

HOW TO ASSESS BLOOD FLOWING USING AN

Ankle-Brachial Pressure Index (ABPI) Assessment

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When a patient presents with lower leg problems, such as pain, edema, an ulcer or other skin breakdown, one of the first tasks is to identify what the cause or causes might be, and which factors could affect treatment strategies. After taking a thorough patient history, a clinician should consider an ankle-brachial pressure index (ABPI, or ABI) assessment, a common test to determine any impairment to the arterial blood flow to the lower extremities. An ABPI assesses the ratio of systolic blood flow in the brachial artery to that of the dorsal pedis and posterior tibia. This article discusses how to conduct an ABPI.

Equipment Needed

- Blood pressure (BP) cuff: cuff bladder length should be approximately 80% of the circumference of the upper arm, with the width approximately 40% of the circumference of the upper arm
- Doppler (preferred) with an 8 MHz vascular probe
- Ultrasound gel
- Towels for removing gel

Steps

Step 1

1. Explain the procedure.
2. Ensure the patient has not smoked a cigarette within 24 hours of the procedure.
3. Have the patient roll up their sleeves and pant legs and remove shoes and socks.
4. Have the patient lie comfortably flat for a minimum of 15 minutes to normalize blood pressure and decrease patient anxiety.

Step 2

1. Secure the appropriate size of blood pressure cuff around the arm, loose enough for two fingers but not so loose that it slips down. Pediatric or oversized cuffs may be required.
2. Locate the brachial pulse with your fingers in the patient's antecubital fossa.

Why Do an ABPI?

- ✓ To help to identify if arterial disease is a factor that is impacting leg health and wound healing
- ✓ To assist with goal setting and help guide treatment and referrals
- ✓ To protect against patient harm and clinician liability. For example, compression therapy cannot be initiated unless adequate blood flow has been demonstrated and documented (see Table 1).
- ✓ To help to stratify the degree of peripheral arterial disease

3. Apply a generous amount of ultrasound gel over the brachial pulse.
4. Slowly adjust the probe to obtain an audible signal (40- to 60-degree angle in the direction of the flow).
5. Inflate the cuff until the Doppler signal disappears, usually 20 mmHg above their normal BP, then gradually release the pressure valve until the signal returns.
6. Repeat on the other arm. (Brachial systolic pressure must always be assessed bilaterally.)
7. If you need to repeat the measure, wait one to three minutes before repeating the procedure.

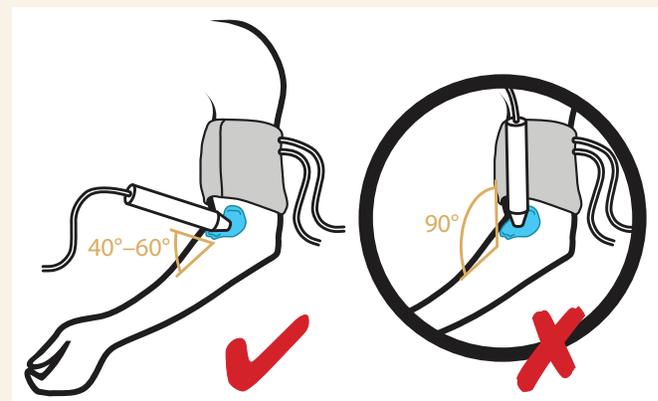


Figure 1: Correct and incorrect angles for conducting an ABPI. In a successful assessment, the higher number of the two arms is the brachial systolic pressure (B).

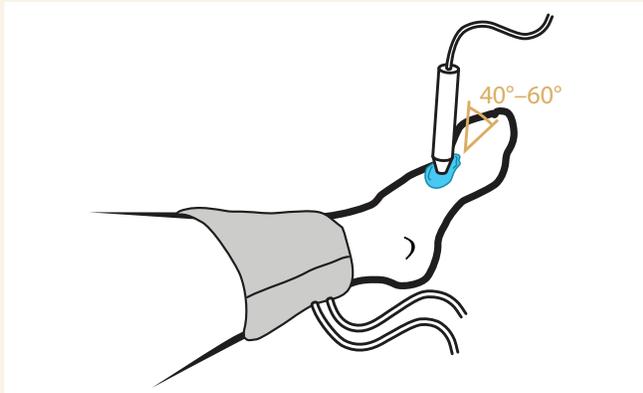


Figure 2: Proper position and probe angle for measuring ankle systolic pressure (A).

