Injection sclerotherapy for varicose veins (Review)

Tisi PV, Beverley C, Rees A

This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2009, Issue 1

http://www.thecochranelibrary.com

TABLE OF CONTENTS

[Intervention Review]

Injection sclerotherapy for varicose veins

Paul V Tisi[1], Catherine Beverley[2], Angie Rees[3]

[1]Department of Vascular Surgery, Bedford Hospital, Bedford, UK. [2]Adult Social Care Directorate, Cumbria County Council, Carlisle, UK. [3]School of Health and Related Research, University of Sheffield, Sheffield , UK

Contact address: Paul V Tisi, Department of Vascular Surgery, Bedford Hospital, Kempston Road, Bedford, Bedfordshire, MK42 9DJ, UK. pvtisi@rcsed.ac.uk.

Editorial group: Cochrane Peripheral Vascular Diseases Group.
Publication status and date: Edited (no change to conclusions), published in Issue 1, 2009.
Review content assessed as up-to-date: 30 October 2006.

Citation: Tisi PV, Beverley C, Rees A. Injection sclerotherapy for varicose veins. *Cochrane Database of Systematic Reviews* 2006, Issue 4. Art. No.: CD001732. DOI: 10.1002/14651858.CD001732.pub2.

ABSTRACT

Background

Injection sclerotherapy is widely used for superficial varicose veins. The treatment aims to obliterate the lumen of varicose veins or thread veins. There is limited evidence regarding its efficacy.

Objectives

To determine whether sclerotherapy is effective in improving symptoms and cosmetic appearance and has an acceptable complication rate; to define rates of symptomatic or cosmetic varicose vein recurrence following sclerotherapy.

Search strategy

The Cochrane Peripheral Vascular Diseases Group searched their Specialised Register, the Cochrane Central Register of Controlled Trials (*The Cochrane Library,* Issue 4, 2006), MEDLINE and EMBASE (both inception to October 2006) and reference lists of articles. Manufacturers of sclerosants were contacted for additional trial information.

Selection criteria

Randomised controlled trials (RCTs) of injection sclerotherapy versus graduated compression stockings (GCS) or 'observation', or comparing different sclerosants, doses, formulations and post-compression bandaging techniques on people with symptomatic and/or cosmetic varicose veins or thread veins were considered for inclusion in the review.

Data collection and analysis

Data were extracted by authors and Review Group Co-ordinators independently.

Main results

Seventeen studies were included. One study comparing sclerotherapy to GCS in pregnancy found that sclerotherapy improved symptoms and cosmetic appearance. Three studies comparing sodium tetradecyl sulphate (STD) to alternative sclerosants found no significant differences in outcome or complication rates; another study found that sclerotherapy with STD led to improved cosmetic appearance compared with polidocanol, although there was no difference in symptoms. Sclerosant plus local anaesthetic reduced the pain from injection (one study) but had no other effects. Two studies compared foam- to conventional sclerotherapy; one found no difference in failure rate or recurrent varicose veins; a second showed short-term benefit from foam in terms of elimination of venous reflux. The recanalisation rate was no different between the two treatments. One study comparing Molefoam and Sorbo pad pressure dressings

found no difference in erythema or successful sclerosis. The degree and duration of elastic compression had no significant effect on varicose vein recurrence rates, cosmetic appearance or symptomatic improvement.

Authors' conclusions

Evidence from RCTs suggests that the choice of sclerosant, dose, formulation (foam versus liquid), local pressure dressing, degree and length of compression have no significant effect on the efficacy of sclerotherapy for varicose veins. The evidence supports the current place of sclerotherapy in modern clinical practice, which is usually limited to treatment of recurrent varicose veins following surgery and thread veins. Surgery versus sclerotherapy is the subject of a further Cochrane Review.

PLAIN LANGUAGE SUMMARY

Injection sclerotherapy for varicose veins

Varicose veins are enlarged, visibly lumpy knotted veins, usually in the legs. They can cause pain, burning discomfort, aching and itching as well as generalised aching, heaviness or swelling in the legs, cramps at night and restless leg syndrome. There is also little correlation between these symptoms and the extent or size of the varicose veins which, like minor venous abnormalities thread veins or venous flares, can be cosmetically unattractive. Wearing graduated compression stockings is one treatment option.

Injection sclerotherapy can be used for superficial varicose veins, residual or recurring varicose veins following surgery and thread veins to obliterate the varicose vein. An irritant liquid such as sodium tetradecyl sulphate (STD) is injected into the faulty blood vessel. Pressure pad dressings at the injection site and compression bandages may then be applied, options including crepe bandaging, proprietary elastic bandaging or compression stockings. Bandaging can cause discomfort and foot swelling and may slip. Possible complications of sclerotherapy include formation of blood clots, skin staining, inflammation, ulcers and tissue damage and reactions to the sclerosing agent.

Seventeen randomised controlled trials involving over 3,300 people were included in the review. One study comparing sclerotherapy to compression stockings in pregnancy found that sclerotherapy improved symptoms and cosmetic appearance. There was no overall benefit from using alternative agents to STD (four trials), or any evidence that a foam is superior to liquid (two trials). Adding local anaesthetic to the sclerosing agent did reduce the pain of injection in one study. Neither the type, nor duration of elastic compression (seven studies) or type of pressure pad (one study) after sclerotherapy had any clear effect on the effectiveness of sclerotherapy, on varicose vein recurrence rates, cosmetic appearance or symptomatic improvement, or on complications. Many of the included studies took place in the 1980s and there is very limited evidence on which to assess the merits of sclerotherapy for treatment of varicose veins or comparing graduated compression stockings to sclerotherapy. There were no controlled trials comparing sclerotherapy for thread veins with either laser treatment or simple observation; hypertonic dextrose had similar efficacy in terms of sclerosis to STD in one study.

BACKGROUND

Varicose veins are a common finding with a point prevalence of 20 to 25% in females and 10 to 15% in males over the age of 15 years (Callam 1994). It is difficult to find a satisfactory definition of varicose veins upon which consensus has been reached. Minor venous abnormalities such as thread veins are also seen in up to 50 to 55% of women and 40 to 50% of men. Brand 1998 suggests that 2.6% of women and 2.0% of men will develop varicose veins over a two-year period (Brand 1998).

The symptoms attributable to varicose veins, and their correlation with the extent of venous reflux, are not clearly defined. Epidemiological evidence suggests that even in the presence of 'main stem' varicose veins, most lower limb symptoms have a non-venous cause (Bradbury 1999). The Edinburgh Vein Study has demonstrated superficial venous reflux in 9% of randomly selected men and 15% of women as well as deep venous reflux in 22% of men and 11% of women (Allan 2000). Subjects with visible truncal varicosities have a higher incidence of reflux on Duplex ultrasound, although in many cases of documented reflux there are no visible varicose veins. There is also little correlation between symptoms of varicose veins and their extent or size on examination. Commonly re-

ported symptoms include local discomfort over varicosities (pain, burning discomfort, aching and itching), generalised lower limb symptoms (aching, heaviness, swelling and restless leg syndrome) and nocturnal cramps, as well as complaints about cosmetic appearance.

Swelling and night cramps are commonly reported symptoms of varicose veins in pregnancy; a recent Cochrane Review from the *Cochrane Database of Systematic Reviews* has evaluated the treatment options for pregnant women (Young 1998). The majority of outcome measures, following treatment of varicose veins, are assessed subjectively, i.e. symptomatic improvement, cosmetic appearance and quality of life measures. Outcomes that can be assessed objectively include varicose vein recurrence and complication rates.

Surgery is commonly used to treat 'main stem' varicose veins. Sclerotherapy has been used to treat varicose veins from as early as 1835 according to records from Massachusetts General Hospital. Chassaignac, who published a series of cases from 1853 injected zinc chloride into varicose veins (Chassaignac 1855). Hobbs gave a historical overview on the use of sclerotherapy and compression bandaging in the early part of the 20th century, starting in Paris with Linser (1911) and Sicard (1911) (Hobbs 1968). However, it was not until 1963 that the technique of sclerotherapy was described and popularised by Fegan, whose name has become synonymous with the procedure (Fegan 1963). Vascular surgeons have adopted sclerotherapy with varying levels of enthusiasm and with differing indications. A survey on behalf of the Vascular Surgical Society of Great Britain and country-regionplaceIreland showed that most surgeons reserved sclerotherapy for either primary varicose veins in the absence of superficial venous incompetence (69.7%) or residual varicose veins following surgery (77.1%) (Galland 1998).

OBJECTIVES

The main aims of the review were to determine whether injection sclerotherapy is effective for treating varicose veins in terms of symptomatic improvement and cosmetic appearance, whether sclerotherapy has an acceptable complication rate, and to define the rate of symptomatic or cosmetic recurrence following sclerotherapy.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs) of injection sclerotherapy versus graduated compression stockings or 'observation' were considered for inclusion in the review. RCTs comparing sclerotherapy to surgery are the subject of a further Cochrane review and thus are not included in this review. All RCTs comparing different sclerosants, sclerosant doses, different formulations of sclerosants and post-compression bandaging techniques were also included.

Types of participants

All people over 15 years of age referred to a surgical outpatient clinic or primary care practitioner with symptomatic or cosmetic varicose veins. Children presenting with varicose veins and people with venous ulcers and deep venous insufficiency were excluded from the analyses. Participants were potentially divided into three groups:

1. Those with superficial venous incompetence demonstrated on hand-held Doppler or Duplex ultrasound scanning, i.e. long saphenous vein (medial thigh vein), short saphenous vein (posterior calf vein) and calf vein perforators (veins connecting superficial and deep venous systems).
2. Those with varicosities with no evidence of superficial venous incompetence.
3. Those with thread veins (venous flares/hyphen-webs).

