

**Completing the Venous Picture:
Sclerotherapy and Ambulatory Phlebectomy**

Neil Khilnani, MD

Cornell Vascular

Weill Medical College of Cornell University

1. Introduction: The treatment of varicose veins begins by eliminating all sources of truncal reflux. This is generally taken care of with surgical techniques such as ligation and stripping or, more recently, with endovenous methods such as EVLT or RF ablation. Once these sources of truncal reflux are eliminated, attention is turned toward the elimination of the varicose veins themselves. In this presentation the principles and practice of *Compression Sclerotherapy* of varicose veins will be presented. A description of the technique as it is applied to spider veins will also be discussed. Ambulatory phlebectomy is an alternative tool which can be utilized for the treatment of large to medium sized varicose veins. A brief description of that technique will be made during the lecture but the emphasis will be on sclerotherapy.

2. Goals: Sclerotherapy is a treatment which has been applied to varicose veins in various forms for centuries. In the last several decades numerous advances in the understanding of the anatomy and pathophysiology of venous insufficiency along with improvements in techniques and materials has made this treatment exceptionally safe and effective.

The assumptions made with the most popular approaches to sclerotherapy is that reflux is derived from higher or more proximal sources in an extremity and that reflux passes from larger to smaller veins. As such, the most efficient treatment of varicose veins begins from proximal to distal and from the largest veins to the smallest. The goal is to obliterate veins which carry blood retrogradely without damaging other veins. Successful obliteration requires irreversible injury to the endothelium; injury below this threshold will result only in thrombus formation which is more likely to recanalize. When using a sclerosant that is too weak the injury may not be sufficient to produce a lasting occlusion. Using a sclerosant that is too strong or using too much volume may injure adjacent normal veins including the deep veins. Therefore the choice of sclerosant and the volume to be injected has to be individualized to the size and location of the vein to be treated.

3. Technique: Most injections are performed with the patient supine. In this position, the veins are relatively empty so there is minimal dilution of the sclerosant. The contact time is maximized as well since there is little flow in the superficial veins in this position. Therefore, one gets the maximum effect with the smallest volume and concentration of drug limiting injury to surrounding normal veins.

Veins are generally treated with 3cc syringes and 27G needles. The techniques vary based on the size of the vein to be treated. For the larger veins, aspiration on needle advancement will yield a flash of blood which will identify successful venous cannulation. For telangiectatic veins, aspiration is not generally possible and visual confirmation of successful cannulation is followed by a low pressure injection will determine successful cannulation.

Visualization of veins can be improved with magnification. Loupes are helpful; however, we find a magnified lens coupled to a light source to be an excellent way to visualize veins and protect the operator from blood borne infections. Some operators used polarized light sources to improve visualization. Others use transillumination tools to identify some of the more subtle reticular veins which are often feeding veins to groups of telangiectasias.

Generally it is best to treat a pathway in an organized way as described in the goals section. Proximal thigh veins should be injected first and then successively lower veins when attempting to obliterate an incompetent pudendal vein pathway. Similarly, the most proximal residual patent incompetent tributaries of the previously treated saphenous vein should be injected before the often more apparent more peripheral varicosities. Also, feeder veins, such as reticular veins which feed spider veins, should be treated first before the spider veins themselves.

Injection is performed with steadying of the syringe and traction on the skin using the hand not holding the syringe. Care is made not to extravasate especially when using more concentrated materials. Each site is swabbed with an alcohol saturated cotton ball to clean the skin as well as to improve visualization of the vein. Injection pressures should be low and the volume based on the size of the vein (usually 0.2-1.0 cc per site) and the sites spaced out every 3-5 cm.

After injection of several sites (usually 20-30 minutes of treatment), compression stockings are placed on the patients. Patients are instructed to wear their compression stocking while they are standing for 4 days. Compression limits the amount of trapped blood that can form and increases venous blood velocities decreasing the risk of thrombosis of normal veins. For telangiectasias, support grade stockings (15-20mmHg compression) are used. For varicose veins, Class 1 (20-30 mmHg) or Class 2 (30-40 mmHg) stocking are used depending on the size of the veins. They are encouraged to walk as much as possible to increase flow in their deep veins and to pursue all but vigorous gym workouts, heavy weight lifting or hot baths.

