



Validation of a New Duplex Derived Haemodynamic Effectiveness Score, the Saphenous Treatment Score, in Quantifying Varicose Vein Treatments[☆]

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WHAT THIS PAPER ADDS

- This paper introduces the saphenous treatment score (STS). It is a novel duplex-derived haemodynamic assessment of the great saphenous vein. Reflux, competency and occlusion are recorded before and after treatment, above and below the knee. Descriptive outcome terms like recanalisation and length of obliteration are replaced with numerical scores. This study has demonstrated that the STS is responsive to different treatments and ongoing treatments and shown that it may be used to complement other assessment tools in evaluating outcomes.

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ABSTRACT

Objectives: To evaluate a duplex-derived score for varicose vein treatments using numerical values of haemodynamic effectiveness.

Design: The saphenous treatment score (STS) was developed prospectively to compare the effect of endovenous treatments on reflux within saphenous segments.

Patients: Sixty-six patients were randomised to endovenous laser ablation (EVLA) or ultrasound-guided foam sclerotherapy (UGFS) to the great saphenous vein (GSV).

Methods: Assessments included the Aberdeen varicose vein severity score (AVVSS), the venous clinical severity score (VCSS), the venous filling index (VFI) and the STS.

Results: A mean STS of 5.70 decreased to 3.30, $P < .0005$, post-treatment. The median (IQR) AVVSS, VCSS and VFI (ml/sec) decreased from 21.52(15.48) to 18.86(11.27), $P = .14$, from 6(4) to 3(4), $P < .0005$ and from 7.1(6.9) to 1.9(.9) $P < .0005$, respectively. In 15 patients requiring additional UGFS the mean STS values decreased from 5.8 to 4.13 and then to 2.6 $P < .0005$, respectively. The individual above and below knee mean treatment differences in STS on 38 EVLA and 28 UGFS patients were 1.92 and .87 (EVLA) compared to 1.57 and .29 (UGFS) $P = .001$, respectively.

Conclusions: The STS has been shown to grade the haemodynamic effects of different treatments as well as ongoing treatments on the GSV.

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Introduction

Endovenous treatments for varicose veins like foam sclerotherapy, laser and radio-frequency ablation have evolved

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alongside traditional sapheno-femoral ligation, stripping and multiple phlebectomies. Combinations of treatments are also popular with one technique used for the truncal veins and a different treatment used to obliterate the tributaries.

Treatments aimed at abolishing great saphenous vein (GSV) reflux can have varying results with co-existing areas of reflux, competency and occlusion in the above knee (AK) and below knee (BK) segments of the same saphenous trunk. These post-treatment patterns are difficult to standardise with most reports relying on descriptive terms, like partial recanalisation, rather than using numerical scores. This is in contrast to other scoring systems, which

have a scale upon which to quantify severity and the results of treatment.

The current duplex-derived venous segmental disease score (VSDS)¹ has a single outcome value, 1 for reflux and 1 for occlusion, for the length of the GSV and consequently lacks the dynamic sensitivity to quantify saphenous treatments (Table 1). Thus a focused, dynamic scoring system on the effects of treatment on the saphenous trunk is proposed.

The saphenous treatment score (STS) is a duplex-derived haemodynamic outcome evaluation which grades the significance of co-existing haemodynamic patterns throughout the saphenous trunk. It is not an assessment which describes the length of GSV obliteration. Obliteration is a technical success but if reflux is present in other areas of the GSV this may result in haemodynamic failure, which will be recorded in the STS. The STS therefore has the potential to compare endovenous treatments to surgical solutions.

A refluxing BK-GSV has been demonstrated to be clinically significant. The extent of reflux below the knee leads to worse symptoms and signs, with a greater likelihood of residual varicose veins. If the GSV is ablated for a longer length it is associated with a better outcome and if a refluxing BK-GSV is neglected then there are often residual symptoms with an increased need for sclerotherapy.² It is therefore justified to include the BK-GSV in a scoring system following treatment since this is likely to have a clinical impact.

The STS focuses on the haemodynamic post-treatment effects on the GSV trunk compared to the pre-treatment value. It uses a weighting system to prioritize reflux, competency and obliteration, and assesses both the AK and BK segments of the GSV.

The aim of this study was to evaluate a haemodynamic scoring system, the STS, to grade different varicose vein treatments, ongoing treatments and compare them to other validated assessments.

