Technical Pearls For Optimizing Sclerotherapy

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Whether performing visual Cosmetic Sclerotherapy for spider and reticular veins or utilizing Endovenous Chemical Ablation for the medically-induced treatment of varicose veins, use patient positioning to your advantage. A vein having a diameter of 1 cm while standing becomes 0.5 cm when supine and then reduces to 0.25 cm with the leg elevated above the general circulation. By adjusting the patient’s position prior to treatment you will reduce the size of the vein, use less sclerosant, and get better results. I like to put the back slightly up to about 30 degrees with the legs slightly elevated and then put the table in Trendelenberg so the legs are higher than the hips. This is similar to a La-Z-Boy recliner position.

Make sure to always keep the knee slightly bent. In the supine position, place a bolster pillow under the knee; while in the prone position, place it under the foot. There is a small percentage of the general population that have popliteal vein compression with extension of the knee. This may be even more important in patients with a higher BMI (> 34) since their incidence of popliteal vein compression may be higher. Since some of the sclerosant can pass into the deep system we would not want to have the popliteal vein partially compressed or totally occluded.

Use Position to Your Advantage and Keep the Knee Slightly Bent.

The best news we have had in many years is that Polidocanol is now FDA approved. Yes, the world’s most widely-used and documented sclerosant is available in the US under the trade name Asclera®. Available in two concentrations, 0.5% is approved for the treatment of spider veins 1 mm or less, and the 1% concentration is approved for reticular veins from 1-3 mm. The treatment of any vein larger than 3 mm would be considered off-label use. This release adds another weapon to the armamentarium of the sclerotherapist. It’s half the strength of Sotradecol® at the same concentration but has a unique property of causing a greater venospasm. In my opinion, this is why 1% proprietary polidocanol microfoam Varisolve®, has been shown to be very effective in treating truncal saphenous veins. Originally developed as a local anesthetic, it will cause circumoral numbness with increasing concentrations (just like local anesthetics); an important indicator to stop any further treatment with the drug for that session. I highly recommend all clinicians learn about and use all the sclerosants that are available in the US as off-label or FDA approved drugs. The best way to optimize your results is to optimize your knowledge and use of the drugs available.

Know Your Sclerosants
The use of sclerosant foam is not FDA approved and the debate continues as to whether it's illegal or off-label. Are we changing the biological behavior of scleroasant, or changing the physical state of sclerosant? What is for sure, as stated by John Bergan, is that “office-produced foam has been shown to be a safe, effective treatment modality and is considered by most as the “Standard of Care” for endovenous chemical ablation”. Foam is considered to be twice as potent as its liquid counterpart. Ultrasound guidance allows for accurate treatment of saphenous tributaries, major trunks and reticular veins, regardless of their size, tortuosity or anatomic location. Ultrasound guided foam sclerotherapy is excellent for treating the distal GSV after thermal ablation or stripping to the knee and residual/ recurrent varices following venous surgery or ablation. It’s also the treatment of choice of neovascularization and venous malformations. Unlike surgery or thermal ablation, it requires no anesthesia. But how can we keep foam from entering the deep venous system? Many maneuvers have been described from elevating the leg, to keeping the patient motionless in Trendelenberg with pressure on the SFJ. It has been shown, however, foam will go where ever it wants and it is futile to try and keep foam from reaching the central venous circulation, even when small volumes (3 ml) are injected.\(^5\) It is important to note, in the presence of a right-to-left shunt it can proceed into the arterial circulation.

**You Can’t Keep Foam from Reaching the Central Venous Circulation.**

Even though we know that foam sclerotherapy is very safe, we should always strive to decrease any known risk when performing it. Using room air to produce foam has been shown to have the highest incidence of side effects. When room air was substituted with a physiologic gas, such as CO\(_2\), or a combination of physiologic gases, such as CO\(_2\)-O\(_2\), the incidences of side-effects were much lower. Morrison\(^6\) has shown that when using the gas mixture of 70% CO\(_2\) and 30% O\(_2\) patients were 40 times less likely to experience the side effects of dry cough, metallic taste, and chest tightness. Additionally, patients were 7 times less likely to experience the side effects of nausea, visual disturbances, and dizziness as compared to patients treated with air-based foam.

**Don’t Use Air Based Foam**

I do not know of any 70/30 pre-mixtures of medical grade CO\(_2\)/O\(_2\) commercially available in tanks, and such a mixture would require separate tanks of each of the gases, with a measuring system for creating the mixture within your office. Most medical gas companies can make up the tank, but sometimes they are reluctant to do so if you tell them it is for injection directly into humans. There is also some question as to the sanitary nature of the re-fillable tanks, and some have been found to carry a number of fungi and molds which would compromise the sanitary nature of the sclerotherapy procedure. There is, however, a new medical device called the CO\(_2\)MMANDER, which
was designed to deliver medical grade CO₂ gas, and a mixture of CO₂/O₂ from cartridges, in a safe and portable fashion. Figure 1.

![Figure 1](image)

The device is registered with the FDA and uses USP and CE certified medical-grade cartridges, which are disposable. Containing a 77/23 mixture of CO₂/O₂, the mixed gas cartridges provide what seems to be an optimum mixture for nitrogen-free foam, with greater foam stability. The whole system can fit in your drawer.

**Find a Reliable Way to Make CO₂/O₂ Based Foam.**

We know that foam created with CO₂/O₂ produces fewer side effects and complications than air-based foam. Foam made with CO₂/O₂, however, tends to deteriorate more quickly in the syringe prior to injection, thus making it more difficult to work with and creating a barrier to its widespread acceptance. This is even more so with CO₂ based foam.

The most commonly used system to produce foam today is the double-syringe system (DSS) technique where two syringes are connected by a two-way connector or with a three-way stopcock. With the sclerosing solution in one syringe, and air/gas in the another syringe, the sclerosant is drawn back and forth with pump-like movements through the connector/stopcock. The narrower the passage between the two syringes the greater the turbulence and the smaller the bubbles size. Foam with smaller bubbles has a greater half-life than foam with larger bubbles.⁷

A 5-micron filter is traditionally used as a safety precaution in filtering any glass fragments from medication ampules, or any crystalline particles from various medical solutions. Figure 2. When a 5-micron filter is used with the DSS technique, the stability of the foam produced will almost double. This was shown by Shirazi ⁸ using room air and Hill ⁹ using CO₂. The filter can be used with a two-way connector Figure 3 or a
three-way stopcock as seen in Figure 4. This greater stability will make it much easier to work with air, CO₂, or CO₂/O₂ based foam and optimize your results with foam sclerotherapy.

Use a 5-Micron Filter When Making Foam

**Figure 2.** 5-micon filter.

Photo courtesy of D. Hill, MD.

**Figure 3.** Double-syringe system with a two-way connector and 5-micron filter.
**Figure 4.** Double-syringe system with a three-way stopcock and 5-micron filter.

**References**


9. Hill D. Effect of a 5 micron filter on CO2 sclerosant foam stability. XVI World Congress of the UIP. Monaco, 31 August - 4 September 2009