Types of interventions

1. Sclerotherapy versus other treatment options:

a) Sclerotherapy versus graduated compression stockings for varicose veins with superficial venous incompetence.

b) Sclerotherapy versus graduated compression stockings or observation for varicose veins in the absence of superficial venous incompetence.

c) Sclerotherapy versus laser treatment or no treatment (i.e. simple follow-up) in people with thread veins.

2. Comparison of different sclerosants (e.g. sodium tetradecyl sulphate (STD), ethanolamine, polidocanol (Sclerovein, aetoxysclerol, aethoxysklerol, aethoxysclerol, atoxisclerol, Sotrauerix, Laureth 9), chrome alum (Scleremo), hypertonic saline, sclerosant dose (e.g. STD 0.2%, 0.5%, 1%, 3%) and sclerosant formulation (liquid, foam).
3. Comparison of injection techniques, bandaging and compression techniques and repeat treatment intervals.

Types of outcome measures

1) Subjective outcome measures

Assessed by the patient, to be determined either at a follow-up outpatient visit (commonly six weeks after the intervention in the UK), or by a postal questionnaire:

a) Symptoms - specifically pain, burning discomfort, aching, itching, limb heaviness, oedema and nocturnal cramps. Suitable trials

reporting a change in symptoms by direct questioning of the patient were included in the review.
b) Cosmetic appearance.
c) Quality of life measures: using formal quality of life questionnaires, administered either in person at the follow-up visit or by post.

2) Objective outcome measures

Assessed by a clinician:
a) Complication rates, specifically haematoma formation, skin staining, ulceration and necrosis, superficial thrombophlebitis, deep venous thrombosis, failed obliteration and anaphylactic reaction. Suitable trials reporting clinical assessment of complication rates (usually at the follow-up outpatient visit) were included.
b) Recurrent varicose veins and venous flare formation. These outcomes were determined by trials reporting long-term patient follow-up.

Search methods for identification of studies

The Cochrane Peripheral Vascular Diseases Group (PVD) searched their Specialised Register (last searched October 2006) and the Cochrane Central Register of Controlled Trials (CENTRAL) in *The Cochrane Library* (last searched Issue 4, 2006) for RCTs of injection sclerotherapy for treatment of varicose veins (excluding comparisons with surgery). See Appendix 1 for details of the search strategy used to search CENTRAL. The full list of journals that have been handsearched, as well as the search strategies used are described in the 'Search strategies for the identification of studies' section within the editorial information about the Cochrane PVD Group in *The Cochrane Library,* http://www.mrw.interscience.wiley.com/cochrane/clabout/articles/PVD/frame.html. The authors searched MEDLINE and EMBASE (both inception to October 2006) and bibiographies of relevant trials were also examined to identify any further RCTs.
Pharmaceutical manufacturers of sclerosants were contacted to determine whether any further trial information was available. There were no restrictions on language.

Data collection and analysis

Selection of trials

Trials identified from the computerised literature search were selected for possible inclusion in the study by the first author (PVT). It was anticipated that additional information, if required, could be sought from the relevant authors. In most cases this was historical data (1970s to 1980s) and therefore no attempt was made to obtain further information.

Quality of trials

Potentially eligible trials were assessed by the authors independently to determine the relevance of each study. Ideally, studies should have sufficient statistical power to detect a difference between treatment groups. Trials were accepted only if the authors agreed that the inclusion criteria had been met. Disagreements were resolved by discussion. Trials were scrutinised for allocation concealment, ensuring that a participant of the trial did not influence the randomisation process.
Blinding is not possible in studies comparing sclerotherapy to other treatment options. However, RCTs comparing different sclerosants should be blinded for both the patient and clinician.
Trials were scrutinised to ascertain whether follow-up was explicitly reported or implied in order to avoid attrition bias. Missing follow-up data were not sought from the original investigators (*see* Selection of trials).
The quality of included trials was assessed by PVT and agreed by CB using a simple standard checklist developed by the Cochrane Peripheral Vascular Diseases Review Group.

Data extraction

Data from trials were extracted by PVT, CB, and the Cochrane PVD Review Group Co-ordinators independently and were then cross-checked for agreement.

Statistical analysis

Heterogeneity of the results from different studies for each comparison of outcome variables was assessed using RevMan Analyses 1.0.2 statistical software, as well as by clinical judgement. However, the comparatively low number of trials included in the review meant that the test for heterogeneity was not powerful enough to determine whether significant heterogeneity was present. In future updates of this review, should additional trials be included and if there is marked heterogeneity, then the outcomes from different studies will not be pooled.

The authors originally intended to appraise the results of the review by performing sensitivity analyses to examine key decisions and assumptions that might affect the results (Mulrow 2006). However, the included studies yielded such a low volume of good quality data that re-analysis was not performed due to the difficulties in estimating 'reasonable' data. Likewise, we decided it was not appropriate to perform 'funnel plots' to identify publication bias or to attempt sensitivity or sub-group analyses.
Results were expressed as Peto odds ratios (OR) with 95% confidence intervals (CI) for dichotomous variables, although for comparisons with a high frequency of events, outcomes were given as relative risk (RR) with 95% CI. Results for continuous variables were expressed as standardised mean differences (SMD); for studies where standard deviation was not given, further analysis was not possible and studies were not combined.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies.

Forty-four studies were considered for inclusion in the review. The following sclerosant manufacturers were contacted directly for other available data on randomised controlled trials but none were available: Omega Laboratoires Limited, Montreal, Canada (hypertonic saline, polidocanol); Medeva Pharma Limited, Leatherhead, UK (ethanolamine); STD Pharmaceutical, Hereford, UK (STD). Twenty-seven studies were excluded from the review. Twelve studies (Ariyoshi 1996; Bountouroglou 2004; Chant 1972; Doran 1975; Einarsson 1993; Hobbs 1968; Ikeda 1996; Iwamoto 2003; Jakobsen 1979; Rutgers 1994; Scultetus 2003; Seddon 1973) were randomised controlled trials comparing surgery to sclerotherapy which is the subject of a different Cochrane review from the *Cochrane Database of Systematic Reviews* (Rigby 2004). Two further trials compared local anaesthetic removal of varicose veins to sclerotherapy (Belcaro 1991; De Roos 2003). Seven studies were not randomised controlled trials and were therefore excluded (Kanter 1992; Leach 2003; Lupton 2002; Martimbeau 1995; Mosley 1998; Queral 1990; Sadick 1991). In a further study, it was reported that early recanalisation of the long saphenous vein may be reduced by treating long saphenous tributaries with sclerotherapy in addition to the long saphenous vein itself. However, no numerical data were reported to support this conclusion (Schadeck 1995b). Five further studies were excluded because of uncertain methodology and/or absence of numerical data: sclerotherapy with aethoxysclerol versus STD (Belcaro 2003a); sclerotherapy with polidocanol foam versus liquid sclerotherapy (Wright 2003); sclerotherapy with 1% STD as a foam versus liquid formulation (Martimbeau 2003); sclerotherapy with polidocanol foam versus polidocanol foam with Gelofusine (Zeh 2003) and sclerotherapy with STD foam versus perfluoropropane-filled albumin microspheres containing STD (Martimbeau 2003b).

Many of the 17 studies included in the review were performed in the 1980s, although there appears to have been a resurgence of interest in the 2000s. Duration of recruitment ranged from six months to 10 years and study follow-up ranged from three minutes (determination of venous spasm and loss of reflux following sclerotherapy (Schadeck 1995a)) to 10 years. All were parallel trials. Thirteen studies were hospital based, two were clinic based and in two studies the setting was not specified. *See* Table of characteristics of included studies for inclusion and exclusion criteria, details of pattern of venous disease and outcomes. Fourteen studies did not comment on the presence or absence of deep venous insufficiency, whilst three studies excluded these participants (Belcaro 2003b; Bukhari 1999; Hamel-Desnos 2003). The studies examined seven main comparisons:

1) sclerotherapy with two different sclerosants,
2) local anaesthetic in sclerosant versus no local anaesthetic,
3) sclerotherapy with foam versus liquid formulation,
4) use of Molefoam versus Sorbo pads at the injection sites following sclerotherapy,
5) use of elastic compression versus conventional bandaging after sclerotherapy,
6) short-term versus standard bandaging after sclerotherapy,
7) sclerotherapy versus graduated compression stockings.

Risk of bias in included studies

The method of randomisation was either not stated or was unclear in 14 studies. Numbered sealed envelopes were used in two studies and a randomisation code was used in a further study. Blinding of the studies to the patient and treating doctor was problematic due to the differences in the appearance of different dressings and different follow-up times (*see* Methods of the review). In eight studies, the outcome assessor was blinded to the randomised treatment. The risk of bias was estimated as low in four studies and moderate in 13 studies. Allocation concealment was considered adequate in two studies and unclear in 15 studies. If we had applied stricter inclusion criteria for the review in terms of randomisation method and blinding of the outcome assessor then 14 out of the 17 studies would be excluded.

Effects of interventions

The comparatively low number of trials included in the review meant that the test for heterogeneity was not powerful enough to determine whether significant heterogeneity was present. In addition, the studies yielded such a low volume of good quality data that re-analysis was not carried out due to the difficulties of estimating 'reasonable' data.

There were no randomised trials comparing sclerotherapy to simple observation. Equally, there were no RCTs comparing sclerotherapy for thread veins with either laser treatment or simple observation.

