The management of superficial venous incompetence

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Superficial venous disease of the leg is common, disabling, and costly, and it has a negative effect on patients’ quality of life.1 A cross sectional survey from the United Kingdom found a prevalence of trunk varicosities of more than 30%.2 Trunk varicosities originate from the great saphenous vein in almost 50% of cases, the small saphenous vein in 30%, and both veins in 20% (fig 1).1

We review the management of superficial venous incompetence of the leg, focusing on the effectiveness of the procedures most commonly used and their complication rates.

Who gets superficial venous incompetence?
A positive family history, increasing age, and pregnancy are known risk factors for developing superficial venous incompetence. Controversial risk factors are obesity, standing for long periods of time, and decreased mobility.4 Evidence that venous incompetence is more common in women is not convincing.

How is superficial venous incompetence diagnosed?
Patients may have aching, itching, cramps, swelling, and restless legs, which are relieved by walking. Symptoms are mostly worse during the evening and night. Clinical signs vary from small reticular veins and varicosities, to oedema, eczema-like skin changes, and venous ulcers. The gold standard for diagnosis of superficial venous incompetence is duplex ultrasound to identify valve incompetence. The sensitivity of duplex ultrasound for the great and small saphenous vein varies between 91% and 95%. The specificity varies between 95% and 100%.5

Classification of venous disease
The CEAP (clinical, (a)etiology, anatomy, pathophysiology) classification is used for the clinical description of venous disease in general and can be used for superficial venous incompetence.6 The “C” part of the classification is most useful for rating the clinical severity of venous disease and ranges from C0 to C6 (table). The aetiology of superficial venous incompetence is often unknown. The anatomy and physiology of the venous system in the leg are shown in fig 1.

Fig 1 | Venous anatomy of the leg

<table>
<thead>
<tr>
<th>Internal iliac vein</th>
<th>Common iliac vein</th>
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<tbody>
<tr>
<td>Common femoral vein</td>
<td>External iliac vein</td>
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<tr>
<td>Profunda femoris vein</td>
<td>Saphenofemoral junction</td>
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<td>Valve</td>
<td>Great saphenous vein</td>
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<td>Superficial femoral vein</td>
<td>Blood flow</td>
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<tr>
<td>Deep fascia</td>
<td>Saphenopopliteal junction</td>
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<tr>
<td>Popliteal vein</td>
<td>Ankle venous comites</td>
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<tr>
<td>Small saphenous vein</td>
<td>Posterior tibial venous comites</td>
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<tr>
<td>Peroneal venae comites</td>
<td>Lateral perforating vein</td>
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<tr>
<td>Internal perforating veins</td>
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A patient’s perspective
I stalled the treatment of my varicose veins for years even though I had fatigue, swelling, and restless legs almost every day. I hated the idea of an operation, but forgot to wear my stockings too often. Then my doctor proposed a laser treatment under local anaesthesia. Finally I got on with it and went to the laser lab. The local anaesthesia was not so bad, but I will never forget the awful smell and taste of burnt flesh during the laser treatment. For the first eight days I felt little pain, but then it got really bad. I needed painkillers for another week. Two years after treatment my legs are so much better and I am very glad that I decided to have the treatment.

pathophysiology of venous disease can be described only after venous duplex ultrasound. 5

To treat or not to treat?
There is no evidence that asymptomatic patients with venous disease need treatment or that prophylactic treatment in these patients reduces the progression of venous disease. A good quality observational study concluded that venous disease will progress in time (for example, a patient with C1 venous disease will progress to C2 and years later to C3 or C4. This progression can be symptomatic or asymptomatic). 7

Symptomatic patients with C1-C6 disease can be treated to reduce symptoms. Varicose veins can be unsightly and we think that cosmesis is a valid reason for treatment. 8 9

What are the treatment options?
Great and small saphenous vein incompetence can be treated conservatively with compression stockings or invasively. The aim of treatment is to reduce symptoms. Traditionally, surgical treatment has consisted of high ligation and stripping of the great saphenous vein and high ligation for the small saphenous vein. In recent years, minimally invasive treatments such as endovenous thermoablation and foam sclerotherapy have become popular. These approaches are thought to be associated with reduced postoperative pain, faster recovery, and improved cosmesis.

