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Surgical techniques

NEW SURGICAL TECHNIQUE FOR TREATMENT OF SUPERFICIAL VARICOSE VEINS

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Abstract

In this article we have described our combination of few proven surgical techniques in treatment of superficial venous disease.

Superficial venous disease and complications that are a consequence from their presence represent an increasingly common problem observed in different medical specialties.

Many patients consult their family physician for the first time when they have experienced some of the complications from superficial venous disease.

Availability of Color-Doppler sonography (CDS) enables timely diagnosis in early phase when only few symptoms are present.

Most patients require a combination of treatment methods depending on the point of the highest venous reflux, the presence of bulging varicosities, the presence of incompetent perforator veins and the depth of subcutaneous tissue overlying the muscle fascia.

Keywords: varicose veins, venous insufficiency, deep vein arterialization, perforator vein dysfunction, varicose vein surgical treatment

Introduction

Superficial venous disease broadly has been divided into different categories: venous insufficiency/reflux, perforator dysfunction disease and occlusive disease such as SVT (superficial venous thrombosis).

These conditions include lot of different signs, symptoms and clinical presentations.

In more than 50% of the general population, superficial venous disease presents as spider or reticular veins, but in more than 20% of the population this disease can progress to visible varicosities on the extremities, changes in skin color or skin ulcerations[1,2].

The veins of the lower extremity are classified according to their relationship to the muscular fascia and are located in either the superficial or deep compartment. The venous system of the lower extremities includes the deep veins, which lie beneath the muscular fascia and drain the lower extremity muscles; the superficial veins, which are above the deep fascia and drain the cutaneous microcirculation; and the perforating veins that penetrate the

muscular fascia and connect the superficial and deep veins. Communicating veins connect veins within the same system (i.e., deep to deep, superficial to superficial).

Small anatomic series in cadavers have reported an average of 64 perforating veins between the ankle and the groin[3]. The foot perforators are unique in that they normally direct flow toward the superficial veins, while all others normally direct flow to the deep system[4,5]. The major perforators of the medial calf and thigh have one to three valves that direct flow from the superficial to the deep veins[4].

The superficial venous system includes the reticular veins as well as the great (greater) and small (lesser) saphenous veins and their tributaries. The reticular veins, a network of veins parallel to the skin surface and lying between the saphenous fascia and dermis, drain the lower extremity skin and subcutaneous tissue[6]. These veins communicate with either saphenous tributaries or the deep veins through perforators. Direct communication between incompetent reticular veins and the deep venous system through perforating veins has been reported in 60% of patients with extensive thigh telangiectasias[6].

The CEAP classification system, developed under the auspices of the American Venous Forum, provides a mechanism for the uniform diagnosis of venous disease and comparison of populations of patients. The four components of the CEAP classification are a description of the clinical disease class (C) based upon objective signs, the etiology (E), the anatomic (A) distribution of reflux and obstruction, and the underlying pathophysiology (P), whether related to reflux or obstruction[7].

Table 1. CEAP classification

CEAP Clinical score	**Description**
C0	No visible or palpable varicose veins
C1	Telangiectasia (Thread veins / Spider veins / Broken veins)
C2	C2A Varicose veins without any symptoms (Asymptomatic) C2S Varicose veins with symptoms
C3	Swollen ankle (edema) due to varicose veins or hidden varicose veins (venous reflux)
C4	Skin damage due to varicose veins or hidden varicose veins (venous reflux)
C5	Healed venous leg ulcer
C6	Venous leg ulcer

Diagnosis

The most common form of CVI is primary varicose veins due to the insufficiency of the saphenous system. Color-Doppler sonography (CDS) is actually the main diagnostic technique of imaging for CVI. Deep veins are "comitantes" to the corresponding arteries and run under the muscular fascia. Superficial veins course into the subcutaneous fat, superficially to the deep muscular fascia; the main superficial veins are the greater and lesser saphenous and their tributaries. Connection between the saphenous veins is defined as communicating veins. Superficial and deep veins are connected by perforating veins, with flow directed, under normal circumstances, from the superficial to the deep system. The main perforating are the Hunter in the mid thigh, the Dodd in the lower thigh, the Boyd in the upper calf, and the Cockett's in the middle and lower calf. Sonographic examination must be performed in the upright and supine position. Compression sonography and color and PW Doppler are systematically employed to assess the absence of deep venous thrombosis. Femoro-popliteal veins are evaluated with color and PW Doppler for valvular insufficiency with reflux by performing Valsalva maneuver and calf compression. The sapheno-femoral and sapheno-popliteal junctions are examined to identify type of junction, continence, accessory saphenous, and incompetent collaterals. Perforating veins are usually identified at

the medial aspect of the thigh and at the medial, lateral, and posterior aspects of the leg. Outward flow (lasting more than 500 ms) in the perforating veins should be considered a sign of their incompetence.