1) Sclerotherapy with two different sclerosants

STD appears to be the most frequently used sclerosant in both randomised and non-randomised trials. Four studies compared alternative sclerosants to STD. Schadeck 1995a showed that 4% polidocanol (aetoxysclerol) resulted in more venous spasm following sclerotherapy than 3% STD (RR 7.50, 95% CI 2.06 to 27.25), although the disappearance of superficial venous reflux following sclerotherapy was not statistically significant (RR 1.30, 95% CI 0.86 to 1.96). The analyses in this study are based on estimates from percentage figures quoted in the text.

Goldman 2002 showed no difference in photographic appearance of varicose veins following sclerotherapy with polidocanol (aethoxysklerol) compared to STD (in varying concentrations, according to vein diameter), although polidocanol caused less skin necrosis (Peto OR 0.14, 95% CI 0.03 to 0.71). In contrast, Labas 2003 showed that STD improved cosmetic appearance of varicose veins and achieved greater symptomatic improvement at six months (RR 0.85, 95% CI 0.78 to 0.92), although this effect

was non-significant at five years follow-up. For thread veins, 10% hypertonic dextrose had similar efficacy in terms of sclerosis to 0.15% STD (Prescott 1992). Complication rates in terms of pain, matting and pigmentation were not significantly different.

The haemodynamic benefit from sclerotherapy was demonstrated by Kahle 2003. Sclerotherapy with 3% polidocanol reduced venous by arterial flow (as assessed by Duplex ultrasound) to essentially normal levels in comparison with placebo (normal saline). This study did not assess any clinical parameters.

2) Local anaesthetic in sclerosant versus no local anaesthetic

A single study explored whether the addition of local anaesthetic to the sclerosant was beneficial (Bukhari 1999). Lidocaine/19% hypertonic saline resulted in less moderate or severe pain on injection than 23.4% hypertonic saline alone, although this was of borderline statistical significance (RR 0.25, 95% CI 0.06 to 1.04). Local anaesthetic had no effect on disappearance of varicosities or complications, specifically microthrombosis, ulceration, matting and pigmentation.

3) Foam versus liquid formation

Two studies compared foam sclerotherapy with standard liquid formulation. Hamel-Desnos 2003 randomised 88 participants to Duplex-guided sclerotherapy with 3% polidocanol foam or 3% polidocanol liquid. The foam was generated using sterile air in a sclerosant: air ratio of 1:5. Foam sclerotherapy caused more venous spasm than liquid sclerosant (Peto OR 4.27, 95% CI 1.86 to 9.82) with elimination of superficial venous reflux on Duplex ultrasound (Peto OR 6.65, 95% CI 2.82 to 15.69). Complication rates were no different between the two formulations and importantly, recanalisation rates at six months were no different. The VEDICO Trial compared a number of different treatments for varicose veins (Belcaro 2003b). The failure rate and incidence of recurrent varicose veins at 5 and 10 years was no different between sclerotherapy with STD foam (foam created using a tensoactive agent J&J-93FA) and liquid formulation.

4) Use of Molefoam versus Sorbo pads at the injection sites following sclerotherapy

One study assessed the effect of two different local pressure dressings applied to each injection site (Stanley 1991). There was no significant difference between Molefoam (Scholl) dressings and the conventional Sorbo rubber pad in terms of successful sclerotherapy (RR 1.02, 95% CI 0.92 to 1.13) or erythema following injection (Peto OR 0.44, 95% CI 0.17 to 1.13), although the results tended to favour the Molefoam dressing. No ulcers were caused by sclerotherapy in either group.

5) Use of elastic compression versus conventional bandaging after sclerotherapy

There is no standard method of compression to be used after sclerotherapy. Options include crepe bandaging, proprietary elastic bandaging (e.g. Coban, Elastocrepe) or compression stockings. Increasing the level of compression prevented dressings from slipping (Peto OR 0.49, 95% CI 0.24 to 1.00) but also caused more discomfort (Peto OR 3.65, 95% CI 1.92 to 6.95) (Fraser 1985; Shouler 1989). Increased elastic compression had no significant effect on the incidence of superficial thrombophlebitis (Peto OR 0.79, 95% CI 0.47 to 1.34) or risk of skin staining (Fraser 1985; Scurr 1985; Shouler 1989). In addition, elastic compression had no significant effect on disappearance of varicosities (RR 1.06, 95% CI 0.91 to 1.24) (Fraser 1985; Scurr 1985; Shouler 1989).

6) Short-term versus standard bandaging after sclerotherapy

Duration of compression following sclerotherapy was the subject of five randomised controlled trials (Batch 1980; Fraser 1985; Moody 1996; Raj 1981; Reddy 1986). Results for complication rates and participants' symptoms could not be estimated from two of the trials as standard deviations were not quoted in the published data (Batch 1980; Reddy 1986). However, Reddy 1986 stated that there was a significant advantage in three weeks bandaging compared to one week ($p<0.001$) at two and four years follow-up. This could not be validated from the published data. Two trials (Fraser 1985; Moody 1996) showed no difference in superficial thrombophlebitis with short-term bandaging (three days to one week) compared to long-term bandaging (six weeks) (Peto OR 1.06, 95% CI 0.66 to 1.73). The same two studies showed that short-term bandaging resulted in less discomfort, slipping, foot swelling and bandage intolerance than long-term bandaging (RR 0.54, 95% CI 0.40 to 0.73). Raj 1981 showed no significant difference in cosmetic appearance and symptoms in short-term (eight hours) compared to long-term (six weeks) bandaging (RR 0.86, 95% CI 0.69 to 1.08). Three studies showed no difference in the incidence of recurrent varicose veins between short-term and long-term bandaging (Peto OR 0.69, 95% CI 0.43 to 1.10) (Batch 1980; Fraser 1985; Moody 1996).

7) Sclerotherapy versus graduated compression stockings

A single RCT compared sclerotherapy to graduated compression stockings in pregnancy (Abramowitz 1973). Sclerotherapy was more effective in terms of symptomatic improvement and cosmetic appearance (RR 1.61, 95% CI 1.19 to 2.18).

DISCUSSION

The goal of injection sclerotherapy is to obliterate the lumen of the incompetent varicose vein or thread vein. This requires both intravascular thrombosis and significant damage to the vascular endothelium, in order to prevent recanalisation by native vessel thrombolysis (Feied 1999). Weak sclerosants may cause no endothelial injury, whereas if the volume and concentration of the sclerosant is too high, damage to normal vessels will ensue (Feied 1999).

In 1963, Fegan published the seminal paper on sclerotherapy, reporting results from 13,352 treated people with a recurrence rate of less than 15% at six years (in a sample of 760 people) (Fegan 1963). This paper provided a detailed description of methods to achieve successful sclerotherapy. Fegan highlighted several impor-

tant points which are covered by this review. Significantly, he emphasised the importance of firm continuous compression following sclerotherapy in order to avoid superficial thrombophlebitis and improve the outcome of the injection. However, these conclusions are not supported by the evidence from this review. Neither the type nor duration of elastic compression used following sclerotherapy has any statistically significant effect on the incidence of superficial thrombophlebitis, obliteration of varicose veins or long-term recurrence rates, which are the most important outcomes of sclerotherapy. Fegan used 3% STD (0.5 ml per injection) for sclerotherapy and this is usually considered as the 'gold standard' sclerosant. This review also shows no benefit from using alternative sclerosants to STD, nor any evidence that sclerosant foam is superior to conventional liquid formulation.

There is, therefore, very limited evidence on which to assess the relative merits of sclerotherapy for treatment of varicose veins. Publication bias may contribute to this with studies showing negative results from sclerotherapy perhaps having been withheld from publication. An important example is the small amount of evidence comparing graduated compression stockings (a recognised treatment option for varicose veins) to sclerotherapy: a single RCT in pregnancy did show benefit for sclerotherapy over compression hosiery. Good evidence for the relative merits of sclerotherapy versus compression hosiery would have important implications for the treatment of varicose veins that are not considered sufficiently severe to warrant surgery according to local and/or national clinical guidelines such as those issued by the National Institute of Clinical Excellence in the placecountry-regionUK. The cost-effectiveness of treatment of varicose veins has important implications for health care. The methodological quality of many of the trials included in the review is questionable. If one were to rigidly adhere to the inclusion and exclusion criteria, 14 out of the 17 included trials would have to be excluded. The main problems with the trials appear to be in the randomisation process and in blinding of the patient and/or observer to the treatment, e.g. type of bandage, duration of bandaging, etc. Many of the trials date back to the 1980s. One would expect that modern trial design would overcome some of these problems.

AUTHORS' CONCLUSIONS

Implications for practice

In terms of clinical practice, this review shows that there is no robust randomised trial data to influence the choice of sclerosant, sclerosant formulation, local pressure dressing, degree of compression or length of compression following sclerotherapy. Short-term bandaging is better tolerated than more prolonged bandaging. One RCT has shown that sclerotherapy is more effective than compression hosiery in pregnancy. The overall place for sclerotherapy in the management of varicose veins cannot be determined from this review.

Implications for research

For symptomatic varicose veins, there is little evidence to support or dispute the continued use of sclerotherapy. The place of sclerotherapy in comparison to surgery is the subject of a further Cochrane review from the *Cochrane Database of Systematic Reviews* (Rigby 2004). Current research in sclerotherapy is focused on sclerosant foam. Initial case series suggest that 88 to 93% of varicose veins could be obliterated using these techniques (Frullini 2002). To date, RCT evidence does not support the efficacy of foam over conventional liquid formulation.

