



THE SOCIETY FOR
VASCULAR TECHNOLOGY OF
GREAT BRITAIN AND IRELAND

Vascular Technology Professional Performance Guidelines

Lower Limb Venous Reflux Duplex Ultrasound Examination

Introduction

This guideline was prepared by the Professional Standards Committee (PSC) of the Society for Vascular Technology (SVT) as a template to aid the Clinical Vascular Scientist/Vascular Sonographer and other interested parties. It may be used in part or in its entirety with suitable additions made by local policy implementers, and should be read in combination with the following SVT guidelines.

- Vascular Ultrasound Service Specifications ¹

Suggestions for improvement of this guideline are welcome and should be sent to the Chair of the PSC – see www.svtgbi.org.uk for current Chair details.

Purpose

To assess the deep and superficial venous lower limb systems for evidence of valvular incompetence and to establish the source of any reflux identified in the superficial lower limb veins.

Common Indications

Common indications for the performance of a venous Duplex Ultrasound examination include but are not limited to:

- Skin changes, venous eczema, hyperpigmentation and venous ulcers
- Swelling
- Pain
- Visible varicose veins
- Venous claudication
- Acute bleeding varicose vein

Patient Pathway

Within the varicose vein pathway the assessment of venous reflux is the major diagnostic test. Further guidance is given by the Vascular Society Great Britain and Ireland publication Provision of Services for Patients with Vascular Disease 2018 ². Scriven et al ³ and the National Institute for Health and Care Excellence (NICE) ⁴.

Venous anatomy can be variable, and it is important to have a full understanding of possible variants, the recently updated venous nomenclature as well as knowledge of ultrasound identification and venous physiology^{5,6,7,8,9}.

REFERRAL

Clinical Indications

For venous reflux scans clinical indications for this type of scanning include simple or complex primary varicose veins, secondary (recurrent) varicose veins, leg ulcers, skin changes and chronic leg swelling.

There is also some evidence that duplex imaging should be a routine part of the investigation of every patient with varicose veins, particularly if they are to undergo interventions^{4,5}. It is necessary as part of the selection process for surgery, foam sclerotherapy, laser and radiofrequency ablation. A duplex ultrasound investigation is also indicated where there is suspicion of reflux in the deep veins or where there is a history of deep vein thrombosis (DVT).

Preparation

No specific preparation is required. Access will be required to the patient's full limb. Compression stockings and where appropriate, other dressings should be removed to enable access to the areas of the limb which require scanning. These tests involve using the probe to apply pressure on the limb to compress the vein, and also squeezing the limb below the level of the probe to check for venous reflux/patency. Careful explanation of this will aid compliance as these processes can sometimes be uncomfortable for the patient.

During lower limb scanning the patient needs to be positioned such that enough hydrostatic pressure is generated to get good venous filling in the calf. The position should be as similar to standing as possible^{5,10,11,12,13,14}, in order to reproduce physiological conditions. Ideally the patient should be standing with appropriate support (provision of a braked couch on its highest setting to lean against or low stool with arm support or tilt table is helpful) or, where this is not possible, sitting on the edge of the couch with the legs as dependent as possible. Horizontal limb positions are not appropriate for detection of reflux⁵. Consideration should be given to the reliability of the results where patients are not able to tolerate optimal positioning.

Due to intimate nature of the examination it may be considered necessary to offer a chaperone^{15,16}. It is not unusual for patients to feel faint during lower limb assessments, so it is advisable to monitor their well-being regularly (onset of yawning can be a useful sign of imminent feelings of faintness). A second person can be useful with these aspects of patient care whilst the Vascular Scientist concentrated on the ultrasound assessment.

Examination

The examination may be unilateral or bilateral dependent upon clinical symptoms, referral and departmental policy.

