

**ascular Laboratories**

**Varicose Vein Duplex Protocol**

**Date updated: October 2019  
Date for review: October 2020**

**Purpose**

Lower limb varicose vein duplex ultrasound examinations are carried out to assess the haemodynamic status (location and severity) of the lower limb veins.

**Pre Procedure**

**Patient preparation**

* Identify patient
* The patient should be identified by at least two means e.g. name, date of birth, address
* For administrative purposes the referral should also include MRN number which can be used to check for previous relevant imaging
* Be aware of special circumstances such as the need for an interpreter or chaperone
* Explain procedure
* The vascular scientist should introduce her/himself and anyone else in the room, explain the procedure to the patient including time frame, what clothing they will need to remove and use of cold gel etc, why it is being performed, how long it will take and what will happen with the results afterwards
* Obtain consent
* Verbal consent is suitable for this examination
* If consent is withheld or the patient lacks capacity a note to that effect should be made on the referral and the referring consultant informed
* The patient’s consent should be sought if the scan is also being used for teaching/research purposes
* Prepare patient
* Ask patient to remove clothing and jewellery appropriate to the procedure, assisting if necessary
* The patient should be positioned on the examination couch in a manner commensurate with the procedure being undertaken
* Dressings over wounds should be removed to an extent that is relevant to the clinical information needed. Infection control policy should be adhered to for reduction of infection risk.

Throughout the procedure the patient’s privacy, dignity and security should be observed.

The vascular scientist should recognise and adapt to ethnic, medical and demographic variables.

This protocol is available to the patient.

R**elevant medical history**

A medical history relevant to venous disease should be taken prior to the scan. This should include presenting symptoms, their timescales and frequency, and medication. Previous history of DVT and any procedures to the veins should be noted. The leg should be physically examined with the patient standing to observe varicosities and skin change. This also provides opportunity to verify that the requested procedure correlates with the patient’s clinical presentation.

Common indications for performing a lower limb venous duplex scan;

* Varicose veins with skin changes, itching, swelling, venous eczema/bleeding
* Venous ulcers, including healed ulcers and recurrent ulcers
* Swelling
* Aching
* Venous claudication
* Tenderness
* Source of DVT/PE (eg phlebitis)

Only the leg/s that has/have been requested should be scanned unless the clinical picture does not correlate, in which case the scientist should use common sense to determine the clinical necessity of the examination to be performed. Previous clinic letters from the secretary can be useful.

**Equipment**

The examination is performed using a range of medium to high frequency probes, 3-9MHz and/or 5-17MHz flat linear transducer. The curvi-linear probe may be useful to assess deep veins where visualisation is sub-optimal.

The ultrasound machine should be regularly safety checked and maintained according to local Quality Assurance protocols.

The examination couch should be height adjustable and the vascular scientist’s chair should be height adjustable to minimise occurrence of work related musculo-skeletal disorders. There should be a height adjustable stool or tilting couch to allow comfortable scanning of veins to be able to demonstrate reflux appropriately.

The examination room should be temperature controlled with adjustable lighting suitable for examination.

Cleaning materials should be available in line with local and manufacturers guidelines.

**Procedure**

**Lower Limb Venous interrogation**

The patient should be positioned supine for deep venous compression only, or sitting on the edge of the flat, raised couch with their feet dependent on a stool, with the aim to minimise compression from the couch to the thigh and so the knee is lower than the thigh but with slight flexion.

The vein optimised preset is selected at the start of the examination, and the patient name/operator ID can be entered for image capture, if required. Images for veins are rarely required as the anatomy and haemodynamic data is recorded on a report sheet.

Throughout the duplex scan the machine controls (e.g. scale, gain, angle, depth, gate etc.) are adjusted to optimise the image/colour filling/spectral trace.