For thread veins, a randomised controlled trial of sclerotherapy versus laser treatment or thermo-coagulation (Veinwave^{TM}) could provide answers regarding the benefits of sclerotherapy. This would be difficult to set up in the UK, as treatment for thread veins is not generally available on the National Health Service, and the ethics of setting up a randomised trial in private practice are problematic.

ACKNOWLEDGEMENTS

The authors would like to thank the Cochrane Peripheral Vascular Disease Group for performing literature searches, the Consumer Network for providing a Plain Language Summary, and the contributions of the Peer and Consumer Reviewers.

REFERENCES

References to studies included in this review

Abramowitz 1973 *{published data only}*
Abramowitz I. The treatment of varicose veins in pregnancy by empty vein compressive sclerotherapy. *South African Medical Journal* 1973;**47**(14):607–10.

Batch 1980 *{published data only}*
* Batch AJG, Wickremesinghe SS, Gannon ME, Dormandy JA. Randomised trial of bandaging after sclerotherapy for varicose veins. *BMJ* 1980;**281**(6237):423.
Dormandy JA, Woodyer AB. A randomised trial of bandaging after sclerotherapy for varicose veins. *Phlebologie* 1982;**35**(1):125–31. [MEDLINE: 82174899; : 7041145 (Pub Med)]
Reddy P, Wickers J, Terry T, Lamont P, Moller J, Dormandy JA. What is the correct period of bandaging following sclerotherapy?. *Phlebology* 1986;**1**:217–20.

Belcaro 2003b *{published data only}*
Belcaro G, Cesarone M, Di Renzo A, Brandolini R, Coen L, Acerbi G, et al.Treatments for varicose veins: Surgery, sclerotherapy,

foamsclerotherapy and combined (surgery+sclerotherapy) options. A 10-year, prospective, randomised, controlled, follow-up study. The VEDICO* trial and EST (European Sclerotherapy Trial). *Angeiologie* 2003;**55**(1):29–36. [MEDLINE: 6165]
Belcaro G, Cesarone MR, Di Renzo A, Brandolini R, Coen L, Acerbi G, et al.Foam-sclerotherapy, surgery, sclerotherapy and combined treatment for varicose veins: a 10-year prospective, randomised, controlled trial (VEDICO Trial). *Angiology* 2003;**54**(3):307–15.

Bukhari 1999 *{published data only}*
Bukhari RH, Lohr JM, Paget DS, Hearn AT, Cranley RD. Evaluation of lidocaine as an analgesic when added to hypertonic saline for sclerotherapy. *Journal of Vascular Surgery* 1999;**29**(3):479–83.

Fraser 1985 *{published data only}*
Fraser IA, Perry EP, Hatton M, Watkin DFL. Prolonged bandaging is not required following sclerotherapy of varicose veins. *British Journal of Surgery* 1985;**72**(6):488–90.

Goldman 2002 *{published data only}*
Goldman MP. Treatment of varicose and telangiectatic leg veins: double-blind prospective comparative trial between aethoxysklerol and sotradecol. *Dermatologic Surgery* 2002;**28**(1):52–5.

Hamel-Desnos 2003 *{published data only}*
* Hamel-Desnos C, Desnos P, Wollmann JC, Ouvry P, Mako S, Allaert FA. Evaluation of the efficacy of polidocanol in the form of foam compared with liquid form in sclerotherapy of the greater saphenous vein: initial results. *Dermatologic Surgery* 2003;**29**(12):1170–5.
Hamel-Desnos C, Ouvry P, Desnos P, Mako S. Evaluation of the efficacy of polidocanol in the form of foam versus liquid form in sclerotherapy of the long saphenous vein. www.phlebology.org/AbstractsFTL.htm#19. 2002. [: 5427]

Kahle 2003 *{published data only}*
Kahle B, Leng K. Efficacy of sclerotherapy in varicose veins - prospective, blinded, placebo-controlled study. *Dermatologic Surgery* 2004;**30**(5):723–8.
Kahle B, Leng K, Bolz S. Efficacy of sclerotherapy in Varicose Veins: A blinded, placebo-controlled study. Abstracts from the UIP World Congress Chapter Meeting (www.phlebology.org/AbstractUIP.htm#114). San Diego, 2003. [: 5432]

Labas 2003 *{published data only}*
Labas P, Ohradka B, Cambal M, Reis R, Fillo J. Long term results of compression sclerotherapy. *Bratislavske Lekarske Listy* 2003;**104**(2):78–81.

Moody 1996 *{published data only}*
Moody AP, Nicklin S, Wilcox A, Enabi L, Harris PL. Prospectively randomised trial of 1 versus 6 weeks of compression after sclerotherapy for varicose veins. *British Journal of Surgery* 1996;**83 Suppl**(1):48.

Prescott 1992 *{published data only}*
Prescott R. A comparative study of two sclerosing agents in the treatment of telangiectasias. In: Raymond-Martimbeau P, Prescott R, Zummo M editor(s). *Phlebology '92*. Vol. **2**, Paris: John Libbey Eurotext, 1992:803–4.

Raj 1981 *{published data only}*
Raj TB, Makin GS. A random controlled trial of two forms of compression bandaging in outpatient sclerotherapy of varicose veins. *Journal of Surgical Research* 1981;**31**(5):440–5.

Reddy 1986 *{published data only}*
Reddy P, Wickers J, Terry T, Lamont P, Moller J, Dormandy JA. What is the correct period of bandaging following sclerotherapy?. *Phlebology* 1986;**1**:217–20.

Schadeck 1995a *{published data only}*
Schadeck M. Aetoxisclerol 4% in the treatment of the saphenous veins. In: Negus D, Jantet G, Coleridge-Smith P editor(s). *Phlebology*. Vol. **1**, Springer Verlag Inc, 1995:620. [: ISBN: 3540199993]

Scurr 1985 *{published data only}*
Scurr JH, Coleridge-Smith P, Cutting P. Varicose veins: optimum compression following sclerotherapy. *Annals of the Royal College of Surgeons of England* 1985;**67**(2):109–11.

Shouler 1989 *{published data only}*
Shouler PJ, Runchman PC. Varicose veins: optimum compression after surgery and sclerotherapy. *Annals of the Royal College of Surgeons of England* 1989;**71**(6):402–4.

Stanley 1991 *{published data only}*
Stanley PRW, Bickerton DR, Campbell WB. Injection sclerotherapy for varicose veins - a comparison of materials for applying local compression. *Phlebology* 1991;**6**(1):37–9.

References to studies excluded from this review

Ariyoshi 1996 *{published data only}*
Ariyoshi H, Kambayashi J, Tominaga S, Hatanaka T. The possible risk of lower-limb sclerotherapy causing an extended hypercoagulable state. *Surgery Today* 1996;**26**(5):323–7.

Belcaro 1991 *{published data only}*
Belcaro G, Christopoulos D, Vasdekis S. Treatment of superficial venous incompetence with the SAVAS technique (Section Ambulatoire des Varices avec Sclerotherapie). A 4 year randomised, controlled trial comparing venous hemodynamic and costing after SAVAS, sclerotherapy and the dentist's technique. *Journal des Maladies Vasculaires* 1991;**16**(1):23–7.
Belcaro G, Dugall M, Vasdekis S, Christopoulos D, Laurora G, Nicolaides AN, et al.Comparison between endovascular sclerotherapy, surgery and surgery plus sclerotherapy in the treatment of superficial vein insufficiency. A randomized study on 10 years follow-up [Comparaison entre la sclerotherapie endovasculaire, la chirurgie et al chirurgie associee a la sclerotherapie dans le traitment de l'incontinence des veines superficielles. Une etude randomisee sur 10 ans de sum]. *Angeologie* 1998;**50**(1):57–61.
Belcaro G, Nicolaides AN, Ricci A, Dugall M, Errichi BM, Vasdekis S, et al.Endovascular sclerotherapy, surgery, and surgery plus sclerotherapy in superficial venous incompetence: a randomized, 10-year follow-up trial- final results. *Angiology* 2000;**51**(7):529–34.

Belcaro 2003a *{published data only}*
* Belcaro G, Cesarone MR, Dugall MD, Griffin M, Di Renzo A, Ricci A. Primary classic sclerotherapy registry and trial: The Sclero Randomized 10-year follow-up study in chronic venous

insufficiency. Abstracts from the UIP World Congress Chapter Meeting (www.phlebology.org/AbstractUIP.htm#13). San Diego, 2003. [: 5420]

Bountouroglou 2004 *{published data only}*
Bountouroglou D, Geroulakos G. Ultrasound-guided foam sclerotherapy for treatment of primary varicose veins. *Phlebology* 2004;**19**(3):107–8.

Chant 1972 *{published data only}*
Beresford SA, Chant AD, Jones HO, Piachaud D, Weddell JM. Varicose veins: a comparison of surgery and injection/compression sclerotherapy. Five-year follow-up. *Lancet* 1978;**1**(8070):921–4.
* Chant ADB, Jones HO, Weddell JM. Varicose veins: a comparison of surgery and injection/compression sclerotherapy. *Lancet* 1972;**2**(7788):1188–91.
Piachaud D, Weddell JM. The economics of treating varicose veins. *International Journal of Epidemiology* 1972;**1**(3):287–94.

De Roos 2003 *{published data only}*
de Roos KP, Nieman FHM, Neumann HAM. Ambulatory phlebectomy versus compression sclerotherapy: results of a randomized controlled trial. *Dermatologic Surgery* 2003;**29**(3): 221–6.

Doran 1975 *{published data only}*
Doran FSA, White M. A clinical trial designed to discover if the primary treatment of varicose veins should be by Fegan's method or an operation. *British Journal of Surgery* 1975;**62**(1):72–6.

