**Introduction**

This protocol was prepared by the Senior Vascular Physiologist. The SVT guidelines were used in conjunction with our current lab practices.

A lower limb deep and superficial venous duplex scan is performed to evaluate the deep and superficial veins for valvular incompetence and to identify areas of reflux within the superficial veins.

**Common Indications**

1. Visible varicose veins
2. Venous ulcers
3. Recurrent swelling of the lower calf and ankles
4. Skin changes, venous eczema and hyper pigmentation
5. Pain or feelings of heaviness in the lower extremity
6. Venous claudication

**Limitations**

1. Limited mobility i.e., unable to stand unaided
2. Patients with severe oedema and lower limb swelling
3. Casts, dressings, open wounds which will limit visualisation
4. Patients with reduced cognitive function who are unable to follow instruction
5. Patient discomfort, in particular calf tenderness

**Patient Referral**

The referral should include details of the presenting symptoms.

**Patient Preparation**

No preparation is required. The examination should be fully explained to the patient and consent obtained. Patient name and date of birth must be confirmed. Relevant medical history should be taken prior to the examination. Such as:

* Presence of risk factors eg previous DVT and/or superficial venous thrombosis, lower extremity trauma, history of venous ulcers, family history of varicose veins
* History of previous varicose vein treatment
* Nature of patients symptoms
* Current therapies regarding lower limb complaint such as dressings, compression therapy

The Vascular Physiologist should complete a limited visual examination of varicosities, ulceration and skin discolouration prior to conducting the ultrasound examination.

**Examination**

The examination may be unilateral or bilateral depending on clinical symptoms and consultant referral. The examination is performed in the standing position. Usually (pre-Covid) air conditioning would be utilised during the examination. The patient will be asked to remove lower limb clothing and wear a disposable gown which will maintain patient dignity at all times. During the examination the patient’s physical status should be monitored and modifications to the exam protocol made if necessary. Occasionally patients may feel faint due to augmentation of the calf veins.

1. Patient remains standing for the examination (with their weight on the contralateral limb) leaning against the couch.
2. The patient will be instructed to rotate the symptomatic leg externally so the medial calf and thigh can be accessed.
3. The patient will be instructed to look straight ahead and breathe normally.
4. Apply ultrasound gel to the correct linear array transducer and select the Varicose Vein programme on the Ultrasound machine
5. There will be constant adjustment of the different functions on the control panel throughout the exam to ensure optimal imaging eg., depth, focus, gain, TGC, sample volume size, colour box, colour scale etc.
6. In the transverse plane in B-mode begin at the groin and locate the Common Femoral Vein (CFV) and Common Femoral Artery (CFA).
7. Rotate the transducer into the longitudinal plane and assess the CFV for patency and competency of flow. Observe if phasic spontaneous flow is present, without angle correction. If continuous or abnormal flow is demonstrated within the CFV this may be due to iliac vein obstruction which will require investigation in the supine position.
8. In the transverse plane in B Mode slide the transducer down the leg and locate the Superficial femoral vein (SFV).
9. Rotate the transducer into the longitudinal plane and assess the SFV for patency and competency of flow. Observe if phasic spontaneous flow is present, without angle correction. If thrombus is identified within the deep veins the upper extent of the thrombus should be noted.
10. Measure duration of reflux in the SFV in the upper thigh, mid thigh and lower thigh using Spectral Doppler and distal (calf) compression usually performed by trainee vascular physiologist.
11. Locate the below knee Greater Saphenous vein (GSV) and follow the vein superiorly along the medial thigh until it drains to the Saphenofemoral junction (SFJ).
12. In longitudinal align the transducer with the SFJ and assess patency. With Spectral Doppler assess the competency of the SFJ and proximal GSV.
13. Measure duration of reflux in the SFJ using Spectral Doppler and distal (calf) compression.
14. In the longitudinal plane assess the GSV for patency and competency from the groin to below the knee
15. In the transverse plane assess the GSV for branches and perforators. If perforators are present assess them for competency.
16. Any varicose veins that did not drain the GSV should be examined to identify source of reflux this will involve assessment of the anterior tributary vein and medial tributary vein (if present) for competency
17. Ask the patient to turn around; facing away from the examiner so the Popliteal vein and the short saphenous vein may be assessed.
18. Assess patency and competency of the Popliteal vein above the popliteal crease and below the popliteal crease with Spectral Doppler and calf compression.
19. Locate the short saphenous vein (SSV) and assess patency and competency using Spectral Doppler and distal (calf) compression.
20. Locate short saphenous popliteal junction (SSPJ) and determine competency. If incompetent document its position relative to the popliteal crease.
21. If no SSPJ is identified follow the SSV superiorly and identify the superior extension of the short saphenous vein (EXSSV).
22. Assess patency of the EXSSV and determine if it continues as the Giacomini vein. Document where the Giacomini vein drains the GSV.
23. Identify the connecting vein; assess it for patency and competency. Document the position where it drains the Popliteal vein relative to the popliteal crease.

**Interpretation of Competency and Reflux**

Competency: Retrograde flow for less than 0.5 seconds post calf compression.

Reflux: Retrograde flow seen on Doppler Spectrum which lasts for greater than 0.5 seconds post calf compression.

**Reporting**

The report is a recording and interpretation of observations made during the assessment. It should be written by the Vascular Physiologist who performed the exam**.**

The Non-Invasive Vascular Unit has a standardised reporting system for each examination so that all Vascular Physiologists and clinicians alike can understand the report.

The report should include:

* Patient name, Medical Record Number, Date of examination, examination type, Vascular Physiologists initials.
* The presence/absence of phasic flow in the CFV
* Which veins have been assessed, their patency or presence of thrombus, the competency of the veins
* Any anatomical variations due to previous procedures (for example absence of GSV due to previous stripping, evidence of neovascularisation)
* Where thrombus is identified in the deep or superficial venous system, the location and extent must be documented. Distinguish chronic from acute thrombus, identify non-occlusive from occlusive thrombus and thrombus extending from a superficial system into a deep system.
* Any incidental findings for example such as enlarged lymph nodes, Baker’s cysts, abscesses, cysts, interstitial fluid, lipomas and arteriovenous malformations
* Any limitations encountered during exam
* Recommendations for further imaging in the event of a limited examination
* An appropriate amount of annotated images that represent the entire ultrasound examination in accordance with department protocol
* Any significant or unexpected findings should be recorded using the PACS peervue system
* The referring doctor/team must be contacted at time of examination referring them to the report findings in the patient’s chart so that a treatment plan can be developed or expedited.