Methods

Study design

This was a randomised study achieved using sealed envelopes. Sixty-six consecutive patients (66 legs) received either endovenous laser ablation (EVLA) or ultrasound-guided foam sclerotherapy (UGFS) for varicose veins during 2009–2010. Hospital rationing policy and pre-screening by the family doctor precluded treatment of patients with varicose veins which were only of cosmetic concern. Thus all patients had symptoms from their primary varicose veins and they had a C score of the CEAP classification of C_{2–6} and significant sapheno-femoral junction (SFJ) reflux extending for at least 10 cm from the junction as determined by duplex ultrasound. Patients with deep venous reflux, evidence of a current or past DVT, or sapheno-popliteal junction reflux were excluded from the study.

Pre-treatment assessments included the Aberdeen varicose vein severity score (AVVSS), the venous clinical severity score (VCSS), air plethysmography (APG) and a duplex examination. Follow-up was

at 3 weeks and 3 months and included the AVVSS, the VCSS and colour duplex examinations. Follow-up VFI was performed at 3 months in all patients.

The STS scoring system was compared in five different situations:

- In all patients undergoing endovenous treatment against AVVSS and the VCSS, before and 3 weeks after intervention.
- In the subgroup of patients requiring additional foam sclerotherapy against the venous filling index (VFI).
- Between EVLA and UGFS patients, AK and BK, before and 3 weeks after treatment.
- Correlations between the absolute values of the STS and the AVVSS, VCSS and VFI assessments 3 months after treatment.
- Improvements in the STS at 3 months compared with improvements in the AVVSS, VCSS and VFI measures. Improvement was defined as the difference between the pre and post-treatment values for each assessment tool.

Ethics committee approval was granted from the local ethics committee (No: 08/H0710) and informed consent was obtained from participating patients.

Scoring with duplex/STS

Scoring was performed using a portable Sonosite® Titan colour duplex scanner (SonoSite Inc, Bothell, WA98021-3904, USA) with a linear 7 MHz transducer. All examinations were performed by the same, experienced clinical vascular scientist (MA). Superficial and deep veins and their junctions were assessed for reflux, competence and occlusion. Reflux was induced using a manual calf compression and release manoeuvre in the standing position. Reflux duration of >.5 s for superficial veins and >1.0 s for deep veins was considered significant. Occlusion was defined as the presence of complete luminal obliteration of any length. The mean GSV diameter was calculated from the average of 3 measurements taken below the SFJ, at mid thigh and above the knee. Non-refluxing segments of the GSV, localised dilatations or a saphena varix were avoided.

An STS^{1–3} was given to the above knee (AK) and the below knee (BK) parts of the GSV, demarcated by the popliteal skin crease, in a standing patient. Straight continuing tributaries of the GSV in patients with a hypoplastic distal GSV were considered as part of the GSV. A refluxing anterior-accessory saphenous vein (AASV) was also included as part of the GSV evaluation provided reflux originated from the proximal GSV. A score of 1 represented complete occlusion of any length without reflux, 2 represented competency without occlusion or reflux and 3 represented the presence of reflux irrespective of co-existing occlusion or competency. The AK and BK scores were then added to give an STS of 2–6 for the leg. The STS was then repeated after each treatment. When deriving the total score the appropriate number was used for each segment (AK or BK) in legs with co-existing haemodynamic patterns. The scores in the AK and BK segments were then combined to create the STS, as shown in Fig. 1 and Table 2.

Air plethysmography

This was performed using the APG-1000® apparatus comprising a sensor air-cuff, an air-pump and software (ACI Medical LLC, San Marcos, CA92078, USA).³ The VFI represents the rate of venous filling of the calf when the patient stands up after lying supine with the leg elevated at 45°. If elevated (>2 ml/s), it provides a global assessment of reflux. The VFI was measured in all patients prior to and 3 months after the treatment.

Table 1

Clinical and duplex scoring systems for evaluating saphenous insufficiency. The VCSS and STS are relatively more dynamic systems.

	Static (stage/classification)	Dynamic (change)
Clinical	C part of CEAP	VCSS
Duplex	VSDS	STS

VCSS, Venous Clinical Severity Score; STS, Saphenous Treatment Score; CEAP, Clinical Etiological Anatomical Pathophysiological; VSDS, Venous Segmental Disease Score.

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