ANKLE-BRACHIAL INDEX (ABI): CLINICAL UTILITY AND INTERPRETATION

Prepared by **Dr. Sidhartha Mullapudi**, DrNB (Cardiology), MD (General Medicine)
Last reviewed: October 2026

I DEFINITION AND STANDARDIZED CALCULATION

- **Core Definition:** The **Ankle-Brachial Index (ABI)** is a non-invasive bedside diagnostic tool used to screen for and monitor **Peripheral Arterial Disease (PAD)** by comparing the systolic blood pressure (SBP) in the ankles to the SBP in the arms.
- **Measurement Protocol:** The patient must rest in the **supine position for at least 10 minutes** prior to measurement, and SBP is recorded in all four limbs using an appropriately sized blood pressure cuff and a continuous-wave **handheld Doppler probe**.
- **Mathematical Formula:**
  - **Numerator (Ankle Pressure):** For each leg individually, use the **higher** of the **Dorsalis Pedis** or **Posterior Tibial** artery systolic pressures.
  - **Denominator (Brachial Pressure):** Use the **higher** of the two brachial artery systolic pressures (Right or Left arm).
  - **Calculation: ABI = Higher Ankle Systolic Pressure / Higher Brachial Systolic Pressure**.

II INTERPRETATION OF ABI VALUES

ABI Numerical Value	Diagnostic Category	Clinical & Hemodynamic Interpretation
Greater than 1.40	**Non-Compressible Arteries**	Severe medial arterial calcification (**Monckeberg Sclerosis**); requires **Toe-Brachial Index (TBI)**
1.00 to 1.40	**Normal**	Normal lower-extremity arterial perfusion
0.91 to 0.99	**Borderline**	Early or mild PAD; warrants clinical follow-up or **Exercise ABI** testing
0.41 to 0.90	**Mild-to-Moderate PAD**	Hemodynamically significant arterial stenosis; typically associated with **Intermittent Claudication**
0.40 or Less	**Severe PAD**	High risk for **Critical Limb-Threatening Ischemia (CLTI)**, ischemic rest pain, ulceration, or gangrene

III CLINICAL UTILITY AND ADVANTAGES

- **Diagnostic Screening:** Highly sensitive and specific non-invasive test for detecting occult or symptomatic PAD in high-risk cohorts (smokers, patients with Diabetes Mellitus, or adults older than 65 years).
- **Systemic Cardiovascular Risk Prediction:** An abnormal ABI (**less than 0.90** or **greater than 1.40**) is a powerful independent predictor of **Major Adverse Cardiovascular Events (MACE)**, myocardial infarction, and stroke, even in patients without lower-extremity claudication.
- **Post-Revascularization Surveillance:** Used serially to monitor the patency and hemodynamic success of peripheral endovascular intervention (angioplasty/stenting) or surgical bypass grafting.
- **Tissue Healing Potential:** An absolute ankle systolic pressure of **less than 50 mmHg** indicates severely impaired perfusion and predicts poor wound healing for foot ulcers or minor amputations.

IV LIMITATIONS AND TECHNICAL PITFALLS

- **The "Calcified Leg" (False-Normal or Falsely Elevated ABI):** In patients with long-standing **Diabetes Mellitus** or **End-Stage Renal Disease (CKD)**, medial arterial calcification (**Monckeberg Sclerosis**) renders the tibial vessels rigid and non-compressible, yielding a falsely normal or elevated ABI (**greater than 1.40**) despite severe occlusive disease. In these patients, the **Toe-Brachial Index (TBI)** must be performed because digital arteries rarely calcify.
- **Normal Resting ABI in Masked Stenosis:** Patients with isolated iliac or superficial femoral stenosis and robust collaterals may have a normal resting ABI; if exertional leg symptoms persist, a **Treadmill Exercise ABI** is indicated, where a **post-exercise ABI drop of greater than 20 percent** is diagnostic of PAD.
- **Inability to Localize Anatomic Lesions:** While a low ABI confirms lower-extremity inflow obstruction, it cannot localize the exact anatomical level of stenosis (iliac, femoral, popliteal, or tibial) without adjunctive **Duplex Ultrasound** or CT angiography.

V PRACTICAL CONSIDERATIONS IN THE INDIAN CLINICAL CONTEXT

- **High Burden of Diabetic Foot Disease:** Given the high prevalence of Diabetes Mellitus in India, routine ABI screening is essential in diabetic patients over 50 years of age; due to frequent medial calcification, Indian vascular clinics routinely pair ABI with **Toe-Brachial Index (TBI)** and **Arterial Duplex Ultrasound**.
- **Thromboangiitis Obliterans (Buerger Disease):** In young Indian male tobacco/bidi smokers presenting with distal extremity ischemia, segmental pressures and ABI help distinguish **Buerger disease** (infrapopliteal distal small-to-medium vessel involvement) from premature **atherosclerotic PAD** (aorto-iliac and femoropopliteal large-vessel involvement).
- **Neuropathic vs. Neuro-Ischemic Foot Ulcers:** In rural Indian patients who walk barefoot and suffer repetitive plantar trauma, bedside ABI rapidly differentiates a purely **neuropathic ulcer (normal ABI)** from an **ischemic or neuro-ischemic ulcer (low ABI)** prior to surgical debridement.

KEY REFERENCES

- **Mazzolai L, Teixido-Tura G, Lanzi S, et al.:** 2024 ESC Guidelines for the management of peripheral arterial and aortic diseases, *European Heart Journal*, 2024.
- **Libby P, Bonow RO, Mann DL, Tomaselli GF, Bhatt DL, Solomon SD:** *Braunwald's Heart Disease: A Textbook of Cardiovascular Medicine*, 12th Ed., Elsevier, 2022.