

**ascular Laboratories**

**Lower Limb Arterial Duplex Protocol**

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

**Purpose**

Lower limb arterial duplex ultrasound examinations (common femoral to ankle level) are used to determine the location and severity of vascular disease.

**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

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.

**Relevant medical history**

A medical history relevant to lower limb arterial pathology should be taken prior to the scan. This should include presenting symptoms, their timescales and frequency, and presence of risk factors. This also provides opportunity to verify that the requested procedure correlates with the patient’s clinical presentation.

Common indications for performing a lower limb arterial scan include;

* Intermittent claudication
* Ischemic rest pain
* Gangrene
* Ulceration
* Post-surgical / intervention follow up

**Equipment**

The examination is performed using a medium to high frequency (between 3-9MHz) flat linear transducer. 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 provide good lumbar support and be height adjustable to minimise occurrence of work related musculo-skeletal disorders.

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

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

**Procedure**

**Lower limb arterial interrogation**

The patient is usually scanned in a supine position with the head supported by a pillow.

The arterial optimised preset is selected at the start of the examination. The patient name/operator ID should be entered for image capture.

The following techniques should be used to evaluate the lower limb arterial system;

* B-mode in longitudinal and transverse section to image the artery and assess for aneurysmal dilation and vessel contents e.g. atheromatous plaque
* Colour Doppler in longitudinal and transverse section to assess for presence/absence of flow and aid the position of Spectral Doppler when quantifying stenoses
* Spectral Doppler in longitudinal section to determine direction of flow, blood flow velocities and absence of flow

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.

Care should be taken to ensure the Doppler insonation angle is ≤60° and the angle correction cursor is angled in the direction of flow with the sample volume placed in the middle of the vessel.

Evaluation of the following arteries should be included;

* Common femoral artery (CFA)
* Proximal profunda femoris artery (PFA)
* Superficial femoral artery (SFA)
* Popliteal artery
* Tibio-peroneal trunk (TPT)
* Posterior tibial artery (PTA)
* Peroneal artery
* Anterior tibial artery (ATA)

Each artery is examined at regular intervals along its length, paying close attention to areas of turbulence, colour aliasing or any other abnormality. Details of collateral circulation and should be noted.

The aorto-iliac segment (see separate protocol) should be assessed if signals in the CFA indicate proximal disease or the referral indicates.

The location and nature (size, echogenicity etc) of any disease, occlusions, aneurysms and any abnormal Doppler readings or waveforms are assessed. In the presence of disease, peak systolic velocity (PSV) measurements are used to grade the degree of stenosis using the criteria below. Factors such as tortuosity, vessel size and collaterals are considered.

On diagnosis of a tight stenosis in the CFA, the patency of the contralateral CFA and iliac system is very helpful if time allows. This can be used for the planning of possible angioplasty via guidewire through the contralateral CFA.

Unexpected findings of an urgent nature (mobile thrombus or more critical ischaemia etc.) should have appropriate investigations such as ABPI or extra evaluations if possible.

**Criteria**

|  |  |
| --- | --- |
| **Diameter reduction** | **Velocity ratio** |
| <50% | <2 |
| 50-75% | ≥2 <4 |
| 75-99% | ≥4 |
| Occluded | No flow |

Thrush and Hartshorne, third edition, ‘from various references’

* Rise/acceleration time (ms) may be used to assess inflow (mainly at the CFA).
* Qualitative assessment comment on waveform shape, spectral broadening and phasicity is acceptable. This is less a definitive quantification, and more experiential analysis.

**Report**

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

The report should also include;

* Which arteries have been assessed and the PSV of these arteries at appropriate intervals noted, commenting on the presence/absence of flow
* Anatomical position of any occlusions (and length of stump if not flush), stenoses or aneurysms
* Any limitations to the examination
* Any incidental/abnormal findings
* If annotated images provided appropriate to the investigation and in accordance with SVT image storage guidance.

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

**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 arrange appropriate follow up.

All inpatient reports are filed in the hospital notes. The vascular team should be contacted if the result requires immediate attention.

All outpatient reports are sent back to the referrer. If the patient has previously unreported or worsening rest pain, tissue loss or any other urgent finding, the vascular team should be contacted to review the patient urgently.

**References**

IPEM/SVT Vascular Laboratory Practice, Part 3

SCoR and BMUS. (n.d.). *Guidelines for Professional Ultrasound Practice.* Retrieved from <http://www.sor.org/sites/default/files/document-versions/bmus_scor_ultrasound_guidelines.pdf>

SVT Professional Standards Committee April 2012: Guidance on image storage and use, for vascular ultrasound scans.

Thrush A, Hartshorne T. Harcourt Publishers Ltd. 1999, Peripheral Vascular Ultrasound, How,Why and When.