The authors of a good quality randomised trial with long term follow-up recommended that venous duplex ultrasound of the deep and superficial venous system should be performed before all interventions. 10 Treatment of the great or small saphenous vein is contraindicated if occlusion of the deep venous system is identified by duplex ultrasound because venous blood return is then only possible through the superficial venous system.

Conservative management
Patients who have symptoms but do not want invasive interventions can be treated with short (below the knee) class 2 compression stockings (20-30 mm Hg ankle pressure). Compression stockings improve both symptoms and venous haemodynamics. However, this benefit is limited to the period during which the stockings are worn, and patient compliance is known to be poor. 11

Surgery for superficial venous incompetence
Traditionally, short stripping of the great saphenous vein has been the treatment of choice for great saphenous vein incompetence. The saphenofemoral junction and its tributaries in the groin are ligated and divided, and the great saphenous vein is stripped from groin to knee level. An alternative stripping method, known as cryo stripping, has no benefits over conventional stripping. 12

The incompetent small saphenous vein is ligated and divided near the popliteal vein in the knee pit, but not stripped, because stripping carries the risk of damaging the sural nerve. Nowadays duplex ultrasound is used to localise the small saphenous vein before surgery. The venous system of the leg has a large residual capacity and will take over the function of the great or small saphenous vein. These surgical procedures are performed in day care and usually under general or spinal anaesthesia. Some specialised venous centres perform stripping using local (perivenous tumescent) anaesthesia and perioperative duplex ultrasound.

In a randomised trial, after five years, recurrence (confirmed by duplex ultrasound) occurred in 13-29% of patients who had stripping of the great saphenous vein. 13 A low evidence observational study suggested a recurrence rate of 60% after more than 30 years. 14 A review found that recurrence (confirmed by duplex ultrasound) at five years after ligation of the small saphenous vein was 30%. 15

Problems arising from superficial venous surgery are the most common reason for litigation in the UK. 16 Most settled claims result from a failure to warn patients about nerve damage. The risk of saphenous nerve damage is lower with the use of a short strip (groin to knee level) than with a strip from groin to ankle level (8% vs 40%). 17 Deep vein thrombosis (confirmed by duplex ultrasound) occurs in about 5% of patients after conventional stripping, and is mostly confined to the calf veins. About 2.1% of these patients have symptoms. 18 Haematoma formation is common after stripping; wound infection occurs in about 10% of patients and is responsible for delayed return to normal activity and work. 19 Sural nerve damage occurs in 2.1% of patients after small saphenous vein ligation and paraesthesia occurs in 1.7-34%. 20

Endovenous thermoablation for superficial venous incompetence
Radiofrequency ablation and endovenous laser ablation are minimally invasive catheter based procedures in which thermal energy is delivered into the vein wall. Thermal energy causes an inflammatory response, which results in fibrosis and closure of the vein (fig 2).

The great or small saphenous vein is cannulated under duplex ultrasound guidance. A catheter is inserted and positioned near the saphenofemoral or saphenopopliteal junction. Local anaesthesia is administered used using the periveneous tumescent technique. In this technique, under duplex ultrasound guidance, a large volume of local anaesthetic in saline solution is injected around the great or small
No studies have compared surgical and endovenous treatment of the small saphenous vein. Available data show that endovenous laser ablation of the small saphenous vein is more common than radiofrequency ablation. Success rates of endovenous thermoablation of the small saphenous vein in large case series varies between 91% and 100%.

Problems that may occur after an endovenous procedure
Deep vein thrombosis occurs in less than 1% and 1.3-5.7% of patients after endovenous procedures of the great saphenous vein and small saphenous vein, respectively. Early ambulation is essential. The risk of deep vein thrombosis is increased by performing the procedure under general or spinal anaesthesia and with concomitant multiple stab phlebectomies, because the total procedure time is greater and patients are not able to mobilise early. Complications such as neural damage and skin burns occur seldom because of the use of tumescent anaesthesia.

Foam sclerotherapy
Foam sclerotherapy can be undertaken in the outpatient clinic. Sclerosing foam is injected through a cannula in the vein under duplex ultrasound guidance until the foam reaches the saphenofemoral or saphenopopliteal junction and varicose enlargement occurs. Compression therapy is immediately started after the procedure.

