Sclerotherapy

This week's Update looks at sclerotherapy advances in the treatment of venous disorders.

This week's Update is by **Dr Adrian Lim**

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Introduction

Up to a third of the community may be suffering from lower-limb varicose veins with varying degrees of venous hypertension.[1]

Venous thrombophlebitis and skin ulceration are examples of potential complications of longstanding venous hypertension that carry significant morbidity, healthcare costs and burden of disease.[2,3]

Varicose veins are frequently under-diagnosed, in part due to the perception that the condition is trivial and of cosmetic concern only. As a result, the opportunity to treat this chronic, progressive condition at an early stage may be missed.

Treatment of incompetent leg veins by either surgical or non-surgical means can enhance quality of life through improvements in appearance and symptoms, such as bulging veins, leg aching and swelling.[4,5]

Early intervention will also reduce the risk of ongoing vein- and skin-related damage secondary to chronic venous hypertension. These changes progressively worsen with time, and earlier treatment is preferable to a wait-and-see approach.

Sclerotherapy is the non-surgical technique of injecting veins with sclerosing agents (sclerosants) to chemically ablate them. Modern-day sclerotherapy can effectively treat venous disorders ranging from cosmetic telangiectasias to bulging varicose veins and selected vascular malformations.[6-8]

Sclerotherapy remains the gold standard for treatment of small telangiectatic and reticular leg veins. More recently, ultrasound-guided sclerotherapy has gained acceptance as an effective and safe alternative to surgery as a method of treating varicose veins.[9,10]

In the past decade, there has been significant progress in sclerotherapy. These advances have occurred in the areas of sclerosant preparation, ultrasound and laser technologies, as well as vein-injection protocols, making the procedure safer and more effective for patients.

These sclerotherapy advances will be the focus of this article.

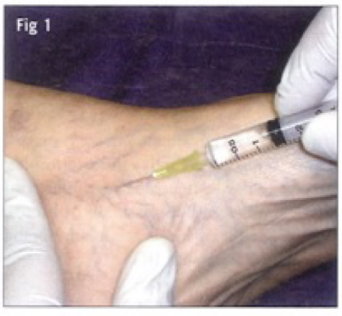
Sclerotherapy methods

DIRECT-VISION SCLEROTHERAPY

Sclerotherapy can be broadly classified as direct-vision sclerotherapy (DVS) (see Figure 1) or ultrasound-guided sclerotherapy (UGS) (see Figures 2a,b,c,d).

DVS has been an established method of treating veins since the 1940s. With DVS, visible veins are injected with sclerosants that disrupt the intravascular endothelial lining, resulting in vein sclerosis or fibrosis that is subsequently absorbed by the body. Commonly used sclerosants include hypertonic saline, sodium tetradecyl sulfate (STS) and polidocanol (POL). A comparison of these commonly used sclerosants is represented in Table 1.

DVS is also known as microsclerotherapy, as the target vessels are usually less than 2-3 mm in diameter. These vessels constitute the red-purple telangiectasias or 'broken capillaries' (<1 mm in diameter),



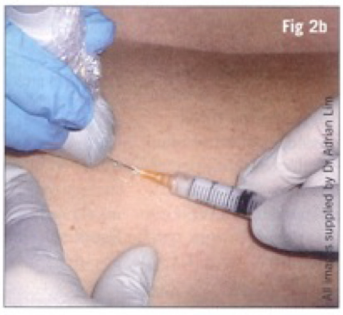


Figure 1: Direct-vision sclerotherapy (DVS) using liquid sclerosants on telangiectasias of the medial ankle.
Figures 2a,b: Ultrasound-guided sclerotherapy (UGS) using foam sclerosants on incompetent veins that are not easily visualised clinically.

and the green reticular veins (1-3 mm diameter).

DVS is the mainstay of treating cosmetic leg veins that are visible by clinical inspection. The limitation of DVS is its inability to adequately treat incompetent leg veins that are not easily visualised clinically. Up to a third of seemingly surface cosmetic leg veins may have 'hidden' incompetent or refluxing veins that would have been missed without the benefit of doppler/duplex ultrasound investigations (see Figures 3a,b,c).