Einarsson 1993 *{published data only}*
* Einarsson E, Eklof B, Neglen P. Sclerotherapy or surgery as treatment for varicose veins: a prospective randomized study. *Phlebology* 1993;**8**(1):22–6.
Neglen P, Einarsson E, Eklof B. The functional long-term value of different types of treatment for saphenous vein incompetence. *Journal of Cardiovascular Surgery* 1993;**34**(4):295–301.

Hobbs 1968 *{published data only}*
Hobbs JT. Surgery and sclerotherapy in the treatment of varicose veins. A random trial. *Archives of Surgery* 1974;**109**(6):793–6.
Hobbs JT. Surgery or sclerotherapy for varicose veins. 10 year results of a random trial. In: Tesi M, Dormandy JA editor(s). *Superficial and Deep Venous Diseases of the Lower Limbs/Surgical Therapy*. Edizioni Panminerva Medica, 1984:243–8.
* Hobbs JT. The treatment of varicose veins. A random trial of injection-compression therapy versus surgery. *British Journal of Surgery* 1968;**55**(10):777–80.

Ikeda 1996 *{published data only}*
Ikeda M, Kambayashi J, Iwamoto S, Shinoki N, Nakamura T, Okahara K, et al.Hemostasis activation during sclerotherapy of lower extremity varices. *Thrombosis Research* 1996;**82**(1):87–95.

Iwamoto 2003 *{published data only}*
Iwamoto S, Ikeda M, Kawasaki T, Monden M. Treatment of varicose veins: an assessment of intraoperative and postoperative compression sclerotherapyy. *Annals of Vascular Surgery* 2003;**17**(3): 290–5.

Jakobsen 1979 *{published data only}*
Jakobsen BH. The value of different forms of treatment for varicose veins. *British Journal of Surgery* 1979;**66**(3):182–4.

Kanter 1992 *{published data only}*
Kanter AH. Complications of Sotradecol sclerotherapy with and without heparin. In: Raymond-Martimbeau P, Prescott R, Zummo M editor(s). *Phlebology '92*. Vol. **2**, Paris: John Libbey Eurotext, 1992:861–2.

Leach 2003 *{published data only}*
* Leach BC, Goldman MP. Comparative trial between sodium tetradecyl sulfate and glycerin in the treatment of telangiectatic leg veins. *Dermatologic Surgery* 2003;**29**(6):612–4.

Lupton 2002 *{published data only}*
Lupton J, Alster TS, Romero P. Clinical comparison of sclerotherapy versus long-pulsed Nd:YAG laser treatment for lower extremity telangiectases. *Dermatologic Surgery* 2002;**28**(8):694–7.

Martimbeau 1995 *{published data only}*
Raymond-Martimbeau P, Dupuis JL. Telangiectasias: incidence, classification, and relationship with the superficial and deep venous systems: a double-blind study. In: Negus D, Jantet G, Coleridge-Smith PD editor(s). *Phlebology '95*. Vol. **1 Suppl 1**, London: Springer, 1995:169–171.

Martimbeau 2003 *{published data only}*
Martimbeau PR. A randomized clinical trial comparing the sclerosing and side effects of foam Vs. liquid formula for sclerotherapy of primary varicose veins. Abstracts from the UIP World Congress Chapter Meeting (www.phlebology.org/AbstractUIP.htm#144). San Diego, 2003. [: 5433]

Martimbeau 2003b *{published data only}*
* Martimbeau PR. Perfluoropropane-filled albumin microspheres of sodium tetradecylsulphate versus air-filled sodium tetradecylsulphate for foam sclerotherapy of greater saphenous vein incompetence. Abstracts from the UIP World Congress Chapter Meeting (www.phlebology.org/AbstractUIP.htm#145). San Diego, 2003. [: 5434]

Mosley 1998 *{published data only}*
Mosley JG, Gupta I. The clinical and histological effects of ethanolamine in varicose veins. *Phlebology* 1998;**13**(1):29–30.

Queral 1990 *{published data only}*
Queral LA, Criado FJ, Lilly MP, Rudolphi D. The role of sclerotherapy as an adjunct to Unna's boot for treating venous ulcers: a prospective study. *Journal of Vascular Surgery* 1990;**11**(4): 572–5.

Rutgers 1994 *{published data only}*
Rutgers PH, Kitslaar PJ. Randomized trial of stripping versus high ligation combined with sclerotherapy in the treatment of the incompetent great saphenous vein. *American Journal of Surgery* 1994;**168**(4):311–5.

Sadick 1991 *{published data only}*
Sadick NS. Sclerotherapy of varicose and telangiectatic leg veins. Minimal sclerosant concentration of hypertonic saline and its relationship to vessel diameter. *Journal of Dermatologic Surgery & Oncology* 1991;**17**(1):65–70.

Schadeck 1995b *{published data only}*
Schadeck M, Allaert FA. Post sclerosis recurrences of the great saphenous vein. In: Negus D, Jantet G, Coleridge-Smith PD editor (s). *Phlebology '95*. Vol. **1**, Springer, 1995:614.

Scultetus 2003 *{published data only}*

Scultetus AH, Villavicencio JL, Kao TC, Gillespie DL, Ketron GD, Iafrati MD, et al.Microthrombectomy reduces postsclerotherapy pigmentation: multicenter randomized trial. *Journal of Vascular Surgery* 2003;**38**(5):896–903.

Seddon 1973 *{published data only}*

Seddon J. The management of varicose veins. *British Journal of Surgery* 1973;**60**(5):345–7.

Wright 2003 *{published data only}*

Wright D. European randomized controlled trial of Varisolve PD microfoam compared with alternative therapy in management of moderate to severe varicose veins: preliminary results. Abstracts from the UIP World Congress Chapter Meeting. San Diego, 2003. [: Cochrane Ref. 5436]

Zeh 2003 *{published data only}*

Zeh RG. Expanding sclerosing properties of polidocanol foam with Gelofusine. Abstract from the UIP World Congress Chapter Meeting (www.phlebology.org/AbstractUIP.htm#79). San Diego, 2003. [MEDLINE: 5430]

Additional references

Allan 2000

Allan PL, Bradbury AW, Evans CJ, Lee AJ, Ruckley CV, Fowkes FGR. Patterns of reflux and severity of varicose veins in the general population - Edinburgh Vein Study. *European Journal of Vascular & Endovascular Surgery* 2000;**20**(5):470–7.

Bradbury 1999

Bradbury A, Evans C, Allan P, Lee A, Ruckley CV, Fowkes FGR. What are the symptoms of varicose veins? Edinburgh vein study cross sectional population survey. *BMJ* 1999;**318**(7180):353–6.

Brand 1998

Brand FN, Dannenberg AL, Abbott RD, Kannel WB. The epidemiology of varicose veins: the Framingham Study. *American Journal of Preventive Medicine* 1988;**4**(2):96–101.

Callam 1994

Callam MJ. Epidemiology of varicose veins. *British Journal of Surgery* 1994;**81**(2):167–73.

Chassaignac 1855

Chassaignac. *Nouvelle methode pour ce traitement des tumeurs haemorrhoidalis*. Paris: Bailliere, 1855.

Fegan 1963

Fegan WG. Continuous compression technique of injecting varicose veins. *Lancet* 1963;**ii**:109–12.

Feied 1999

Feied CF. The American College of Phlebology. Sclerosing solutions. www.phlebology.org/docmechanism.htm.

Frullini 2002

Frullini A, Cavezzi A. Sclerosing foam in the treatment of varicose veins and telangiectases: history and analysis of safety and complications. *Dermatologic Surgery* 2002;**28**(1):11–5.

Galland 1998

Galland RB, Magee TR, Lewis MH. A survey of current attitudes of British and Irish vascular surgeons to injection sclerotherapy. *European Journal of Vascular & Endovascular Surgery* 1998;**16**(1): 43–6.

Mulrow 2006

Mulrow CD, Oxman AD, editors. Sensitivity analyses and publication bias. In: Higgins JPT, Green S, editors. Cochrane Handbook for Systematic Reviews of Interventions 4.2.5 [updated May 2005]; Section 8.8. http://www.cochrane.org/resouces/handbook/hbook.htm. The Cochrane Library, Issue 4, 1997. Oxford: Update Software, [(accessed 31 October 2006)].

Rigby 2004

Rigby KA, Palfreyman SJ, Beverley C, Michaels JA. Surgery versus sclerotherapy for the treatment of varicose veins. *Cochrane Database of Systematic Reviews* 2004, Issue 4. [Art. No.: CD004980. DOI: 10.1002/14651858.CD004980]

Young 1998

Young GL, Jewell D. Interventions for varicosities and leg oedema in pregnancy. *Cochrane Database of Systematic Reviews* 1998, Issue 2. [Art. No.: CD001066. DOI: 10.1002/14651858.CD001066]

References to other published versions of this review

Tisi 2002

Tisi PV, Beverley CA. Injection sclerotherapy for varicose veins. *Cochrane Database of Systematic Reviews* 2002, Issue 1. [Art. No.: CD001732. DOI: 10.1002/14651858.CD001732]

* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Abramowitz 1973

Methods	Hospital-based study. Duration of recruitment to study: not stated. Duration of follow-up: 6 to 24 months. Parallel trial. Randomisation method: not stated. Blinding: patient - no; doctor - no; outcome assessor - not stated. Cross-overs: unknown. Risk of bias: moderate.
Participants	101 patients. Age: not stated. Sex: female. Inclusion criteria: pregnant, primary or recurrent VV. Exclusion criteria: not stated. Venous problem: varicose veins. Drop-outs: 29 patients at study end; 1 in sclerotherapy group and 28 in compression stockings group.
Interventions	Sclerotherapy versus graduated compression stockings.
Outcomes	1. Symptomatic improvement and cosmetic result.
Notes	Sclerosant: STD. Dose: 0.5 ml (concentration not stated). Number of sites: not stated.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Batch 1980

Methods	Hospital-based study. Duration of recruitment to study: 3 years. Duration of follow-up: 6 years. Parallel trial. Randomisation method: not stated. Blinding: patient - no; doctor - no; outcome assessor - yes. Cross-overs: none. Risk of bias: moderate.