Treatment

Stripping technique

Friedrich von Trendelenburg introduced a modern surgical treatment of varicose veins in 1860 with an operation through a transverse incision in the upper thigh through which he ligated and divided the great saphenous vein. Charles Mayo soon after graduating from medical school, began excising the great saphenous vein through a single incision from the groin to just below the knee. In 1906[8] he reported a series of 185 patients treated in this fashion. Mayo and Keller[8] published separate descriptions of procedures using different "stripping" devices early in the 20th century. Later, Thomas T. Myers[9] of the Mayo Clinic published results using a flexible intraluminal stripper for removal of the great saphenous vein and the direct excision of the varicosities. This popular vein-stripping operation was the treatment of choice from 1950 until recently; it has been widely applied and is still performed by many surgeons. The operation has major drawbacks, however: it requires general or spinal anesthesia; limits patients' activity and causes them to miss work; and is associated with a significant infection rate, a high incidence of postoperative paresthesia and pain, and a high incidence of recurrent varicosities, which has been reported to be as high as 70% at 10 years[10].

Radiofrequent and laser venous ablation

The modern surgical treatment of venous insufficiency of the lower extremities is possible because of endovenous technology, the application of color duplex sonography, and the use of tumescent anesthesia. With ultrasound scanning by a skilled sonographer knowledgeable about venous disease, it is now possible to identify the point of origin of the venous hypertension, i.e., the site of failure of the most proximal venous valve, and to map completely the extent of the venous reflux. Endovenous methods and the Seldinger technique permit a minimally invasive approach. Tumescent anesthesia[11, 12], the injection of a dilute concentration of local anesthesia in relatively large volumes into the surrounding tissues, allows the patient to remain conscious and avoid general or spinal anesthesia. It also serves to insulate the treated vein from other structures and thus avoid thermal injury to adjacent tissues and overlying skin. Because the vein is compressed down around the radiofrequency catheter or the laser fiber by the tumescence, better contact against the vein wall is achieved.

There are two new options to achieve saphenous vein ablation that have good outcomes and few complications. The first minimally invasive endovenous ablation device to gain approval was the radiofrequency catheter, which was followed by the laser fiber a few years later.

Both have proved effective at causing thermal injury to the vein wall and subsequent thrombosis.

Foam ablation

Foam sclerotherapy was developed in Europe and has gained popularity over the past few years. Using Tessari's method[13] the sclerosant solution is mixed forcefully with air or carbon dioxide using a technique employing two syringes and a three-way connector to create a foam, which is injected into veins being treated. The sclerosant, which coats the gas bubbles, tends to linger against the endothelial surface of the veins rather than be washed out. This allows more contact time for the sclerosant to cause endothelial and vein wall damage by

interfering with the function of endothelial and subendothelial cell surface proteins that are necessary for cell survival. The end result is thrombosis and fibrous obliteration of the vein.

Clearly, foam chemical ablation has been a useful tool in treating recurrent veins after treatment with endovenous ablation methods. It has also been successful in treating varicosities emanating from pelvic venous reflux, which produces vulvar, high thigh, and posterior thigh painful varicosities. It is the best method of ablating incompetent communicating veins and perforators. These veins, which perforate the fascia generalis overlying the muscles of the leg, carry venous flow and transmit high pressure from the deep veins of the muscles into the superficial veins of the leg.

Subfascial endoscopic perforator vein surgery

With the popularity of minimally invasive endoscopic surgery, surgeons began to apply the technique to interrupt incompetent perforator veins in the subfascial space. The subfascial endoscopic perforator vein surgery (SEPS) approach avoided the larger and, in many cases, multiple incisions necessary to divide the communicating veins, as described by Linton[14]. The SEPS operation has been shown to be effective in accelerating ulcer healing and in preventing recurrences[15,16]. It has the disadvantage of requiring general or spinal anesthesia, and patients experience some wound pain and disability for a while. It appears that foam chemical ablation using a sclerosant is less invasive and safely accomplishes perforator closure without incisions and division of the vessels.

