

Vascular Risk Assessment of the Older Cardiovascular Patient: The Ankle-Brachial Index (ABI)

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WHY: Vascular disease encompasses a wide array of arterial and venous problems, including stroke, abdominal aortic aneurysm (AAA) and peripheral arterial disease, as well as acute and chronic venous disease. Stroke is the third leading cause of death and the primary cause of older adult disability in the U.S. and carotid artery disease is the single most important risk factor in the development of stroke. The prevalence of AAA in ages 75-84 years is 12.5% for men and 5.2% in women. Peripheral arterial disease (PAD) affects 12% of the general population and 20% of persons older than 70 years (AHA, 2009). PAD has been identified as a marker for systemic arteriosclerosis and is associated with increased risk of cardiovascular events.

BEST TOOLS: The Ankle-Brachial Index (ABI) is a screening tool used to 1) detect asymptomatic arterial disease in the legs to prevent progression to claudication or limb ischemia; and 2) detect individuals at high risk of cardiovascular events. The ABI is the ratio of systolic blood pressure at the ankle to that in the arm. It is measured with the patient supine using a sphygmomanometer and Doppler ultrasound probe. Systolic pressure is measured in both arms and at the posterior tibial and dorsalis pedis arteries in each ankle. The ABI is calculated as the higher pressure at the ankle divided by the higher of the left and right arm pressures. An ABI ratio above 0.90 is normal, 0.71-0.90 indicates mild obstruction, 0.41-0.70 indicates moderate obstruction, and <0.40 indicates severe obstruction.

TARGET POPULATION: Vascular risk factor assessment is important for any older adult; all adults over 40 years should be screened for vascular risk. The extent of assessment is dependent on family history, presence of cardiovascular disease (CVD) or PAD, other comorbidities and number of identifiable risk factors for PAD such as smoking, obesity, hypertension, dyslipidemia and physical inactivity.

VALIDITY AND RELIABILITY: An ABI cut-point of 0.90 has a sensitivity of 41% and a specificity of 88% in detecting future cardiovascular deaths. In the NHANES Survey data, the prevalence of ABI <0.90 in older adults aged 70 years or greater was 14.5%. An ABI of <0.90 has been consistently associated with a 2 to 4 fold increased relative risk of cardiovascular events and death.

STRENGTHS AND LIMITATIONS: The ABI has been used extensively with men and women, with many ethnic groups and many age groups. The financial cost to perform an ABI is minimal and takes less than 15 minutes to perform. It is noninvasive and if a low ABI is detected early, cardiovascular risk-reduction measures can be implemented. The only limitation may be in the accuracy of performing the ABI if the examiner is rushed, distracted or unable to hear the Doppler.

MORE ON THE TOPIC:

Best practice information on care of older adults: www.ConsultGeriRN.org

American Heart Association. (2009 Update). Heart disease and stroke statistics. www.americanheart.org.

Doobay, A.V., & Anand, S.S. (2005). Sensitivity and specificity of the ankle-brachial index to predict future cardiovascular outcomes:

A systematic review. *Arteriosclerosis, Thrombosis, and Vascular Biology*, 25(7), 1463-1469.

Fahey, V.A. (2004). *Vascular Nursing* (4th ed.). St. Louis, MO: Elsevier-Saunders.

Grenon, S.M., Gagnon, J., & Hsiang, Y. (2009) Ankle-brachial index for assessment of peripheral arterial disease.

New England Journal of Medicine. 361(19): e40.

National Heart Lung and Blood Institute: www.nhlbi.nih.gov/health/public/heart/pad.

Vascular Disease Foundation: PAD: www.vdf.org/diseaseinfo/pad/anklebrachial.php.

Vascular Assessment in Older Adults

Vascular assessment includes a comprehensive history and physical examination with emphasis on assessment of vital signs and pulses, as well as the use of risk assessment tools including the Ankle-Brachial Index (ABI). The health care provider may order diagnostic testing including arterial and venous Doppler ultrasound and plethysmography to determine blood volume change.

| Pulses to be Assessed | Pulse Characteristics Palpation | Pulse Characteristics Auscultation | Extremity Characteristics with Disease Inspection and Palpation |
|---|--|---|---|
| Carotid Brachial Radial Ulnar Aorta Femoral Popliteal Dorsalis Pedis Posterior Tibial | Rate Bilateral Equality Regular or Irregular Strength: 0 = absent 1 = weak 2 = normal 3 = full, increased 4 = bounding Older adult norms: slower rate, pulses weak = 1 | Bruit <ul style="list-style-type: none"> Listen with stethoscope bell Turbulent, low-pitched sound Jugular Venous Pressure <ul style="list-style-type: none"> Level where pulsations of jugular vein are visible Measure from the manubriosternal angle Normal = < 1 inch rise in pulsations from angle with regular, wavelike pulsations | Venous: <ul style="list-style-type: none"> Normal pulses Normal hair distribution Thick, pigmented skin Normal nails Ulcers on medial ankles, legs Normal temperature No pain Edema present when extremity dependent Arterial: <ul style="list-style-type: none"> Diminished/absent pulses Hair loss Thin, smooth, shiny skin Thick, brittle nails Ulcers on toes, heels Cool to touch Painful No edema Older adult norms: Cooler extremities; Blood vessels = dilated, prominent, tortuous |

ABI Worksheet

Right Arm:
Systolic Pressure mmHg

Left Arm:
Systolic Pressure mmHg

Right Ankle:
Systolic Pressure
Posterior Tibial (PT) mmHg
Dorsalis Pedis (DP) mmHg

Left Ankle:
Systolic Pressure
Posterior Tibial (PT) mmHg
Dorsalis Pedis (DP) mmHg

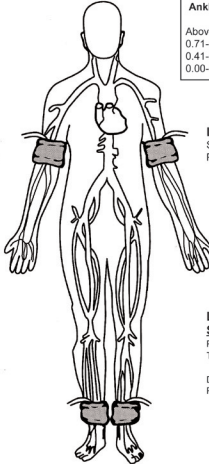
Right ABI equals ratio of:
Higher of the Right Ankle Pressures (PT or DP) mmHg
Higher Arm Pressure (right or left arm) mmHg = . *

Left ABI equals ratio of:
Higher of the Left Ankle Pressures (PT or DP) mmHg
Higher Arm Pressure (right or left arm) mmHg = . *

*The lower of these numbers is the patient's overall ABI.
Overall ABI (lower ABI) =

Ankle-Brachial Index Interpretation

Above 0.90: Normal
 0.71-0.90: Mild Obstruction
 0.41-0.70: Moderate Obstruction
 0.00-0.40: Severe Obstruction



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