

Medical Engineering & Physics
PMS
LEG ARTERY PRESSURES AND EXERCISE

Introduction and scope:

Peripheral vascular disease (PVD) causes narrowing of the arteries. This results in haemodynamic changes which can be measured using continuous wave Doppler ultrasound and simple manometric equipment. An ABPI may be requested to determine the presence, site and severity of disease in a patient with symptoms of PVD or for a patient who requires compression hosiery or bandaging.

Responsibilities:

Test staff: scientific or technical staff trained in continuous wave Doppler ultrasound.

Equipment:

DWL EZ-dop with 4 MHz and 8 MHz probes; with spectral analysis. Hand held Doppler unit e.g. Huntleigh Healthcare Dopplex with 8MHz probe. Aneroid sphygmomanometer and blood pressure cuff in range of sizes. Automatic oscillometric blood pressure monitor (Dinamap vital signs monitor).

Method:

Examination protocol

The test is performed in the laboratory unless the patient cannot be transported then portable equipment may be used in other parts of the hospital.

Ensure the patient is rested to ensure the blood pressure is stable prior to testing. Examine the patient supine unless they are wheelchair bound.

Place the blood pressure cuff around their right upper arm and locate the brachial pulse with the Doppler probe. Check the brachial waveform to ensure it is triphasic and pulsatile. Inflate the cuff to 20-30mmHg above the last audible pulse and then slowly deflate, recording the pressure at which the pulse returns, this is a reading of the systolic pressure. If the brachial artery waveform appears abnormal the left brachial pressure should also be recorded. There should be no greater than 10mmHg difference between the two. If there is a >10mmHg difference this should be stated in the report and the higher of the two values used to calculate ABPI.

Once the brachial pressure has been measured place the cuff on the right and then left ankle and measures the pressure (using the same technique as described for the brachial artery) at the posterior tibial (PT) and dorsalis pedis (DP) arteries and assess the waveforms. A lower frequency probe calf be used if the vessels are deep at the ankle (eg if there is swelling or large patient body habitus).

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If the patient is wheelchair bound pressures can be recorded with the legs elevated however this will lead to artefactually raised readings due to hydrostatic pressure and the report should indicate this.

The absolute values of pressure are entered onto CRIS and the system will automatically calculate the ABPI.

In the presence of arterial disease waveforms should be recorded to ascertain the level of the disease (ie common femoral and/or popliteal artery).

The resting ABPI is now complete. If the patient is not mobile or has shortness of breath or chest pains on arrival the exercise test should not be carried out, record why the patient was not exercised in the report on CRIS.

If able and appropriate, perform treadmill exercise test and post exercise pressures: Explain operation of the treadmill to the patient before commencing exercise. Instruct the patient to face the front, holding the handrail for support, and to walk normally when the belt starts to move. Start the treadmill and gradually increase the speed to 4 kph or as fast as the patient can manage. Stand beside the patient and treadmill control panel throughout the exercise period and enquire at regular intervals if the patient has any pains. Terminate the exercise if the patient has severe leg pains and needs to stop or any other limiting problems such as dizziness, shortness of breath or chest pain. If the patient is not limited then end the exercise at 300m or 5 minutes. At completion of exercise return the patient to the couch and measure and record pedal and brachial pressures also noting the speed, distance and limiting factor from the treadmill.

Following assessment with ABPI and/or exercise testing it may be necessary to proceed to duplex scan (VAS-PRO-008). In the following instances the patient should also be scanned:

1. Patient with reduced ABPI and symptoms of ulceration, rest pain etc.
2. Claudicant with evidence of iliac segment disease (it may be sufficient to scan the iliac segment only).
3. Pedal vessels should be assessed in cases of presentation of foot ulcer and normal ABPI values.

The operator must use their clinical skills and knowledge to decide if there are other instances where a scan should also be performed (for example where acute onset of symptoms is reported/suspected).

Reporting:

Enter pressure values and describe waveforms as mono- bi- tri- phasic: and / or as pulsatile, damped, severely damped or absent.

Describe treadmill performance and observations.

Record the results on the CRIS system.

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Inspection criteria:

Complete CRIS report.

References:

Goss DE. PhD thesis 1995. Departmental library.

Fulton TJ. PhD thesis 1983. Departmental library.

SVT ankle brachial pressure index service specification:

<http://www.svtgbi.org.uk/assets/Uploads/Professional-Issues/SS-ABPIFINAL-01112012.doc>

Lower limb peripheral arterial disease: diagnosis and management, NICE guideline CG147, August 2012