ULTRASOUND-GUIDED SCLEROTHERAPY

UGS is the method for treating varicose veins (3 mm or greater in diameter). It relies on real-time duplex imaging to guide the needle into incompetent veins that are not clearly visible by direct vision. The duplex ultrasound can precisely locate the abnormal or incompetent veins, as well as adjacent structures such as deep veins and arteries, ensuring precise localisation of the target vein while minimising accidental injection outside the vein. The injection is performed while monitoring the needle position on the ultrasound monitor.

UGS is an in-office treatment alternative to surgical stripping of moderate- to large-diameter veins. Several injections, all monitored by the ultrasound, will be required along the length of the vein to achieve complete closure of the target vein. The injections are repeated every 5-10 cm along the length of the incompetent vein, starting from proximal to distal (groin to foot).

FOAM SCLEROTHERAPY

Fortunately, the two most efficacious and widely used sclerosants – STS and POL – are amenable to foaming with room air or carbon dioxide, as they have detergent-like properties.

The advent of foam UGS in the new millennium has increased the efficacy of large-vessel sclerotherapy without compromising safety.

Foam UGS is routinely practised by phlebologists for post-operative (ligation/stripping) recurrent varicose veins. In recent years, foam UGS has become an accepted first-line treatment for primary varicose veins.[10]

Most Australian phlebologists use either STS or POL as first-line sclerosants because of their favourable safety profile and efficacy. STS can be used in varying concentrations to treat spider veins through to grossly dilated varicose veins.

Both STS and POL foam readily, and the use of foam sclerosants has advanced the practice of sclerotherapy worldwide.

Interestingly, it has been demonstrated that detectable amounts of foam microbubbles can reach the heart, lungs and brain during leg vein treatment.[11]

There is no evidence that this has long-term detrimental effects, but transient effects such as headaches, visual disturbances and coughing may occur.

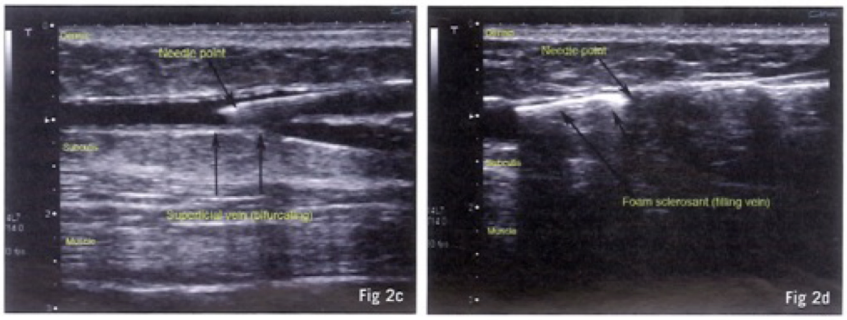
To minimise excessive foam microembolism, the total foam volume per treatment session should be closely monitored.

In practice, patients usually have both cosmetic surface veins and varicose veins requiring a combination of DVS and UGS. The larger veins are typically treated first with UGS, followed by DVS of the smaller surface vessels. Foam is almost universally used in UGS, while liquid sclerosants remain more popular for DVS.

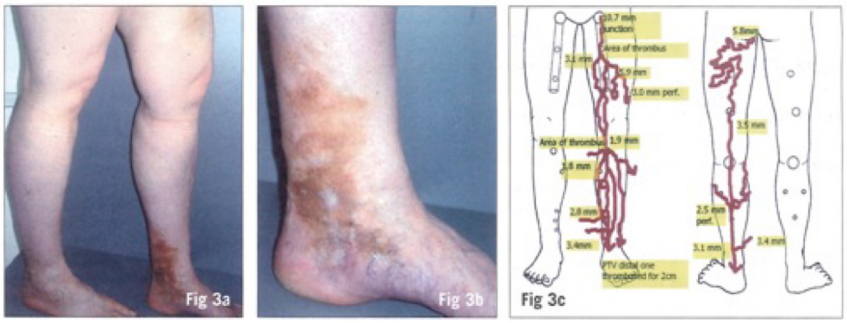
Table 1: A comparison of sclerosants*

Sclerosant	Sodium tetradecyl sulfate (STS)	Polidocanol (POL)	Hypertonic saline (HS)
Category	Detergent	Detergent	Osmotic
Mechanism of action	Interact with the lipid-based inner lining of veins, leading to endothelial cell damage and sclerosis	Same mechanism as STS	Dehydrates endothelial cells through osmosis, leading to cell destruction and fibrin deposition
Sclerosing potential	+++ (most potent)	++	+
Effectiveness on capillaries and reticular veins	Yes	Yes	Yes
Effectiveness on varicose veins	Yes	Yes	No
Ability to foam	Yes	Yes	No
Injection pain	+ (least)	+/++	+++
Cost	$$	$$	$ (lowest)
Comments	Versatile – can be used at various concentrations to treat large varicose veins right down to spider veins	High dosage may cause cardiotoxicity Less likely to cause post-treatment matting and ulcers	Non-allergenic

