Ankle Brachial Index (ABI)

Definition:
- A tool for assessing the presence of peripheral artery disease (PAD)
- The ABI has a sensitivity 95% and a specificity 99%

Indications:
- To diagnose PAD
- To assess the vascular risk for PAD

Contraindications:
- Patients who are unable to remain supine for the exam
- Patients in whom the occlusion from the blood pressure cuff may worsen the extremity injury

Equipment:
- An appropriately sized blood pressure cuff for the upper and lower extremities with a working sphygmomanometer
- A Doppler device for detecting flow
- Ultrasound transmission gel

Technique:
1. The patient should rest supine, with arms and legs at the level of the heart, on a exam table in a warm room for at least 10 minutes *before* testing
2. Choose an appropriate size blood pressure cuff for both arms and ankles (cuff width should be, at a minimum, 20% greater than the diameter of the extremity)
3. Place blood pressure cuffs on the arm and ankle on the side to be measured first
    - The ankle cuff should go on the leg between the malleolus and the calf
4. Apply ultrasound gel over brachial, dorsalis pedis, and posterior tibial arteries
5. Measure systolic pressure in arms
    - Use vascular Doppler to locate brachial pulse (medial side of the antecubital fossa)
    - Inflate cuff 20 mm Hg above last audible pulse
    - Deflate cuff slowly and record pressure at which pulse becomes audible
    - Obtain 2 measures in each arm and record the average as the brachial pressure in that arm
6. Measure systolic pressure in ankles
    - Use vascular Doppler to locate dorsalis pedis (DP) pulse (dorsum of the foot between the proximal section of the first and second metatarsals)
    - Inflate cuff 20 mm Hg above last audible pulse
    - Deflate cuff slowly and record pressure at which pulse becomes audible
    - Obtain 2 measures in each ankle and record the average as the dorsalis pedis pressure in that leg
7. Repeat step 6 for posterior tibial (PT) arteries (just dorsal and inferior to the medial malleolus)
8. Calculate ABI (see next section)

How to Calculate Ankle Brachial Index (ABI):
- Right ABI = highest right average ankle pressure (DP or PT) divided by highest average arm pressure (right or left)
- Left ABI = highest left average ankle pressure (DP or PT) divided by highest average arm pressure (right or left)

Interpretation of ABI Results:

- > 1.30 = Noncompressible, severely calcified vessel
- >0.90 (range of 0.90 to 1.30) = normal lower extremity blood flow
- <0.89 to >0.60 = Mild PAD
- <0.59 to >0.40 = Moderate PAD (sufficient to cause claudication)
- <0.39 = Severe PAD (sufficient to cause resting pain or gangrene)

Pearls:

- The difference between the 2 readings for each artery should be less than 10 mm Hg
- Patients with diabetes may have extensive medial layer calcinosis, rendering the vessel resistant to compression by the pneumatic cuff
- If done properly, the ABI has a sensitivity 95% and a specificity 99%

References:

1. Bickley LS et al. Bates' Guide to Physical Examination and History Taking. 11th ed. Philadelphia, PA: Lippincott Williams & Wilkins. 2013; 516.
2. Hiatt WR. Medical treatment of peripheral arterial disease and claudication. N Engl J Med. 2001;344(21):1608-21.
3. McDermott MM et al. The ankle-brachial index is associated with leg function and physical activity: the walking and leg circulation study. Ann Intern Med. 2002;136:873-883.