

## LOWER LIMB ARTERIAL SCANNING GUIDELINES

**REFERRAL SOURCE:** Vascular Team / Plastic Surgery for surgical reconstruction assessment / Dermatology. All other referrals can to be accepted via a vascular radiologist.

**PATIENT PREPARATION:** None

**SCAN TIME:** 30 minutes single limb / 40mins bilateral limbs

**PATIENT POSITION:** supine with relevant limb relaxed and slightly rotated laterally. Popliteal arteries may be seen well if patient in the lateral decubitus position with relevant limb superior.

**EQUIPMENT SET UP:**

**PROBE** - Linear mid frequency probe (9-3MHz), curvilinear low frequency (5-1MHz) probe may be required for deeper more proximal vessels.

**PRESET** - arterial

**SUGGESTED MINIMUM IMAGES:**

**LS**

- CFA in colour mode +/- B Mode. Use spectral Doppler to sample waveforms.
- PFA origin as above
- SFA origin and throughout as above, with spectral Doppler samples at the origin, proximal, mid and distal SFA.
- Popliteal artery in colour mode with spectral Doppler samples above and below knee level.
- Extra spectral Doppler assessment is performed at and proximally to sites of pathology in order to obtain velocity ratio which may be recorded on the report
- The length of any sites of vessel occlusion may be measured and recorded
- TS imaging may be used to compliment LS assessment e.g. at occlusion sites to assess collateralisation
- If SFA and popliteal artery waveform samples are all normal, then take LS spectral Doppler samples at ATA and PTA at ankle level where possible.
- These sampling guidelines may be adapted to focus assessment where requested e.g. for iliac arteries or profunda artery assessment

**VELOCITY RATIO:**

Velocity Ratios are calculated using PSV spectral Doppler values as follows:

Ratio = 
$$PSV \text{ at stenosis} / \text{Normal PSV proximal to stenosis}$$

## EVIDENCE BASED CRITERIA

### Waveforms

Triphasic: normal  
Biphasic: some evidence of disease  
Monophasic: evidence of significant disease

### Rise Times

A systolic rise time of greater than 120 milliseconds may be indicative of more proximal disease.

### Ratios

Velocity Ratios  $> 2$  to  $1$  are deemed '*significant*'  
Velocity Ratios  $< 2$  to  $1$  are deemed '*sub-significant*'

Typically: a ratio  $> 2$  to  $1$  represents a diameter stenosis of approximately 50%  
a ratio  $> 3$  to  $1$  represents a diameter stenosis of approximately 75%

## EVIDENCE BASE

- 'Vascular Laboratory Practice part 1 to 4, 'lower limb arterial scanning' - Institute of Physics in Engineering and Medicine in Association with the Society of Vascular Technologists of GB and Ireland.
- 'cardiovascular haemodynamics and Doppler waveforms explained', Crispin Oates, Greenwich Medical Media Ltd 2001
- 'peripheral vascular ultrasound, how, why and when' - Thrush and Hartshorne; Churchill Livingstone 1999

## POPLITEAL ARTERY ENTRAPMENT SYNDROME

The popliteal artery is further assessed with the foot in 2 different positions, plantar flexion and dorsiflexion following a neutral assessment at rest.

Suggested minimum images

LS

- The lower limb arteries are assessed at rest as above
- The patient is then repositioned in either the position which is indicated to provoke symptoms or if possible, lying prone with the lower legs flexed and supported on a pillow.
- In colour mode, assess the popliteal artery with spectral Doppler samples and PSV measurements with the foot in the plantar flexion and dorsi -flexion positions.

- Care must be taken not to hyper extend the knee as this will lead to false positive result.
- The referral may also request a similar assessment of flow within the popliteal vein in these positions. Venous spectral Doppler flow is then recorded at rest and with the foot in plantar flexion and dorsiflexion.
- If entrapment is suspected, TS images may be used to help visualise and record vessel entrapment.

### CRITERIA:

The most relevant finding will be a dramatic change in the flow resulting in a dampened ,monophasic waveform within the popliteal artery distal to the entrapment site during either foot position, often associated with a 50% or more reduction in PSV. This finding is deemed a significant positive test for popliteal artery entrapment. Hyperaemic raised EDV flow may also be seen on foot relaxation to support the findings.

Less severe changes in the PSV and waveform may be seen and noted indicating a less severe element of compression.

### DEFINITIONS

**Plantar flexion** is the movement which increases the approximate 90 degree angle between the front part of the foot and the shin, as when depressing an automobile pedal.

**Dorsiflexion** is the movement which decreases the angle between the foot and the leg, so that the toes are brought closer to the shin.