* Sclerosants available in Australia



Figures 2c,d: Ultrasonic images of needle insertion into a vein and injection of foam sclerosants into the lumen.



Figures 3a,b,c: Chronic venous hypertension resulting in significant stasis-related changes of the skin. Despite the relative absence of protruding (varicose) veins, the duplex map revealed extensive incompetence or reflux (represented in red) in almost all of the superficial veins of the lower limb.

Advances in the resolution of duplex imaging allow for incompetent vessels of as small as 1 mm diameter to be readily visualised and injected.

Increasingly, more complex cases of cosmetic superficial veins with clinically obscure reticular feeder vessels are being treated with UGS.

Indications

The classic indication for sclerotherapy is treatment of incompetent/varicose superficial leg veins. This covers the three main reasons for presentation: cosmesis; symptoms of venous hypertension; and concern for complications and sequelae of chronic venous hypertension.

With the advent of foam sclerotherapy, larger veins can now be consistently treated successfully. Apart from superficial veins, venous malformation at various tissue planes and body sites can potentially benefit from this technique.

Sclerotherapy remains the gold standard for treating smaller leg veins despite the plethora of laser and light devices, as the latter do not have the capacity to consistently ablate incompetent reticular veins that may be feeding into surface venules and capillaries.

The only absolute contraindications to sclerotherapy are previous anaphylaxis to the sclerosant (rare), and acute deep venous thrombosis (DVT). Relative contraindications and/or special precautions include: patients with deep venous obstruction; the inability to mobilise; a poor tolerance of compression stockings; documented thrombophilia; peripheral vascular disease (poor tolerance to compression); pregnancy; breastfeeding; oral contraceptive pill/HRT use; poor general health; recent long-distance travel; hospitalisation; or enforced bed rest.

Many of these contraindications relate to factors that either directly increase the risk of DVT or indirectly interfere with post-treatment compression and mobilisation.

Varicose vein complications

Chronic venous hypertension can lead to stasis changes affecting both the skin and the venous systems.

Vein-related complications include varicosities, phlebitis, haemorrhage and thrombosis.

Skin-related complications include stasis dermatitis, pigmentary changes (iron staining from RBC extravasation), oedema, acute lipodermatosclerosis (painful inflammation of subcutaneous fat), chronic lipodermatosclerosis (end-stage fibrosis), poor wound healing, ulceration, and scarring.

Even when varicose veins are asymptomatic, potential skin and vein complications may still occur secondary to ongoing venous hypertension that is invariably associated with varicose veins.

An approach to leg vein sclerotherapy (see Figure 4)

History and examination are mandatory to define the clinical problem. The lower-limb veins should be photographed and kept as a visual record. Attention should be directed towards the absence or presence of chronic venous hypertension that will require additional duplex studies to sort out.

Significant segments of venous reflux or incompetence may be found in patients presenting with seemingly trivial lower-limb veins. A hand-held doppler unit is a useful screening tool for the presence of venous reflux/incompetence. A positive-screening doppler should be followed up with formal duplex studies to quantify the severity and extent of the superficial venous incompetence.

The key issue is to accurately identify patients with underlying venous incompetence so these vessels can be treated with UGS.

Patients with only minor surface veins without any significant reflux on screening doppler/duplex testing may proceed directly to DVS. Surface telangiectasias with associated venous incompetence should only be treated with DVS after the underlying incompetent veins have been corrected with UGS.

The leg veins are injected with a sclerosant of suitable concentration depending on the vessel diameter. Both lower limbs can be treated at the same time, provided the sclerosant does not exceed recommended safe dosage levels.