Treatments are repeated every 3-4 weeks to allow adequate time to assess the results of a previous treatment as well as to allow the operator to remove trapped blood before it has the opportunity to release too many pigments into the perivenous tissues. Most patients will require several treatments to completely eliminate the abnormal veins.

4. Sclerosants: Unfortunately, there is currently no perfect agent for sclerotherapy. Characteristics of an ideal sclerosant would include:
- a. No allergic potential
 - b. No systemic toxicities
 - c. No pain on injection
 - d. No proclivity toward causing skin pigmentation
 - e. No injury to surrounding tissues if extravasated
 - f. No induction of telangiectatic development (matting)
 - h. No effect on normal veins

Several classes of agents exist of which two are most popularly employed. These include detergent agents like sodium tetradecyl sulfate (STS or Sotradecol), polidocanol (Aethoxysklerol) and chromated glycerine (Scleremo). Of these, only STS is approved for use in the US. Hypertonic agents such as hypertonic saline and 25% dextrose with 10% NaCl (Sclerodex) are also used but not approved by the FDA. However, these are easy to prepare and are used extensively in the US.

The hypertonic agents main advantage is that they are essentially non-allergenic. However, they are painful on injection and can cause significant tissue necrosis on extravasation. STS causes no pain on injection and although the potential for allergy exists it is very rare and more often related to the preservatives used in its preparation. The main shortcoming of STS is its proclivity to produce pigmentation. Although it can cause tissue necrosis on extravasation, the use of lower concentrations leads to substantially less risk.

STS is the agent we use in our practice. It is available in 3% concentration. We dilute this agent for use based on the size of the vessel being treated. Generally, 0.15-0.3% STS is used for spider veins, 0.3-0.5% for reticular veins, 0.5-1.0 % for larger varicose veins and 1.0-3.0% for truncal veins or deeper larger veins refractory to the lower doses.

5. Complications: Fortunately, complications are quite rare after sclerotherapy. The most common complications include pigmentation over a treated vein site and telangiectatic matting.

The pigmentation is related to the cutaneous adsorption of blood pigments which are released from trapped blood in occluded veins. This trapped blood can be expressed from the vein (microthrombectomy) with a 25G or 18G needle on successive visits which may minimize the risk of this complication. Pigmentation may occur in 5-30% of patients but it resolves in almost all patients and lasts > 1 year in about 1% of cases. If it is severe or if it persists, search for an untreated source of reflux trying to fill the veins in this area.

Telangietatic matting is the formation of new minute red spider like veins in the area of previous sclerotherapy . It can occur near surgical wounds after phlebectomy as well. Fortunately it is very rare since it is very difficult to treat. Time is usually the only potential treatment since these are often too small to inject. Cutaneous laser treatment has been described as successful; this is the only role of cutaneous lasers for treating veins on the legs at this time.

Allergies to sclerosants are possible but unusual. However, because of this risk, IV solutions, Benadryl, steroids and epinephrine should be available for treatment should they be needed. Localized urticaria at the site of injection is common and requires no therapy.

Extravasations can lead to tissue injury with punctuate ulceration being the most common. Conservative therapy with standard wound management is usually successful for care of these ulcers. The use of the lowest concentration possible and careful technique will minimize this risk. If an extravasation should occur, milk the sclerosant out of the skin. Injection with saline or other drugs has been recommended but is probably only necessary with the stronger concentrations of sclerosants.

Arterial injections are the most feared complications of sclerotherapy. Risk factors include injection near the ankle where the arteries are very superficial and where AV connections associated with varicose veins are more likely to occur and injection near the SFJ and SPJ where small crossing arteries exist. US guided injections with inadvertent arterial cannulation is another risk factor. Arterial injection leads to a sludge embolus that obstructs small arteries and the microcirculation with little effect on the artery itself. Intrarterial injections are often associated with pain, followed by dusky cyanosis and later pallor. Pulses are often preserved until later. Treatment includes ice to the affected areas, heparin, vasodilators and thrombolysis. This early therapy may have no overall effect on outcome but should be attempted since this is a limb threatening emergency.