**Evaluation of the deep veins**;

* CFV, SFV and Pop V should be assessed for compressibility using external manual compression with the transducer, at regular intervals throughout their length, using B-mode and transverse orientation. The vein walls should meet on compression to show no material is present within the lumen.
* If the presence of iliac vein obstruction is suspected, due to presence of CFV thrombus or no phasicity, minimal wall movement and continuous or absent flow, then detailed investigation of the iliac veins should be performed if possible, or recommended.
* Assessment of the deep thigh veins can be performed with the patient supine, particularly if the patient has a large abdomen that may obscure views. Full assessment with the patient supine is not recommended, although if unavoidable, a minimum of a 30° tilt head up of the couch should be used. The scientist may choose to scan the patient standing if appropriate, in which case the patient’s ability to do so should be determined, and they should be positioned in close proximity to the couch for stability.
* The presence of bifid systems should be noted.
* Assessment of deep calf vein compressibility (crurals and or gastrocnemius and soleal veins) need only be completed if requested, or at the discretion of the vascular scientist.
* If compression is difficult in certain areas careful evaluation with colour flow can be used to determine venous filling but this should be used with caution.
* Venous flow should be assessed in longitudinal orientation for competency or incompetency (reflux) in response to effective calf manual augmentation (or valsalva manoeuvre used for CFV/SFJ), as well as spontaneity, phasicity and vessel filling. The presence of pulsatile flow should be noted. A combination of colour flow and spectral Doppler are used to assess for reflux. The sample volume of the spectral Doppler should be the same width as the vessel.
* If calf augmentation is difficult due to problems with ulceration, phlebitis, lymphedema etc, augmentation of the thigh or foot/ankle can be performed. If this is difficult also, a finger can move up the vein towards the insonation site and this may aid with augmentation, or the patient may carefully clench the calf muscle.

**Evaluating the superficial veins**:

* Assessment for the presence of reflux using a combination of colour and spectral Doppler should be performed. Methods of eliciting reflux are described above.
* Where reflux is present the anatomy, diameter of the vein, tributary or perforator (both incompetent and competent) should be noted. Also, if a superficial truncal vein leaves the fascia or if any bifid systems are present.
* The relevant distance of an incompetent SPJ to anatomical landmarks should be noted and if the SPJ is not seen this should be reported. The SSV may extend into the thigh and be reported as the Giacommini vein.
* The presence and extent of calcification, wall thickening or thrombophlebitis should be determined by assessing in B-mode and compressing the vein.
* If the SFJ/SPJ is not present due to previous surgery, then the presence of neo-revascularisation or a tortuous reconnection should be sized and noted.
* If there is ulceration present, its location should be noted and a scan for any incompetent tributaries leading down towards the ulcer site should be performed.
* In the event of an episode of syncope, the patient can be guided to a supine position, with legs raised above heart. Symptoms preceding this can often be detected, so it is important to pay attention to the patient throughout the procedure.

**Criteria:**  Reflux is recorded as significant at 0.5 seconds when the patient is standing, and 1 second when the patient is inclined. (Ref 1,2 and 3).Through MDT and educational debate, local protocol for venous reflux assessed with the patient positioned for this protocol is 1 second. This is not exclusive and deviations from this are recorded (eg. Low grade/ high volume etc.).

**Post Procedure**

The result of the scan is explained to the patient. The patient is informed that the result will be communicated to the referrer, who will contact them in the next week or two regarding follow up/review date.

If an acute Deep Vein Thrombosis (DVT) is suspected the referring consultant/team or the on call medical team should be contacted to review the patient immediately with patient reported symptoms noted.

If the patient presents with untreated, acute, thrombo-phlebitis a medical opinion should be sought or the patient should be advised to contact their General Practitioner.

**Reporting:**

The report should include correct patient demographics, date of examination, examination type and status of vascular scientist.

The following information should also be documented in the written report;

* The compressibility and competency in the CFV, SFV, PFV confluence and Pop V with any abnormality in the flow (eg pulsatility)
* The presence and competency of the SFJ and SPJ (plus location)
* The presence of neovascularisation/tortuous reconnection at junction sites in recurrent VVS.
* The competency/extent of reflux in the LSV, SSV or tributaries with diameters where reflux is noted
* Location and function of perforators plus diameters
* The presence and extent of phlebitis
* Incidental findings/abnormalities (eg lymph nodes, bakers cysts, fistulas etc).
* Any limitations of the scan
* Position of ulceration/areas of bleed sites etc

All patients have a written report with drawing and comments. The report should contain comments on unusual findings, unseen or inconclusive areas and recommendations for alternative imaging with reasons. Printed images should be available for anything unusual. Limitations should be commented upon and if confidence is low this should be made clear. The reports are signed once complete.

The report is copied to PACS and the original report sent to the referrer with the referral attached.

**Reference:**

1. IPEM/SVT Vascular Laboratory Practice, Part I and IV
2. 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
3. MDT academic and educational meeting GHNHSFT October 1997.