**Procedure for carrying out an ABPI using Doppler ultrasound**

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|  | **Procedure** | **Rationale** |
| **1** | Ensure the room is adequately heated. | This will aid comfort for the patient whilst having to lie immobile for a period of time. |
| **2** | Ensure equipment is in good working order (Have a spare battery in your bag at all times) | Low battery power can result in unnecessary concern when pedal pulses cannot be heard. Sphygmomanometer maintenance should be carried out annually and zero calibrated. Being unable to carry out the procedure due to failed equipment is stressful for the patient and a waste of nursing time! |
| **3** | Lay the patient as flat as possible for 10 – 20 mins and explain procedures carefully. | Ensures systolic BP is not artificially elevated due to stress or exercise. Dependant limbs will give an abnormally raised systolic pressure. If unable to lie flat position as most comfortable and document position. If arm is raised above heart level an over-estimation will result. |
| **4** | Place sphygmomanometer cuff around arm. Apply gel over the brachial pulse. (Ensure correct US gel is used to give effective transmission of the signal and should be in a single use sterile sachet) | Check cuff is appropriate size. It should be long enough to ensure that 80% of the circumference of the upper arm or ankle can be covered by the bladder and the width is at least 40% of the limb circumference. BP will be overestimated if bladder is too short or too narrow. |
| **5** | Hold 8MHz Doppler probe gently over the brachial pulse until a good signal is obtained | The best Doppler signal will be obtained with the probe at an angle between 45 – 60° to the artery. The artery may not be parallel to the skin and adjustment of the probe may be required to obtain a good signal. |
| **6** | Inflate the cuff until the signal disappears. Gradually lower the pressure until the signal returns. This is the Brachial Systolic Pressure. Repeat the process at least one more time. | Care should be taken in patients with atrial fibrillation. The cuff may be slowly deflated to ensure the correct pressure is recorded. The Brachial Systolic reading can vary between limbs. Differences of greater than 15mmHg suggest underlying aortic arch or upper limb arterial disease and therefore should be reported to GP/ Doctor. |
| **7** | Repeat these stages using the other arm. Take the highest of the readings. | This ensures that the systolic pressure is closest to the systemic pressure, especially if arterial disease is present |
| **8** | Place the sphygmomanometer cuff around the leg immediately above the ankle (Place a piece of cling film or dressing towel over any area of ulceration). | The position of the cuff is important. The measurements reflect the pressure required to occlude the artery between the cuff, not where the Doppler is held. If you are not applying the cuff to the ankle you are not recording a resting pressure index of the ankle. |
| **9** | Locate the pedal pulse using the Doppler probe. Avoid excessive pressure. Refer to guide on locating pulses if you are unsure of anatomical location. | Excessive pressure may occlude the underlying artery, particularly in thin patients. |
| **10** | Inflate the cuff until the signal disappears. Deflate the cuff until the signal returns. This is the Ankle Systolic Pressure. Repeat the process at least one more time. Repeat using at least one more pedal pulse. Make a note of each of the readings. | In practice, it is often only possible to use 2 of the pedal pulses for measurement. Avoid frequently inflating the cuff or leaving the cuff inflated for long periods of time as the pressure reading will fall. In large or oedematous limbs a 5MHz probe may give better results. |
| **11** | Repeat this stage using the opposite leg. |  |

**Calculate the resting pressure index for each limb separately**

ABPI = Ankle systolic pressure (Divided by)

Highest brachial systolic pressure

**REMEMBER – ‘Leg Over Arm’**

For example:

Highest brachial = 148

Highest pedal = 118

ABPI = 118 ÷ 148 = 0.79

*Always use a calculator*

**Limitations of ABPI**

* Spurious or inaccurate readings can result in inappropriate management of a patient.
* Arterial wall calcification can give rise to falsely elevated ankle pressure ie ABPI>1.3.
* In a large or oedematous limb a lower frequency probe may improve the signal, as it gives deeper penetration into the tissue.
* If no pulses are detected with the patient lying supine, check that all equipment is working properly. Sit the patient upright with their legs hanging over the edge of the bed. Check pulse sites for evidence of weak signals, gravity may assist perfusion of the foot. Observe the foot for signs of dependent rubor (Buergers sign).

**Interpretation of ABPI**

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| ABPI 1.0-1.3 | Normal | Apply high compression therapy as per local formulary & guidelines  Re Doppler every 12 months or sooner if patient develops ischaemic pain. |
| ABPI = 0.8 - 1.0 | Mild arterial disease | Apply high compression therapy as per local formulary & guidelines. The micro circulation of patients with diabetes can be vulnerable so pay particular attention to pressure points when applying the protective wool layer.  Re Doppler every 6 months or sooner if patient develops ischaemic pain or ulcer fails to progress. |
| ABPI 0.6 - 0.8 | Significant arterial disease | If asymptomatic re pain (i.e. ischaemic pain/ claudication pain) and wound progressing, consider reduced compression therapy and monitor closely. Re Doppler every 3 months or sooner if becomes symptomatic.  If symptomatic re pain, and wound is static or non healing refer to vascular consultant (Routine) |
| ABPI < 0.6 | Severe arterial disease | Urgent referral to vascular consultant. Re Doppler every 3 months. **Do not** apply any compression therapy |
| ABPI > 1.3 | Medial wall calcification | Refer to tissue viability for advice.  If diabetic, discuss with podiatry clinic at Churchill.  Compression therapy can be advocated in this group of patients as an interim measure before a vascular appointment. Prior to commencing this it is suggested that clinicians discuss the option with the tissue viability team.  Re doppler every 3 months. |