Step 3

Locate with your fingers the dorsalis pedis and posterior tibial pulses.

Step 4

1. Secure the blood pressure cuff just above the ankle, making sure it is loose enough to insert two fingers between the cuff and the calf.
2. Locate the posterior tibial, dorsalis pedis and digital artery pulse using the Doppler probe and a generous amount of gel. Move the probe with

Ankle Brachial Pressure Index

$$ABPI = \frac{A}{B}$$

where **A = ANKLE systolic pressure**, measured in the dorsal pedal artery, posterior tibial artery and digital artery (measure all three and calculate an ABPI for each)

and **B = BRACHIAL (ARM) systolic pressure**, measured in the left or right brachial artery (measure both and use the highest value found)

Calculate an ABPI for each ankle artery found using the systolic pressure from that artery. The clinician should expect the ankle and brachial pressures to be similar, yielding a ratio near 1.0.

Common Problems

If you have difficulty with this procedure, do the following:

- ✓ Make sure you are using enough gel.
- ✓ Check that the Doppler probe is pointed toward the direction of blood flow (see figures 1 and 2).
- ✓ Check that the angle of the Doppler probe is between 40° and 60° (see figures 1 and 2).
- ✓ Check that the BP cuff is the correct size.
- ✓ Be patient. Slow down and take a breath.
- ✓ If necessary, ask for help from someone more experienced.
- ✓ If you find it hard to hear, use a headset to block out environmental noise.

- a 45- to 60-degree angle facing toward the heart until you get the loudest pulse sound. Listen carefully to the Doppler sound for each pulse and attempt to identify the waveform as triphasic, biphasic or monophasic (you may require headphones to block out environmental noise).
3. Inflate the cuff until the Doppler signal disappears, then gradually release the pressure valve until the signal returns. Repeat with the second and third pulse.

Step 5

To calculate the ABPI, divide the appropriate ankle systolic pressure by the highest brachial systolic pressure (ABPI = A/B). Record the ABPI for each artery tested.

Tips

- ✓ Prepare your equipment before beginning the procedure.
- ✓ In some elderly patients, the dorsalis pedis pulse is difficult to find. Move down the dorsum of the foot along the first ray and look between the first and second digit.
- ✓ Remember that an ABPI is only one parameter of testing. Results should be considered in relation to presented symptoms and risks, such as claudication and critical ischemia.

Table 1: Interpreting the ABPI

Value	Interpretation	Clinical Correlation
> 1.40	Interpret with caution; may indicate calcified vessels	<ul style="list-style-type: none"> • Be aware of possible falsely elevated measures.
1.0 – 1.40	Normal arterial flow	<ul style="list-style-type: none"> • Pulses palpable and no signs of arterial disease
0.91 – 0.99	Borderline arterial flow	<ul style="list-style-type: none"> • Pulses palpable and no signs of arterial disease
0.70 – 0.90	Mild impairment of arterial flow	<ul style="list-style-type: none"> • Often have no symptoms and no clinical signs of arterial disease
0.41 – 0.69	Moderate impairment of arterial flow	<ul style="list-style-type: none"> • Abnormal exam • May give history of claudication pain
< 0.40	Severe impairment of arterial flow (critical limb ischemia)	<ul style="list-style-type: none"> • Abnormal exam • May give history of rest pain

Step 6

Discuss the results of this test and their implications with your patient. Interpretation of the value of the ABPI is shown in Table 1.

When to Conduct a Toe-Brachial Pressure Index (TBPI)

Incompressibility can occur if calcification of arteries is present. This is indicated by an abnormally high ankle systolic pressure. If there is concern about calcification of vessels, especially in the presence of diabetes, the toe-brachial pressure index (TBPI) can be obtained in a similar fashion using a toe-pressure cuff around the first digit. The Doppler is then used to obtain a systolic reading from the plantar aspect of the first digit. If there is a first-toe amputation, any digit can be used if the appropriate digit-sized cuff is used.

