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University Hospitals Birmingham
NHS Foundation Trust

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

CATEGORY:	Clinical Guidelines
CLASSIFICATION:	Clinical
Controlled Document Number:	CG374
Version Number:	1.1
Controlled Document Sponsor:	Clinical Guidelines Group
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Approved By:	Clinical Guidelines Group
On:	November 2017
Review Date:	June 2024 (Extension x1) November 2020 (Original)

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

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:

- Body habitus
- 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.
- Examination couch should be height adjustable preferably electrical. The scanning chair should provide good lumbar support, be height adjustable and allow for the operator to move close to the examination couch12.
- The examination room should be temperature controlled with adjustable lighting levels suitable for examination1.

Explanation of examination and patient history

The staff member undertaking the examination should:

- Welcome the patient and relatives.
- Introduce themselves and any other members of staff in the room.
- 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
- Identify presence of any risk factors for example; family history; previous DVT; previous venous insufficiency; obesity; pregnancy.
- Verify that the requested procedure correlates with the patient's clinical presentation.
- The test can be terminated at any point if the patient withdraws their consent for the procedure.
- Post procedure the patient must be informed how, when and by whom results/reports will be communicated.

Examination

- During the examination patients must be treated with respect, dignity and discretion.
- Patient comfort should be monitored throughout the test and alterations be made should a patient become uncomfortable.
- 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 seated on the edge of the couch with the legs hanging down; 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 chaperone3.
- 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.

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 automated distal augmentation should be used to enhance the flow and to assess for reflux. Significant venous incompetence is defined as a reflux which is greater than one second.
- 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.
- The diameter and tortuosity of an incompetent LSV should be noted to assess the suitability for EVLT.
- 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 along with the position of any associated perforators or branches.
- The diameter and tortuosity of an incompetent SSV should be noted to assess the suitability for EVLT.
- 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.
- If requested or deemed necessary by the operator, the deep venous system from the CFV to the popliteal vein should be assessed for incompetence.

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 staff member undertaking the examination and viewed as an integral part of the whole examination.
- The report should include correct patient demographics; date of examination; examination type and the name and status of the staff member.
- Reports are in the form of an annotated diagram.
- The report 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 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.

- 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.
- Critical results must be verbally communicated to the on-call specialist registrar/consultant on the day of the test. Evidence of this communication should be noted on CRIS using auto report code DVASC2.
- A critical result is defined as the presence of thrombus in the superficial vein which is either flush to or extends into the deep vein and/or evidence of a DVT.
- Unexpected results must be verbally communicated to the on-call specialist registrar/consultant on the day of the test. Evidence of this communication should be noted on CRIS using auto report code DVASC3
- All reports will be available on IMPAX within 24hrs of the scan being performed.
- Reports can be amended or removed by contacting the PACS team.

Quality Assurance

- Equipment is purchased in line with the Trust Procurement Policy
- Scanners are serviced in accordance with manufactures recommendation.
- Equipment faults are reported on the same day to medical engineering.
- Staff will perform test under supervision until they have been signed off as competent by a senior member of staff.

Monitoring

- Equipment is checked for damage on a weekly basis. Any damage is reported to medical engineers.
- Staff will have competency checked against the SOP on a quarterly basis by a senior member of staff.
- Lower limb venous scans will be audited against feedback in EVLT op notes
- Stakeholder feedback is obtained bi-annually through the Vascular Laboratory feedback questionnaire

Resources

Society for Vascular Ultrasound Vascular Technology Professional Performance Guidelines Lower Limb Extremity Venous Insufficiency Evaluation 2010 www.svunet.org

American Institute of Ultrasound in Medicine Practice Guideline for the Performance of Peripheral Venous Ultrasound Examinations 2010 www.aium.org

Australasian Society for Ultrasound in Medicine Policies and Statements D20 Peripheral Venous Ultrasound 2007 www.asum.com.au

References

1. Guideline 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