THE SOCIETY FOR
VASCULAR TECHNOLOGY OF
GREAT BRITAIN AND IRELAND

Vascular Technology Professional Performance Guidelines

Lower Limb Venous Duplex Ultrasound Examination for the Assessment of Venous Insufficiency/Incompetence

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. This guideline may be used in part or in its entirety with suitable additions made by local policy implementers.
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 evaluate the deep and superficial venous systems for evidence of valvular incompetence or thrombosis and to establish the source of any reflux identified in the superficial veins.

Common Indications

Common indications for the performance of lower limb venous insufficiency evaluation include, but are not limited to:

- Skin changes, venous eczema, hyperpigmentation
- Venous ulcers
- Recurrent swelling of the lower calf and ankles
- Pain or feelings of heaviness in the lower extremity
- Visible varicose veins
- Venous claudication
- Pain and oedema of the lower extremities

Contraindications and Limitations

Contraindications for lower limb venous duplex ultrasound for the assessment of venous insufficiency are unlikely; however, some limitations exist and may include the following:

- Obesity
- Casts, dressings, open wounds/ulcers etc can limit visualisation.
- Patient severe oedema/swelling.
- Limited mobility e.g. unable to stand
- Patients who are unable to cooperate due to reduced cognitive functions e.g. Alzheimer's or dementia and through involuntary movements
- Patient discomfort, particularly calf tenderness.

Equipment:

Duplex Doppler ultrasound machine with imaging frequencies of 3.5MHz and greater; with both linear and curvilinear transducers available. Doppler frequencies of at least 3.0MHz should be available, with colour Doppler capability.
Compliance with the Medical Devices Directive is necessary. Electrical safety testing is required annually, with regular maintenance and quality assurance testing to specified level by qualified personnel.
The examination couch should be height adjustable, preferably electrical. The couch should be capable of tilting by at least 30 degrees or alternatively the patient may be scanned standing in which case a raised platform/step with patient support may be useful. The CVS's chair should provide good lumbar support, be height adjustable and allow for the CVS to move close to the examination couch[1 2]. The examination room should be temperature controlled with adjustable lighting levels suitable for examination[1].

Explanation of examination and patient history:
The CVS undertaking the examination should:

- introduce themselves
- confirm the patient's identity e.g. full name and date of birth
- explain why the examination is being performed and give an indication of the test's duration
- give an explanation of the procedure and it's duration – consideration should be made to the age and mental status of the patient
- obtain verbal consent for the examination
- obtain a pertinent relevant medical history from the patient and/or notes
    - Presence of risk factors e.g. previous DVT and/or superficial venous thrombosis, lower extremity trauma, history of venous ulcers, family history of varicose veins,
    - history of previous treatment to varicose veins
    - Nature of patients symptoms
    - current medications or therapies regarding the lower limb venous complaint ie compression hosiery
- Complete a limited physical exam, which includes observation and localization of the presence of any signs or symptoms of peripheral venous disease: swelling, pain, tenderness, discoloration, varicosities and ulceration
- Verify that the requested procedure correlates with the patient's clinical presentation.

Examination:
The examination may be unilateral or bilateral dependent upon clinical symptoms and departmental policy. The patient is asked to remove their clothing to expose the lower limb from groin to ankle. The patient is examined standing or at a minimum of 30^0 degree angle on a tilting table, this is to be able to assess the competency of the valves against gravity.
Due to intimate nature of the examination it may be considered necessary to offer a chaperone[3]. During the examination the patient's mental and physical status should be monitored and modifications made to the examination accordingly. Occasionally patients may feel faint during the examination.

It is not unusual for patients to feel faint during this assessment, 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 concentrates on the ultrasound assessment.

Knowledge of venous anatomy, the variants and ultrasound appearances are essential[5] as is knowledge of previous surgery for the particular patient. Clinical observation of the superficial veins in the standing patient, in a well-lit room, prior to starting the scan is helpful in determining the scope of the scan.

The following techniques should be applied to all venous segments:

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 long saphenous system (LSV). The LSV should be assessed throughout its 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 if endovenous treatment may be considered.

The patient should be repositioned to assess the sapheno-popliteal junction and short 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 long or short 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, consideration should be given to the provision of a chaperone.

Reporting:

The report is a recording and interpretation of observations made during the lower limb venous duplex ultrasound examination; it should be written by the CVS undertaking the examination and viewed as an integral part of the whole examination[5].
The report should include correct patient demographics; date of examination; examination type and the name and status of the CVS.

The report should include:

- The presence/absence of phasic flow in the proximal veins
- 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 LSV due to previous strip)
- 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 visualized due to ulceration
- An appropriate number of annotated images that represent the entire ultrasound examination - in accordance with local protocols and SVT Image Storage Guidelines[5] It is recognised that ultrasound scanning is operator dependent and recording of images may not fully represent the entire examination.

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] Guidelines for Professional Working Standards Ultrasound Practice United Kingdom Association of Sonographers (UKAS) October 2008 www.sor.org/learning/document-library
[2] The Causes of Musculoskeletal Injury Amongst Sonographers in the UK Society of Radiographers, June 2002 www.sor.org/learning/document-library
[3] Society for Vascular Technology Professional Standards Committee Chaperone Guidelines April 2012 www.svtgbi.org.uk
[4] Coleridge-Smith, P, Labropoulos,N, Partsch H, Myers K, Nicolaides A, Cavezzi A. Duplex ultrasound investigation of the veins in chronic venous disease of the lower limbs –UIP Consensus Document. Part 1 Basic principles. Eur J Vasc Endovasc Surg 2006; 31:83-92
[5] Society for Vascular Technology Professional Standards Image Storage Guideline 2012 www.svtgbi.org.uk

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