Foam sclerotherapy is popular because it is well tolerated, safe, easy to perform, and can be repeated easily, according to a large prospective study. In two small randomised trials, recovery was slightly faster after foam sclerotherapy than after conventional surgery.

No studies have compared surgical and foam treatment of the small saphenous vein. Success rates of foam sclerotherapy of the small saphenous vein vary between 82% and 100% according to observational studies.

Bruising, thrombophlebitis, and skin pigmentation are common after foam therapy. Concerns have been voiced about neurological complications after foam sclerotherapy. Theoretically, microemboli can reach the systemic circulation through a patent foramen ovale. In a recent prospective case study of more than 1250 treated legs, only five self-limiting episodes were seen. The risk of microembolism causing serious adverse events was considered negligible. A good quality randomised trial, which compared stripping, endovenous laser ablation, endovenous

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Efficacy of endovenous thermoablation
Endovenous laser ablation and conventional stripping were found to be equally effective after two years, although return to normal activity and work was faster after endovenous laser ablation. However, high quality randomised controlled trials that compared endovenous laser ablation with surgical stripping performed using duplex ultrasound guidance and tumescent anaesthesia found no differences in postoperative pain, recurrence rates, or return to normal activity or work.

Endovenous radiofrequency ablation shows only slightly better short term results, mainly regarding patient recovery, than conventional stripping.

A randomised trial sponsored by a manufacturer suggested that endovenous radiofrequency ablation is less painful than endovenous laser ablation and has a lower incidence of bruising. Both procedures are equally effective for the treatment of the great saphenous vein in the long term, with a success rate of 95%.

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CLINICAL REVIEW

ADDITIONAL EDUCATIONAL RESOURCES

Resources for healthcare professionals
American Venous Forum (http://veinforum.org/index.php?page=medical-professionals)—A forum for healthcare professionals, which contains links to handbooks of venous disorders and journals
European Venous Forum (http://europeanvenousforum.org/)—Up to date links to international standards in venous disease

Resources for patients
American Venous Forum (http://veinforum.org/index.php?page=hbk14a)—A forum for patients with venous disease and ulceration that tells them about treatments and provides information on anatomy and pathology; includes a vein handbook for patients
Patient UK (www.patient.co.uk/health/Varicose-Veins.htm)—Tells patients about treatments and provides information on anatomy and pathophysiology in a straightforward way

saphenous vein, which also prevents neural damage and the burning of skin because of its cooling effect. These procedures do not require spinal or general anaesthesia and can be performed in an outpatient setting. In contrast to the surgical procedure, the saphenofemoral and saphenopopliteal junctions are not disconnected. Although this is radically different from the conventional treatment, a small observational study concluded that it has no adverse effect on clinical outcome.

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tips for non-specialists

• Use the “C” of the CEAP (clinical, (a)etiology, anatomy, pathophysiology) classification when categorising venous disease
• In symptomatic patients who do not want surgery, below the knee stockings can be useful in the treatment of superficial venous incompetence
• Venous duplex ultrasound should be carried out before proceeding with an intervention of the superficial venous system
• Always refer patients with an active or healed venous ulcer

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310
QUESTIONS FOR FUTURE RESEARCH

- How do the results of endovenous procedures compare with conventional surgery in the long term?
- When using current surgical strip techniques, how does ligation of the tributaries at the saphenofemoral junction affect the results?
- How do new minimally invasive catheter based techniques, such as Clarivein and steam vein sclerosis, compare with current procedures?
- Is it better for patients to wear compression stockings after treatment?

radiofrequency ablation, and foam sclerotherapy, showed that the technical failure rate was highest after foam sclerotherapy. Endovenous radiofrequency ablation and foam sclerotherapy were associated with a faster recovery and less postoperative pain than laser ablation and stripping.13

All treatment modalities seem to be effective and safe at short term and midterm follow-up. Before clinicians consider endovenous treatments as first choice treatment, large high quality randomised trials with long term follow-up are needed.

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Patient consent not required (patient anonymised, dead, or hypothetical).

8 Darvall KA, Bate GR, Sam RC, Adam DJ, Silverman SH, Bradbury AW. Patients’ expectations before and after ultrasound guided foam sclerotherapy for varicose veins. Eur J Vasc Endovasc Surg 2009;38:642-7.