperatively using duplex ultrasonography. A surgical endoscope is introduced subfascially, as is a working port, and under gas insufflation, the perforating veins are individually identified and either ligated, or ligated and divided.

Valvuloplasty

Valvuloplasty should be used to treat venous reflux in the absence of outflow obstruction. Various techniques for repairing the incompetent valve have been employed. Some involve a venotomy (internal valvuloplasty), while other techniques rely on external sutures (external valvuloplasty). A number of methods for venotomy and valve exposure during internal valvuloplasty have been described. A semiclosed repair has also been described where external sutures are placed under angioscopic guidance. All of these operations attempt to bring the two valve attachment lines into proximity. Follow-up of these patients is greater than 15 years in some series, and clinical success is achieved in 60 to 75% of patients. Postoperative complications occur in approximately 10% of patients, and are primarily related to bleeding and thrombosis.

Venous Segment Transfer

Transposition of an incompetent venous segment to one containing a competent proximal valve is another option for the surgical treatment of venous reflux. This procedure relies on competent valves in either the greater saphenous or profunda femoris proximal venous segments. This operation is associated with an ulcer recurrence rate of 35% and an ulcer-free interval shorter than that achieved with primary valvuloplasty. Surgical site thrombosis occurs in approximately 10% of patients.

Vein Valve Transplantation

Another method to restore valve competency is vein valve transplantation. This operation is usually performed in clinical classification 5 to 6 patients by removing a segment of axillary vein after its competency has been proven by duplex scanning or

phlebography. The popliteal vein is exposed through a standard above-knee approach or, alternatively, a groin approach is used to expose the femoral vein below the profunda femoris vein junction. A short segment of vein is excised in either location, and the axillary vein segment is interposed with interrupted suture technique. A summary of the results of 15 large published series reveal nearly 80% of patients have ulcer healing, but ulcer recurrence is found in nearly 30%. Objective hemodynamic improvement is less frequent than ulcer healing. More recent studies using the large axillary vein valve rather than the smaller brachial vein valve (as used in the past) have been very promising.

Venous Bypass

The treatment of post-thrombotic venous obstruction with venous bypass is an important option in a small subgroup of patients who have failed conservative measures. The crossover femorofemoral venous bypass is utilized to bypass an obstructed iliac vein segment, while the saphenopopliteal venous bypass relieves femoral occlusion. Both bypasses require a patent greater saphenous vein without varicosities, as well as unobstructed iliofemoral and IVC runoff. For the femorofemoral bypass the contralateral saphenous vein is used, while for the saphenopopliteal bypass, the ipsilateral saphenous vein is used. In these specific cases, the clinical improvement can be as high as 70 to 80% with both operations. Long-term patency is better for femorofemoral bypass (70%) than saphenopopliteal bypass (50%). The morbidity of these operations ranges from 5 to 10% with minimal risk of mortality. These bypasses have been replaced by venoplasty and stenting in most cases today.

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