Batch 1980 (*Continued*)

Participants	148 patients: 169 legs. Age: not stated. Sex: not stated. Inclusion criteria: primary or recurrent VV. Exclusion criteria: saphenofemoral or saphenopopliteal incompetence. Venous problem: no saphenofemoral or saphenopopliteal incompetence. Drop-outs: 9 legs at 3 weeks; 16 at 3 months; 49 at 1 year; 116 at 2 years.
Interventions	Sclerotherapy with bandaging for 3 weeks versus 6 weeks.
Outcomes	1. Patient questionnaire: pain, mobility, cosmetic appearance, general satisfaction (3 = best score, 11 = worst). 2. Doctor assessment: phlebitis, pigmentation, induration, disappearance of varicosities (3 = best score, 11 = worst). 3. Number of patients requiring treatment for recurrent VV.
Notes	Sclerosant: not stated. Dose: not stated. Number of sites: not stated. Bandaging technique: Sorbo rubber pads, crepe, Elastoplast.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Belcaro 2003b

Methods	Multicentre hospital-based study. Duration of recruitment to study: not stated. Duration of follow-up: 10 years. Parallel trial. Randomisation method: random code. Blinding: patient - not stated; doctor - not stated; outcome assessor - not stated. Cross-overs: none. Risk of bias: low.
Participants	534 patients. Age: 25 to 65. Sex: 33% men group A; 31% group B; 31% group E. Inclusion criteria: primary VV. Exclusion criteria: pregnancy, obesity, thrombophlebitis, skin changes, post-thrombotic occlusion, sapheno-popliteal incompetence; systemic medical disease, coagulopathy. Venous problem: saphenofemoral incompetence. Drop-outs at 10 years: group A = 25; group B = 24; group E = 21.

Belcaro 2003b (*Continued*)

Interventions	Sclerotherapy with STD (group A, 1 to 2 ml of 2% or 3%) versus sclerotherapy with high dose STD (group B, 3 to 6 ml of 3%) versus foam sclerotherapy (group E, foam + 3% STD).
Outcomes	1. Recurrent varicose veins at 5 and 10 years. 2. Failure rate at 10 years (intention to treat): patients who needed any new intervention at 10 years plus drop-outs.
Notes	1. Further 3 treatment groups were excluded as these were surgical: multiple ligations, stab avulsions and surgery followed by sclerotherapy. 2. Foam produced by using 0.1 to 0.2 ml J&J-93FA with 3% STD.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Bukhari 1999

Methods	Hospital-based study. Duration of recruitment to study: not stated. Duration of follow-up: 12 weeks. Parallel trial. Randomisation method: not stated. Blinding: patient - yes; doctor - yes; outcome assessor - yes. Cross-overs: none. Risk of bias: low.
Participants	42 patients. Age: not stated. Sex: not stated. Inclusion criteria: telangiectasia < 1 mm or venulectasia 1 to 3 mm diameter. Exclusion criteria: pregnancy, deep venous thrombosis, chronic venous insufficiency, oedema. Venous problem: as above. Drop-outs: 7 patients; 2 in hypertonic saline and 5 in lidocaine group.
Interventions	Sclerotherapy with lidocaine/hypertonic saline (19%) versus hypertonic saline (23.4%).
Outcomes	1. Patient discomfort from initial injection: no pain (score = 1), mild pain (score = 2), moderate pain (score = 3), severe pain (score = 4). 2. Photographic score: disappearance of VV, pigmentation, neovascularization. 3. Complications: microthrombosis, skin necrosis/ulceration.
Notes	Sclerosant: see 'Interventions'. Dose: less than 2 ml. Number of sites: 25 cm2 area. Bandaging technique: elastic bandages or stockings up to 96 hours.

Bukhari 1999 (*Continued*)

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	A - Adequate

Fraser 1985

Methods	Hospital-based study. Duration of recruitment to study: 19 months. Duration of follow-up: 3 months. Parallel trial. Randomisation method: uncertain - random cards. Blinding: patient - no; doctor - no; outcome assessor - no. Cross-overs: 3 group A to C. Risk of bias: moderate.
Participants	154 patients: 158 legs. Age: matched in all 3 treatment groups (mean 41, 42, 42 years in groups A, B, C). Sex: matched in all. 3 treatment groups (female 73%, 79%, 80% in groups A, B, C). Inclusion criteria: 49 limbs undergone saphenofemoral disconnection 1 month previously. Exclusion criteria: venous ulcer. Venous problem: no superficial venous incompetence. Drop-outs: 8 legs at 3 months.
Interventions	Sclerotherapy with Coban bandaging for 6 weeks versus Coban 3 days versus crepe 6 weeks.
Outcomes	1. Patient symptom score: cosmetic, tiredness, pain, pruritus, cramps, ankle swelling, eczema (7 = worst score). 2. Symptoms from bandage. 3. Phlebitis at 3 months. 4. Residual VV at 3 months.
Notes	

Risk of bias		
Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Goldman 2002

Methods	Clinic-based study. Duration of recruitment to study: not stated. Duration of follow-up: 16 weeks. Parallel trial. Randomisation method: not stated. Blinding: patient - yes; doctor - yes; outcome assessor - yes. Cross-overs: none reported. Risk of bias: low.
Participants	129 patients. Age: not stated. Sex: not stated. Inclusion criteria: telangiectasia < 1 mm, reticular veins 1 to 3 mm diameter or varicose veins 3 to 6 mm diameter. Exclusion criteria: superficial venous incompetence. Venous problem: as above. Drop-outs: none reported.
Interventions	Sclerotherapy with polidocanol (0.5%, 1%, 3%) versus STD (0.25%, 0.5%, 1.5%).
Outcomes	1. Photographic score: appearance of veins (range from 1 (worse) to 5 (complete disappearance). 2. Complications: skin necrosis, hyperpigmentation, matting, local urticaria.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Hamel-Desnos 2003

Methods	Multi-centre clinic based study. Duration of follow-up: 12 months. Parallel trial. Randomisation method: uncertain. Blinding: patient - no; doctor - no; outcome assessor - not stated. Cross-overs: none. Risk of bias: moderate.
Participants	88 patients. Age: 18 to 80 years. Sex: not stated. Inclusion criteria: long saphenous incompetence with LSV diameter 4 to 8 mm. Exclusion criteria: pregnancy, previous DVT, coagulopathy, polidocanol allergy. Venous problem: as inclusion. Drop-outs: none stated.

Hamel-Desnos 2003 (*Continued*)

Interventions	Sclerotherapy with polidocanol foam (0.5 ml sclerosant)versus 2.0 to 2.5 ml 3% polidocanol liquid.
Outcomes	1. Venous spasm, 2. Cutaneous inflammation at 3 weeks, 3. Elimination of reflux at 3 weeks, 4. Recanalisation at 6 months.
Notes	Single does of sclerosant only: 2.0 ml if LSV 4 to 6 mm diameter; 2.5 ml if LSV 6 to 8 mm diameter.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Kahle 2003

Methods	Hospital-based study. Duration of recruitment to study: not stated. Duration of follow-up: 4 weeks. Parallel trial. Randomisation method: not stated. Blinding: patient - yes; doctor - yes; outcome assessor - yes. Cross-overs: none. Risk of bias: low.
Participants	30 patients. Age: not stated. Sex: not stated. Inclusion criteria: varicose veins 5 to 6 mm diameter. Exclusion criteria: none stated. Venous problem: as above. Drop-outs: none.
Interventions	Sclerotherapy with 3% aethoxysclerol (polidocanol)versus normal saline.
Outcomes	1. Venous by arterial volume flow.
Notes	2 layer short stretch bandages in both groups. Duplex scan at 1 and 4 weeks post-sclerotherapy.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Labas 2003

Methods	Hospital-based study. Duration of recruitment to study: 10 years. Duration of follow-up: 6 months, 5 years. Parallel trial. Randomisation method: not stated. Blinding: patient - not stated; doctor - not stated; outcome assessor - yes. Cross-overs: none reported. Risk of bias: moderate.
Participants	1622 patients. Age: not stated. Sex: not stated. Inclusion criteria: not stated. Exclusion criteria: not stated. Venous problem: chronic venous insufficiency. Drop-outs: none reported.
Interventions	Sclerotherapy with aethoxysclerol (Sigg method) vs STD (Fegan method).
Outcomes	1. Cosmetic appearance, including photographic evidence. 2. Symptoms: cramps, pain, fatigue, heaviness.
Notes	Third group treated with both aethoxysclerol and STD (Fegan method) not discussed further: relative proportion of 2 sclerosants not stated.

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Moody 1996

Methods	Hospital-based study. Duration of recruitment to study: not stated. Duration of follow-up: 36 months. Parallel trial. Randomisation method: not stated. Blinding: patient - no; doctor - no; outcome assessor - not stated. Cross-overs: none. Risk of bias: moderate.
Participants	100 patients: 111 legs. Age: not stated. Sex: not stated. Inclusion criteria: not stated. Exclusion criteria: not stated. Venous problem: not stated. Drop-outs: 0 legs at 3 months; 2 legs at 12 months; 28 legs at 36 months.

