The most common test to assess arterial competency is the ankle brachial pressure index (ABPI), which measures the ratio of systolic blood pressure at the ankle to that in the arm – a value between 0.8 and 1.3 is considered normal. This test:

- Measures the pressure of the blood supply to the lower limb using a Doppler device;
- Is embedded in many lower-limb policies and clinical guidelines;
- Identifies peripheral arterial disease;
- Helps assess the suitability of compression therapy and is key to decision making around compression therapy;
- Does not assess for the presence of venous disease.

ABPI should be performed:

- Within two weeks of ulcer presentation/reoccurrence;
- On presentation of heel pressure ulcers to exclude peripheral arterial disease;
- To reassess any non-progressing or deteriorating wounds.

Timely diagnosis of lower-limb ulceration improves healing and patient outcomes.

**HOW TO CARRY OUT AN ABPI ASSESSMENT**

The patient should be laying flat and rested for 10 minutes before the procedure is done.

**Leg measurement**

- Place an appropriately sized cuff around the ankle immediately above the malleolus (protect any ulcer that may be present with a thin dressing or plastic sheet);
- Locate the dorsalis pedis signal with the Doppler probe;
● Angle the Doppler probe at 45 degrees, moving it to locate the best audio signal;
● Inflate the cuff until signal is abolished, then deflate slowly and record the pressure at which the signal returns;
● Take care not to move the probe from the line of the artery;
● Record this pressure, then repeat the measurement for the posterior tibial artery (and, if required, the peroneal artery and/or anterior tibial artery). Aim to obtain at least two leg/foot artery readings;
● Use the highest reading obtained in the specific limb to calculate the ABPI.

**Arm measurement**

● Ensure correct cuff size is selected and place around the upper arm;
● Locate the brachial artery Doppler signal;
● Angle the Doppler probe at 45 degrees, moving the probe to locate the best audio signal;
● Inflate cuff until the signal is abolished, then deflate slowly and record the pressure at which the signal returns;
● Take care not to move the probe from the line of the artery;
● Record this pressure, then repeat the process for the other arm;
● Divide the highest of the two artery ankle pressures by the highest brachial pressure to calculate the ABPI;
● Repeat the procedure for the opposite leg.

**Contraindications and precautions**

ABPI should not be conducted when the patient:

● Has suspected deep vein thrombosis (DVT). If patient has confirmed DVT and prescribed anticoagulation therapy, ABPI can be undertaken;
● Is in a sitting position (this may lead to unreliable results).

Caution is required if the patient has:

● Possible cellulitis, as the procedure may be too painful;
● Fragile skin around the gaiter, as this can result in further skin damage.

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**Fig 1. Calculating ABPI**

<table>
<thead>
<tr>
<th>Location</th>
<th>Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right Brachial</td>
<td>150</td>
</tr>
<tr>
<td>Left Brachial</td>
<td>135</td>
</tr>
<tr>
<td>Right DP</td>
<td>65</td>
</tr>
<tr>
<td>Left DP</td>
<td>150</td>
</tr>
<tr>
<td>Right PT</td>
<td>75</td>
</tr>
<tr>
<td>Left PT</td>
<td>130</td>
</tr>
</tbody>
</table>

Brachial = brachial artery; DP = dorsalis pedis artery; L = left; PT = posterior tibial artery; R = right.
The accuracy of the assessment can be affected by factors such as rest time, diabetes (due to calcified vessels), rheumatoid arthritis, atherosclerosis/arteriosclerosis, cardiac arrhythmias, inadequate preparation, patient and clinician anxiety, incorrect positioning of patient and inappropriate gel.

To sum up, ABPI measures macrocirculation in the larger blood vessels and can help you assess the suitability of compression therapy, but does not assess venous disease.

**Calculating ABPI**

For each leg always take the highest value, and then divide it by the highest value of either of the brachial arteries – it does not have to be the same arm to the same leg, just the highest of the values.

In Fig 1, for the left leg do a simple calculation of 150 divided by 150, which gives a ratio of one. This means that 100% of the blood is getting down to the patient’s left leg. For the right leg, you also take the highest value, which is 75; divide that by the highest brachial (150) to give an ABPI of 0.5. This means that 50% of the blood is getting down to that leg.

**INTERPRETING THE RESULTS**

- <0.6 – arterial disease, refer to vascular services, no compression;
- 0.6-<0.8 – mixed disease, could indicate a mild arterial disease in combination with venous disease;
- 0.8-1.3 – normal;
- >1.3 – caution, vessels may be calcified.

Remember: trust the ABPI when it is low, but question it if it turns out to be high. If the ABPI is high or the procedure cannot be performed, you can also assess arterial supply by:

- Palpating the foot pulses – however, caution is needed as this is dependent on practitioner skills;

![Normal arterial waveform](image1)

![Diseased arterial waveform](image2)

Fig 2. Hand-held Doppler waves
● Listening to the Doppler waves and deciding whether the tone is monophasic or multiphasic – a monophasic signal is indicative of arterial supply issues but, with a normal triphasic Doppler signal, you can hear the systole, diastole and the reflux of the artery (Fig 2);

● Assessing toe pressure, as toe arteries are much less likely to have calcification. This is performed like an ABPI of the toe; a measurement of 70-110mmHg or a toe brachial index (TBI) of >0.5-0.75 is normal, whereas anything below is diagnostic of peripheral arterial disease. A toe pressure of <30mmHg or a TBI of 0.2 is considered severely ischemic.

**SUMMARY**

If you are unsure of your ABPI readings, escalate your patients as soon as possible because they need an accurate diagnosis. Always be mindful that you are causing harm if you delay assessment, compression and referral.

**Videos in this bitesize learning series**

- Immediate and necessary care
- Assessment
- Vascular assessment
- Wound cleansing and wound-bed preparation
- Secondary prevention
- Self-supported care