Knowledge of venous anatomy, the variants and ultrasound appearances are essential⁵ as is knowledge of previous surgery for the particular patient. Clinical observation of the superficial veins in the lower limb in the standing patient, in a well-lit room, prior to starting the scan is helpful in determining the scope of the scan.

If considering compression therapy for a leg ulcer an ankle brachial pressure index (ABPI) assessment should be carried out. All patients with an adequate arterial supply (ABPI>0.9) should be offered effective compression therapy¹⁷.

The following procedure can be used to assess the Lower Limb veins:

B-Mode should be utilised to assess vein patency by observation of the compressibility of the vein, this should be done in a transverse scan.

Pulsed and colour Doppler should be utilised to assess flow characteristics within the veins, this will include assessment of phasicity, spontaneity and direction of flow. Flow characteristics will generally be assessed in a longitudinal scan plane.

Manual or automated distal augmentation should be used to enhance the flow and to assess for reflux.

Start the examination in the groin at the common femoral vein (CFV) and assess the compressibility and flow. Flow should be spontaneous with respiratory and cardiac modulation. Abnormal flow in the CFV or abnormal superficial veins in the groin/abdomen may be due to iliac vein obstruction and in these cases the iliac veins and inferior vena cava need to be examined.

Continue to examine the lower limb veins distally, examining the length of the femoral vein (FV), the proximal profunda femoris vein and the popliteal vein as detailed above. The calf veins may be examined as well. If thrombus is identified the extent of the thrombus should be noted. Incompetence (defined as a reflux time $>0.5s$)⁴ should also be noted.

Once the deep veins have been assessed the transducer should be moved back to the groin to assess the sapheno-femoral junction and great saphenous system (GSV). The GSV should be assessed throughout the length for patency and competency. The location and extent of any incompetent segments should be noted, along with the position of any associated perforators or branches. It may be useful to record the diameter and depth of the vein and whether it is straight and remains within the fascia plane if endovenous treatment is being considered.

The patient should be repositioned to assess the sapheno-popliteal junction and small saphenous vein (SSV). The SSV should be located in the posterior calf and traced back up the leg, assessing it for patency and competency as before. The anatomy associated with the origin of the SSV is very variable and should be commented on if the short saphenous vein is incompetent or if varicose veins arise from this area.

Any varicose veins that have not been linked to either the great or small saphenous system should also be examined to identify any other sources of reflux – i.e. incompetent perforators. This may involve assessment of the medial, anterior, lateral and posterior leg as the refluxing veins are “followed” back to their source.

Assessment of the pelvic veins may be necessary dependent on local protocol. Where transvaginal scanning is required, the provision of a chaperone is recommended^{15,16}.

Reporting

The report is a recording and interpretation of observations made during the course of a duplex ultrasound examination; for general guidance on report writing please review the Society of Vascular Technology service specification document¹.

For venous duplex examination reports should include:

- Which veins have been assessed, the competency of the veins, the extent of incompetent segments, the presence/absence of any thrombus.
- Any anatomical variations due to previous procedures (i.e. absence of GSV due to previous stripping).
- Where thrombus is identified, the location, length/extent, degree of patency and estimated age should be documented.
- Any limitations e.g. if areas in the calf are not visualised due to ulceration

Referral of critical ultrasound results should be made to the referring consultant or appropriate medical/surgical team (as per local protocol) prior to the patient being discharged so that treatment plans can be developed, enforced or expedited accordingly.

RESOURCES

Society for Vascular Ultrasound Vascular Technology Professional Performance Guidelines Lower Limb Extremity Venous Insufficiency Evaluation <http://www.svunet.org/home>

American Institute of Ultrasound in Medicine Practice Guideline for the Performance of Peripheral Venous Ultrasound Examinations <http://www.aium.org/>

Australasian Society for Ultrasound in Medicine Policies and Statements D20 Peripheral Venous Ultrasound <http://www.asum.com.au/>

REFERENCES:

¹ Society for Vascular Technology Professional Ultrasound Service Specifications Document: www.svtgbi.org.uk