Moody 1996 (*Continued*)

Interventions	Sclerotherapy with bandaging for 1 week versus 6 weeks.
Outcomes	1. Patient symptoms- tolerating bandage. 2. Complications: staining, pain, phlebitis, blistering, ulceration, induration. 3. Recurrent varicose veins.
Notes	

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Prescott 1992

Methods	Study setting: not stated. Duration of recruitment to study: not stated. Duration of follow-up: not stated. Parallel trial. Randomisation method: not stated. Blinding: patient - not stated; doctor - not stated; outcome assessor - not stated. Cross-overs: none. Risk of bias: moderate.
Participants	50 patients. Age: < 50 years. Sex: females. Inclusion criteria: previously treated VV. Exclusion criteria: not stated. Venous problem: telangiectasia < 2 mm diameter. Drop-outs: none.
Interventions	Sclerotherapy with 10% hypertonic dextrose versus 0.15% STD.
Outcomes	1. Patient assessment: disappearance of thread veins. 2. Injecting surgeon assessment: disappearance of thread veins. 3. Photographic assessment: disappearance of thread veins. 4. Complications: pain, matting, pigmentation.
Notes	Sclerosant: see 'Interventions'. Dose: not stated. Repeat treatments: mean 4.2 (range 2 to 8) in hypertonic dextrose, 2.6 (range 2 to 5) in 0.15% STD. Bandaging technique: not stated.

Risk of bias

Prescott 1992 (*Continued*)

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Raj 1981

Methods	Hospital-based study. Duration of recruitment to study: not stated. Duration of follow-up: 6 weeks. Parallel trial. Randomisation method: random envelopes. Blinding: patient - no; doctor - no; outcome assessor - yes. Cross-overs: none. Risk of bias: moderate.
Participants	112 patients. Age: mean 41.9 years, range 21 to 70 years. Sex: 68 females, 42 males (N.B. totals 110 and not 112). Inclusion criteria: 'symptoms attributable to below knee VV'. Exclusion criteria: eczema, ulceration, obesity. Venous problem: below knee VV with no clinical evidence of saphenofemoral incompetence. Drop-outs: 12 patients; did not follow instructions or did not attend clinic.
Interventions	Sclerotherapy with bandaging for 8 hours versus 6 weeks.
Outcomes	1. Patient assessment: cosmetic result and symptomatic improvement. 2. Injecting surgeon assessment: cosmetic result. 3. Independent surgeon assessment: cosmetic result. 4. Infrared photography: before and after compared by two independent surgeons (3 = best score, 0 = worst for each assessment; maximum total = 12).
Notes	Sclerosant: 3% STD. Dose: 0.5 ml/site. Number of sites: not stated. Bandaging technique: Sorbo foam rubber pads, crepe, Tubigrip.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Reddy 1986

Methods	Hospital-based study. Duration of recruitment to study: 2 years. Duration of follow-up: 4 years. Parallel trial. Randomisation method: not stated. Blinding: patient - no; doctor - no; outcome assessor - yes. Cross-overs: none. Risk of bias: moderate.
Participants	130 patients: 145 legs. Age: not stated. Sex: not stated. Inclusion criteria: primary or recurrent VV. Exclusion criteria: saphenofemoral or saphenopopliteal incompetence. Venous problem: no saphenofemoral or saphenopopliteal incompetence. Drop-outs: not stated.
Interventions	Sclerotherapy with bandaging for 1 week versus 3 weeks.
Outcomes	1. Patient questionnaire: pain, mobility, cosmetic appearance, general satisfaction (4 = best score, 11 = worst). 2. Doctor assessment: phlebitis, pigmentation, induration, disappearance of varicosities (3 = best score, 13 = worst).
Notes	Trial 1 refers to Batch 1980 study; trial 2 to Reddy 1986 study. Sclerosant: not stated. Dose: not stated. Number of sites: not stated. Bandaging technique: Sorbo rubber pads, crepe, Elastoplast.

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Schadeck 1995a

Methods	Study setting: not stated. Duration of recruitment to study: not stated. Duration of follow-up: 3 minutes. Parallel trial. Randomisation method: not stated. Blinding: patient - not stated; doctor - not stated; outcome assessor - not stated. Cross-overs: none. Risk of bias: moderate.

Schadeck 1995a (*Continued*)

Participants	30 patients. Age: not stated. Sex: not stated. Inclusion criteria: long saphenous vein < 6 mm diameter. Exclusion criteria: long saphenous vein > 6 mm diameter (Duplex ultrasound). Venous problem: long saphenous reflux. Drop-outs: not stated.
Interventions	Sclerotherapy with 4% aetoxisclerol versus 3% Sotradecol (STD).
Outcomes	1. Venous spasm (75% reduction cross-sectional diameter) at 3 minutes. 2. Disappearance of long saphenous reflux.
Notes	Sclerosant: see 'Interventions'. Number of treatments: 2. N.B. Figures used in the analyses were estimates from percentages quoted in the text.

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Scurr 1985

Methods	Hospital-based study. Duration of recruitment to study: not stated. Duration of follow-up: 6 weeks (see Note 1). Parallel trial. Randomisation method: not stated. Blinding: patient - no; doctor - no; outcome assessor - yes. Cross-overs: none. Risk of bias: moderate.
Participants	42 patients (see Note 2). Age: mean 52.6 years, range 42 to 69 years in men; mean 43.2 years, range 28 to 60 years in women. Sex: 33 females, 9 males. Inclusion criteria: unilateral or bilateral VV. Exclusion criteria: saphenofemoral incompetence or high thigh perforating veins. Venous problem: no saphenofemoral incompetence. Drop-outs: none.
Interventions	Sclerotherapy with elastic stocking compression versus conventional bandaging.
Outcomes	1. Successful sclerosis: 100%, 75 to 99%, 50 to 74%, < 50%. 2. Thrombophlebitis: 0%, 1 to 25%, 26 to 50%, > 50%. 3. Skin staining: 0%, 1 to 25%, 26 to 50%, > 50%.

Scurr 1985 (*Continued*)

Notes	Sclerosant: 0.5% ethanolamine. Dose: 0.5 ml/site. Number of sites: maximum 6. Bandaging technique: Struva Forte stocking versus Elastocrepe/ Elastoplast. (1) Patients assessed at 3 and 6 weeks but not clearly stated which time results refer to - presume 6 weeks. (2) Results show 42 limbs in each treatment group therefore all patients must have had bilateral VV.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Shouler 1989

Methods	Hospital-based study. Duration of recruitment to study: not stated. Duration of follow-up: 6 weeks. Parallel trial. Randomisation method: numbered sealed envelopes. Blinding: patient - no; doctor - no; outcome assessor - no. Cross-overs: none. Risk of bias: moderate.
Participants	62 patients. Age: mean 39.3, range 24 to 67 in stocking group; mean 39.7, range 17 to 71 in bandage/stocking group. Sex: 45 females, 17 males. Inclusion criteria: primary varicose veins and residual varicosities following surgery. Exclusion criteria: saphenofemoral or saphenopopliteal incompetence. Venous problem: as above. Drop-outs: none.
Interventions	Sclerotherapy with Elastocrepe bandage and elastic stocking compression versus elastic stocking alone.
Outcomes	1. Patient assessment: discomfort, slipping of dressing. 2. Disappearance of varicosities: good, fair. 3. Complications: thrombophlebitis.
Notes	Sclerosant: STD. Dose: not stated. Number of sites: mean 3.6 in bandage/stocking group, 3.2 in stocking group. Bandaging technique: Brevet Varex and Elastocrepe versus Brevet Varex.

Risk of bias

Item	Authors' judgement	Description

Shouler 1989 (*Continued*)

Allocation concealment?	Unclear	B - Unclear

Stanley 1991

Methods	Hospital-based study. Duration of recruitment to study: 6 months. Duration of follow-up: 6 months. Parallel trial. Randomisation method: not stated. Blinding: patient - no; doctor - no; outcome assessor - no. Cross-overs: none. Risk of bias: moderate.
Participants	102 patients: 51 each group. Age: mean 55.7 years, range 24 to 69 years in Molefoam group; mean 60.1 years, range 31 to 68 years in Sorbo pad group. Sex: 37 females, 14 males in Molefoam group: 36 females, 15 males in Sorbo pad group. Inclusion criteria: not stated. Exclusion criteria: not stated. Venous problem: not stated. Drop-outs: none.
Interventions	Sclerotherapy with Molefoam dressing to injection site versus Sorbo pad.
Outcomes	1. Successful sclerosis (no further injections required). 2. Ulceration following sclerotherapy. 3. Skin erythema.
Notes	Sclerosant: STD. Dose: 0.5 ml/site. Number of sites: mean 4.38 in Molefoam, 3.88 in Sorbo pad groups. Bandaging technique: Elastocrepe/Elastoplast/Tubigrip.

