A new interpretation of ankle-brachial index

Akio Ishida

Department of Cardiovascular Medicine, Nephrology and Neurology, Graduate School of Medicine, University of the Ryukyus, Okinawa, Japan

Ankle, brachial and central pressures are used as important predictor of future cardiovascular risk. Pressure measurement in the brachial artery is widely used for the diagnosis and treatment of hypertension. However, systolic pressure varies throughout the arterial tree, and recent studies suggest that brachial pressure is less related future cardiovascular events than is central pressure. Age-related increase is different between central and brachial pressure; i.e., central systolic pressure increases greater than brachial systolic pressure. The ankle-brachial index (ABI), which represents the ratio of systolic pressure at the ankle to that at the brachial artery, has been used for diagnostic test for lower extremity artery disease (LEAD) in both sexes and at all ages in numerous epidemiological studies. Previous studies have reported that the ABI decreased with age over 55 years, probably because of increased prevalence and progression of LEAD. However, we have recently reported that the ABI was lowest at <40 years, and increased with age until 60 years in screened Japanese subject cohort. In younger adults (<40 years), 8% of men and 18% of women had borderline low ABI (0.91–0.99). ABI was positively correlated with systolic blood pressure, pulse pressure, and brachial-ankle pulse wave velocity (baPWV), indices of arterial stiffness in subjects with ABI ≥1.0. LEAD is rare in younger adults especially in Japanese women. We therefore hypothesized that ABI increases with age (i.e., ankle systolic pressure increases greater than brachial systolic pressure) as a result of arterial stiffness and associates with target organ damages including heart, kidney and brain. Low ABI in older adults or high-risk people represents atherosclerotic stenosis of lower extremity artery. A high normal ABI (1.2≤ ABI <1.4) was associated with proteinuria in participants aged <60 years. By contrast, in participants aged 60≤ years, only low ABI (≤0.9) was associated with proteinuria. The prevalence of left ventricular hypertrophy (LVH), defined by the Minnesota code, was only significantly associated with high normal ABI after multivariate adjustment. We found that both high normal ABI and high baPWV were associated with the presence of cerebral microbleeds, defined as small hypointense lesions on T2*-weighted images. Moreover, the combination of high normal ABI and high baPWV strongly indicates the presence of CMB. These observations provide a new interpretation of ABI as an index for arterial stiffness and target organ damage in younger adults or low-risk people.