Microphlebectomy

In the past, incisions have been used to excise bulging superficial varices, which typically course in the fat layer above the muscle fascia and below the skin. These unsightly and painful veins are removed for cosmetic reasons and to prevent superficial thrombophlebitis that often occurs in these varicosities once the venous hypertension has been alleviated by one of the techniques described above. By removing the varicosities, skin hyperpigmentation is also avoided should clotting of the varicosities occur. Large incisions have been effective but leave significant scars. Microphlebectomy, which was described by Muller[17] and is often referred to as ambulatory phlebectomy, allows the removal of the varicosities quite effectively without leaving objectionable scars. Tiny 2- to 3-mm incisions are made over the bulging varicosities, which have been marked with the patient in a standing position. Through these incisions, a small vein hook delivers the varicose vein, which is clamped, teased out, and excised. Microphlebectomy has proven to be a very esthetic method of removing the varicosities and is easily accomplished using tumescent local anesthesia.

How we do it

Our technique represents an outpatient treatment modality performed in tumescent anesthesia.

In standing position with color duplex sonography, we mark the beginning of VSM anatomically located with surrounding nerve above medial malleolus.

Continuously from the anatomical position of the VSM, we mark all perforators veins with retrograde blood flow in the calf and in the tight.

We also mark the inflow of VSM into VCF in the groin region.

All visible varicose veins of the leg are marked.

Firstly, with small incision above medal malleolus we divide the VSM from surrounding nerve, ligate and cut off the veins in their beginning in the calf.

We ligate the VSM in the most peripheral part around the knee.

In previously marked perforator veins with retrograde flow, we perform subfascial ligation of all perforators in the calf and in the tight.

After ligating the perforators veins, we perform stripping of VSM in their below the knee segment.

With small incision in the groin region and after tissue dissection and verification of the saphenofemoral junction, first we verify the distal branches of VSM as superficial epigastric vein, superficial circumflex vein, superficial pudendal vein, anterolateral and posteromedial vein and we ligate all of identified branches with individual anatomical variation.

Due to anatomical variant, sometimes we identify two to four (2-4) branches of VSM.

We continue our procedure with ligation of VSM in saphenofemoral junction and closure of the skin incision.

In patients with varicosity, we perform mini-phlebectomy.

After procedure, all patients wear compressive bondages and compressive stockings for two weeks.

Results

We have performed this combined procedure in ten (10) patients.

Postprocedural control was performed on day 7 after procedure.

On the first control, we removed the stiches, observed the wounds, made photos and made measurements of the leg in their calf and thigh in standard points.

In comparison to all techniques in venous insufficiency treatment that we provide in our hospital, all patients treated with this technique have reported faster postoperative recovery and prompt return to daily activities in few days.

We registered reduction in hematoma occurrence in comparison with the classical stripping technique.

All patients, after removing the stiches, were advised to use topic heparin ointment.

We have not observed recurrence in any of the patients where we performed this combined surgical treatment in a 6-month follow-up period.

Discussion

Most patients require a combination of treatment methods depending on the point of the highest venous reflux, the presence of bulging varicosities, the presence of incompetent perforator veins, and the depth of subcutaneous tissue overlying the muscle fascia.

It is necessary to compare results of the minimally invasive endovenous ablation procedures using either radiofrequency or laser against the results of the vein-stripping surgical procedure. Multiple series of vein-stripping patients have demonstrated significant recurrence rates of 15% over the course of 5 to 10 years[18-20]. Patient satisfaction with the vein-stripping procedure has been disappointing, with only 85% of patients rating the results excellent or good. This comparison does not take into account the increased pain and morbidity, the requirements for general or spinal anesthesia and hospitalization and the resulting expenses, and the physical limitations and absence from work following the stripping operation. It is important to note that long-term follow-up of patients undergoing radiofrequency or laser venous ablation is limited.

Cabrera[21] has used foam sclerotherapy as a single therapy to ablate truncal veins such as the great saphenous vein. Others have used foam in conjunction with radiofrequency to achieve results superior to either alone. Morrison[22] reported 1445 great saphenous veins treated with radiofrequency. At a mean follow-up of 27 months, success, as measured by sonographic absence of the great saphenous vein, occurred in <50% of the limbs. Of the veins with persistent flow, 80% were successfully closed with ultrasound-guided foam sclerotherapy. However, with the combination of radiofrequency and foam sclerotherapy, he achieved 94% closure (N. Morrison, personal communication, 2006). Adverse events are rare, but reported

symptoms following foam injection include visual disturbance, cough, and migraine, all of which are transient and usually clear within minutes.

Overall patient satisfaction with these modern techniques surpasses that with the vein-stripping operation of the past.

Treatment of chronic superficial venous disease require familiarization of almost all up-to-date known procedures and require individual approach and choice of different treatment modalities in each patient.

Conflict of interest statement. None declared.

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