² The Provision of services for patients with Vascular Disease 2018 <https://www.vascularsociety.org.uk/userfiles/pages/files/Document%20Library/VS%202018%20Final.pdf>

³ Single visit ulcer service the first year' Scriven JM et al Br J Surg (1997); 84:334-6

⁴ National Institute for Health and Care excellence "Varicose Veins: diagnosis and management": <https://www.nice.org.uk/guidance/cg168>

⁵ Duplex Ultrasound Investigation of the Veins in Chronic Venous Disease of the Lower Limbs – UIP Consensus Document. Part I. Basic Principles' Coleridge-Smith P et al. Eur J Vasc Endovasc Surg (2006) 31:83-92: <https://www.ncbi.nlm.nih.gov/pubmed/16226898>

⁶ Duplex Ultrasound Investigation of the veins in Chronic Venous Disease of the Lower Limbs – UIP Consensus Document. Part II. Anatomy' Cavezzi A et al. Eur J Vasc Endovasc Surg (2006) 31:288-299: <http://www.ncbi.nlm.nih.gov/pubmed/16230038>

⁷ The haemodynamic and diagnosis of venous disease' Meissner M H et al. J Vasc Surg (2007) 46:4S-24S: [http://www.jvascsurg.org/article/S0741-5214\(07\)01529-7/abstract](http://www.jvascsurg.org/article/S0741-5214(07)01529-7/abstract)

⁸ [https://www.jvascsurg.org/article/S0741-5214\(02\)00070-8/pdf](https://www.jvascsurg.org/article/S0741-5214(02)00070-8/pdf)

⁹ [https://www.jvascsurg.org/article/S0741-5214\(05\)00121-7/pdf](https://www.jvascsurg.org/article/S0741-5214(05)00121-7/pdf)

¹⁰ "Multicentre assessment of venous reflux by duplex ultrasound" Lurie F et al. J Vasc Surg (2012) 55:437-45: <http://www.ncbi.nlm.nih.gov/pubmed/22178437>

¹¹ "Duplex Ultrasound for Chronic Venous Insufficiency" Zygmunt J A J Invasive Cardiology (2014) 26 (11):E149-55: <http://www.ncbi.nlm.nih.gov/pubmed/25364006>

¹² "Definition of venous reflux in lower-extremity veins" Labropoulos N et al. J Vasc Surg (2003) 38:793-8: [http://www.jvascsurg.org/article/S0741-5214\(03\)00424-5/abstract](http://www.jvascsurg.org/article/S0741-5214(03)00424-5/abstract)

¹³ “What is New in Duplex Scanning of the Venous System?” Zygmunt J. Perspective in Vascular Surgery and Endovascular Therapy (2009) 21 (2):94-104:

<https://pvs.sagepub.com/content/21/2/94.abstract?rss=1>

¹⁴ Clinical Significance of standing verses reversed Trendelenburg position for the diagnosis of lower extremity venous reflux in the great saphenous vein. DeMuth, R,P et al. The Journal for Vascular Ultrasound 2012 36(1):19-22: <https://www.researchgate.net/publications/261859767>

¹⁵ Society for Vascular Technology Professional Standards Committee Chaperone Guidelines April 2012: www.svtgbi.org.uk

¹⁶ Intimate Examinations and Chaperone Policy. The Society of Radiographers. 2016
<https://www.sor.org/learning-advice/professional-body-guidance-and-publications/documents-and-publications/policy-guidance-document-library/intimate-examinations-and-chaperone-policy>

¹⁷ [Management of patients with leg ulcers. The Royal Society of Medicine/The Vascular Society 2018 https://legsmatter.org/wp-content/uploads/2018/02/Management-of-Patients-with-Leg-Ulcers-003-.pdf](https://legsmatter.org/wp-content/uploads/2018/02/Management-of-Patients-with-Leg-Ulcers-003-.pdf)

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