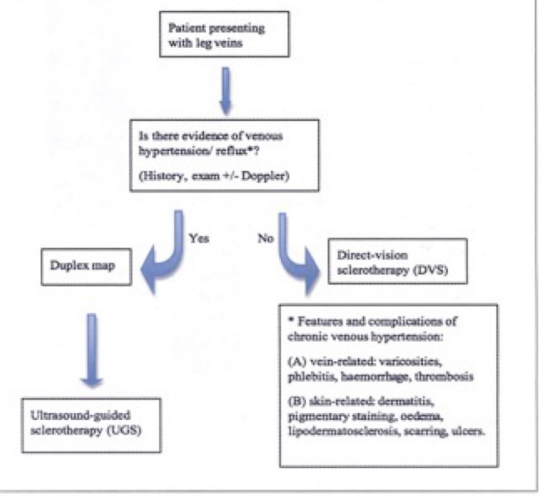
Liquid sclerosants are mostly used with DVS, whereas foam sclerosants are routinely used with UGS. The recommended upper limit of injected foam per treatment session varies from country to country, but is usually around 15 ml (range 10-20 ml). The treatment is carried out at weekly to monthly intervals.

Post-treatment compression (20-30 mmHg) is required for 1-3 weeks, depending on the size of the treated veins.

The patient is required to walk for at least half an hour a day (with the stocking) during the treatment period.

Walking serves to decrease venous pressure in the legs, and will help reduce post-treatment discomfort, trapped blood and DVT risk.

Fig 4: An approach to leg vein sclerotherapy



Post-sclerotherapy progression

The treated veins will look worse before they improve. The injection-associated bruising settles in two weeks, and there will be some darkening of the veins due to retained blood within the treated vessel.

The haemosiderin (iron) content of blood can stain adjacent skin tissue brown and can persist for several months. Transient erythematous patches (matting) may also occur, but are usually self-limiting.

Matting consists of very fine compensatory vessels over the treated vein as a result of the body's attempt to replace the vein that is being destroyed.

In the first month, the treated leg may look worse because of temporary bruising and darkening of the treated veins.

In the second month, when the leg is out of compression, patients may notice 'hot spots', or benign segmental phlebitis (inflammation of the vein), anywhere along the course of the treated vein. This settles with short-term compression and anti-inflammatories.

From the third month, the sclerosed vein will progressively become resorbed. Telangiectasias and venulectasias will clear in 2-3 months.

Varicose veins may take up to six months or more to fully resolve.

Sclerotherapy complications

Up to a third of patients may suffer from mild cases of matting and staining, making these the two most common unwanted side-effects post-sclerotherapy. Fortunately, they are temporary and will resolve in 3-6 months.

In severe cases, staining may last a year, and some cases of matting may persist indefinitely.

Mild degrees of phlebitis (during convalescence) may occur, especially when treating larger and more severe varicose veins. Rare complications include DVT, prolonged ankle oedema, skin ulceration and allergies. DVTs are exceedingly uncommon due to the ambulatory nature of the procedure.

Recent in vitro studies demonstrated that sclerosants (STS and POL) have anticoagulant effects at the concentrations used in varicose vein treatment.[12]

Sclerotherapy today

Sclerotherapy can be used to treat small- to large-diameter veins effectively and safely, either as a stand-alone procedure or in combination with other modalities.

Even if surgical vein stripping is undertaken, residual venulectasias and telangiectasias can only be definitively treated with sclerotherapy.

UGS should be offered as an alternative to repeat surgery in the event of post-surgical varicose vein recurrences. Increasingly, UGS is recognised as an acceptable first-line treatment for varicose veins. Endovenous laser/radiofrequency ablation of incompetent veins is a recent advance in vein treatment that complements rather than replaces sclerotherapy.

The popularity of sclerotherapy is in part due to its minimally invasive nature, with minimal downtime ('walk-in/walk out'), without necessarily compromising safety and efficacy, relative to surgery.

The patient handout 'Sclerotherapy' and references for this Update are available at www.medicalobserver.com.au.

KEY POINTS

- Varicose veins are frequently under-diagnosed, in part due to the perception that the condition is trivial and of cosmetic concern only.
- Early intervention will improve symptoms and appearance, as well as reduce the risk of ongoing vein- and skin-related damage secondary to chronic venous hypertension.
- Sclerotherapy remains the gold-standard treatment for small telangiectatic and reticular leg veins.
- In the past decade there have been significant advances in sclerotherapy, making the procedure safer and more effective for patients.