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

LSV long saphenous vein
STD sodium tetradecyl sulphate
VV varicose veins

Characteristics of excluded studies *[ordered by study ID]*

Ariyoshi 1996	RCT comparing surgery and sclerotherapy to sclerotherapy alone.
Belcaro 1991	RCT comparing local anaesthetic section of varicose veins (dentist's technique), sclerotherapy and 'Section Ambulatoire des Varices avec Sclerotherapie' (SAVAS) (combination of dentist's technique and sclerotherapy) .
Belcaro 2003a	RCT comparing sclerotherapy with aethoxysclerol versus STD. No details of randomisation, blinding or allocation concealment presented. Number of patients/limbs entering trial not stated, only numbers of limbs assessed at 10-year follow-up: drop-outs impossible to assess. Results presented as percentages: unclear as to the denominator. Abstract states that aethoxysclerol is more effective and better tolerated than STD (Anova $p<0.021$).
Bountouroglou 2004	RCT comparing foam sclerotherapy and adjuvant high saphenous ligation under local anaesthetic with conventional surgery.
Chant 1972	RCT comparing surgery to sclerotherapy.
De Roos 2003	RCT comparing surgery (ambulatory phlebectomy)to sclerotherapy.
Doran 1975	RCT comparing surgery to sclerotherapy.
Einarsson 1993	RCT comparing surgery to sclerotherapy.
Hobbs 1968	RCT comparing surgery to sclerotherapy.
Ikeda 1996	RCT comparing surgery to sclerotherapy.
Iwamoto 2003	RCT comparing surgery with intra-operative sclerotherapy to surgery with post-operative sclerotherapy.
Jakobsen 1979	RCT comparing surgery to sclerotherapy.
Kanter 1992	Not an RCT. Controlled study comparing Sotradecol (STD) sclerotherapy with or without heparin.
Leach 2003	Not an RCT. Controlled study where 13 patients with bilateral telangiectatic veins (0.2 to 0.4 mm diameter) were treated with 0.25% STD in one leg and 72% glycerine in the contralateral leg.
Lupton 2002	Not an RCT. Controlled study where 20 women with bilateral telangiectatic veins (0.1 to 1.5 mm diameter) were treated with a long-pulsed 1064 nm Nd:YAG laser to one leg and sclerotherapy with 0.25% STD in the contralateral leg. Results favoured treatment with sclerotherapy.
Martimbeau 1995	Double-blind trial of sclerotherapy with iodine sodium iodide versus sodium tetradecyl sulphate. No evidence of randomisation in study methods and no results reported of differences between the two sclerosants.

(*Continued*)

Martimbeau 2003	RCT comparing sclerotherapy with 1% STD foam versus liquid formulation. Randomisation method not stated, unable to assess blinding or allocation concealment. End point data unclear.
Martimbeau 2003b	RCT comparing sclerotherapy with 1% STD as an air-filled foam versus perfluoropropane-filled albumin microspheres of STD. Randomisation method not stated, unable to assess blinding or allocation concealment. No numerical data reported, only statistical significance. Trend towards benefit with perfluopropane-filled albumin microspheres group.
Mosley 1998	Not an RCT. Controlled study where below-knee incompetent perforating vein treated with varying doses of 5% ethanolamine and contralateral limb treated with normal saline.
Queral 1990	Not an RCT. Alternate assignment of 28 patients with venous ulceration to either Unna's compressive boots alone or in conjunction with sclerotherapy.
Rutgers 1994	RCT comparing surgery to sclerotherapy.
Sadick 1991	Not an RCT. Double-blind paired-comparison study in patients with bilateral starburst telangiectasia and reticular veins. Phase 1: comparison of varying concentrations of hypertonic saline (23.4%, 11.7%, 5.8%) in 600 patients. Phase 2: subgroup of 200 patients treated with hypertonic saline ± heparin.
Schadeck 1995b	RCT comparing sclerotherapy of the terminal segment of the long saphenous vein (LSV) with sclerotherapy of LSV tributaries in addition to this. Excluded because no numerical results presented, although results state that treating tributaries prevents early recanalisation of the long saphenous vein.
Scultetus 2003	RCT comparing sclerotherapy to sclerotherapy with post-operative microthrombectomy.
Seddon 1973	RCT comparing surgery to sclerotherapy: inadequate method of randomisation (alternate patients assigned to each treatment option).
Wright 2003	RCT comparing sclerotherapy with polidocanol foam (Varisolve)with surgery or sclerotherapy. Excluded because no numerical results presented, although abstract states that foam sclerotherapy is as effective as surgery and more effective than conventional sclerotherapy.
Zeh 2003	RCT comparing sclerotherapy with polidocanol foam to sclerotherapy with polidocanol foam with 0.1 cm2 Gelofusine (a synthetic plasma expander). Excluded because: i) randomization method, blinding and allocation concealment are unclear; ii) no results published on the effect of treatment on venous spasm and reflux, as mentioned in the Methods; iii) it is not clear whether the results indicating number of veins sclerosed apply to immediately post-treatment or the 1 month follow-up.

Surgical treatment of varicose veins is beyond the scope of this Cochrane Review.

DATA AND ANALYSES

Comparison 1. Sclerotherapy with different sclerosants

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Results: venous spasm	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
2 Results: disappearance of reflux	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
3 Results: venous by arterial volume flow			Other data	No numeric data
4 Results: disappearance of thread veins	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
5 Results: photographic appearance of veins	1		Mean Difference (IV, Fixed, 95% CI)	Totals not selected
6 Results: cosmetic appearance at 6 months	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
7 Results: cosmetic appearance at 5 years	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
8 Results: symptomatic improvement at 6 months	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
9 Results: symptomatic improvement at 5 years	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected
10 Results: recurrent varicose veins at 5 years	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
11 Results: recurrent varicose veins at 10 years	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
12 Results: failure at 10 years	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
13 Complications: allergic reaction	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
14 Complications: pigmentation	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
15 Complications: pigmentation	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
16 Complications: skin necrosis	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
17 Complications: local urticaria	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
18 Complications: pain	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
19 Complications: vein thrombosis	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
20 Complications: ecchymosis	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
21 Complications: matting	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
22 Complications: matting	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected

Comparison 2. Local anaesthetic in sclerosant versus no local anaesthetic

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Results: disappearance of varicosities, pigmentation, neovascularization	1	35	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
2 Complications: moderate or severe pain from sclerotherapy	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
3 Complications: microthrombosis	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
4 Complications: ulceration	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
5 Complications: matting/ hyperpigmentation	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected

Comparison 3. Sclerotherapy with foam versus liquid

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Results: venous spasm	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
2 Results: elimination of reflux	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
3 Results: recanalisation at 6 months	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
4 Results: recurrent varicose veins at 10 years	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
5 Results: failure at 10 years	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
6 Complications: haematoma	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
7 Complications: cutaneous inflammation at 3 weeks	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
8 Results: recurrent varicose veins at 5 years	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected

Comparison 4. Molefoam versus Sorbo pad to injection sites after sclerotherapy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Results: successful sclerotherapy	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
2 Complications: erythema	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
3 Complications: ulceration	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected

Comparison 5. Increased elastic compression versus conventional dressing after sclerotherapy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Results: disappearance of varicosities	3	246	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.25 [0.71, 2.20]
2 Complications: discomfort	2	168	Peto Odds Ratio (Peto, Fixed, 95% CI)	3.65 [1.92, 6.95]
3 Complications: slipped stockings	2	168	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.49 [0.24, 1.00]
4 Complications: thrombophlebitis	3	246	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.79 [0.47, 1.34]
5 Complications: skin staining	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected

Comparison 6. Short-term versus standard bandaging after sclerotherapy

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Results: cosmetic and symptomatic improvement	1		Peto Odds Ratio (Peto, Fixed, 95% CI)	Totals not selected
2 Results: pain, mobility, cosmetic appearance, satisfaction at 3 months	2	298	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
3 Results: recurrent varicose veins	3	416	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.69 [0.43, 1.10]
4 Results: pain, mobility, cosmetic appearance, satisfaction at 2 years	1	145	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
5 Results: pain, mobility, cosmetic appearance, satisfaction at 4 years	1	145	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
6 Complications: phlebitis, pigmentation, induration at 3 months	2	298	Std. Mean Difference (IV, Fixed, 95% CI)	Not estimable
7 Complications: phlebitis, staining, pain, blistering, ulceration	2	331	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.06 [0.66, 1.73]
8 Complications: discomfort, slipping, foot swelling, bandage intolerance	2	216	Risk Ratio (M-H, Fixed, 95% CI)	0.54 [0.40, 0.73]

Comparison 7. Sclerotherapy versus graduated compression stockings

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Results: cosmetic and symptomatic improvement	1		Risk Ratio (M-H, Fixed, 95% CI)	Totals not selected

WHAT'S NEW

Last assessed as up-to-date: 30 October 2006.

17 October 2008	Amended	Converted to new review format.

HISTORY

Protocol first published: Issue 3, 1999

Review first published: Issue 1, 2002

6 November 2006	New search has been performed	Searches re-run and no new studies found. Search dates amended. Citation error and copy editing errors corrected.
21 August 2006	New citation required but conclusions have not changed	Five further RCTs included and nine RCTs excluded. Plain language summary added. Contributions of Reviewers updated. Overall conclusions unchanged.
26 May 2004	New search has been performed	Two further RCTs included. Overall conclusions unchanged.

CONTRIBUTIONS OF AUTHORS

Paul Tisi: identified trials for inclusion; contacted authors for additional information; assessed eligibility and quality of trials; extracted data; completed review; revised review (February 2003; March 2005; July 2006).

Catherine Beverley: assessed eligibility and quality of trials; extracted data for initial review.

Angie Rees: assessed eligibility and quality of trials.

Heather Maxwell & Andrew J. Wawrzyniak, Review Group Co-ordinators: confirmed data extraction for update of review.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- Chief Scientist Office, Scottish Government Health Directorates, The Scottish Government, UK.

INDEX TERMS

Medical Subject Headings (MeSH)

Bandages; Randomized Controlled Trials as Topic; Sclerosing Solutions [therapeutic use]; Sclerotherapy [*methods]; Varicose Veins [*therapy]

MeSH check words

Humans