

Central pressure and augmentation index

Jeong Bae Park, MD, PhD, FAHA, FESC

Kwandong University College of Medicine, Seoul, Korea

There are three ways to measure arterial stiffness: 1) regional measurement of stiffness—the pulse wave velocity method, mostly at aorta, which is recommended as a gold standard by European Expert Consensus on Arterial Stiffness, 2) central waveform analysis which provide a global arterial system index—the augmentation index, and 3) local determination of arterial stiffness, frequently at carotid and aorta.

The central pulse wave analysis: augmentation index (Aix) is defined as the difference (augmentation pressure) between the second (P2) and first systolic peaks (P1) / the pulse pressure (%), directly from carotid artery or indirectly from radial artery using transfer function. Aix is represented by a global surrogate index which is influenced by arterial function (wall properties and wave reflection), height, ventricular-vascular coupling and heart rate. Therefore central pulse wave is a result of complex arterial behaviors. This is because of difference of wave reflection time, when propagating pressure wave starting from heart comes back toward heart again after a long travel to the arterial system. In view of epidemiological insights, it is clearly linked to cardiovascular disease and has its predictive value for cardiovascular prognosis even though there is some complaints of lack of specificity.

Central blood pressure: central blood pressure (BP) is measured at the aorta (central aortic BP) and the common carotid arteries (central carotid BP). Pressure at central artery differs markedly from peripheral pressure, usually measured at brachial artery. The increase in central blood pressure controls large and small cerebral artery remodeling, influencing on the risk of stroke. And its increase is also directly associated with left ventricular hypertrophy, with a parallelly relative reduction in myocardial tissue perfusion and increasing myocardial infarction. An increase in central PP is associated with renal dysfunction.

Measurement of central pressure and augmentation index: this can be measured easily using applanation tonometry and a generalized transfer function from radial artery to aorta. The accuracy of generalized pressure function and BP difference between radial artery (pressure-sensing artery) and brachial artery (reference artery) are sometimes tackled for the more use in clinic. Another method to measure central BP is introduced by by Van Bortel et al, using brachial artery wave and its mean BP with carotid applanation. It may be more accurate but not

always feasible.

Conclusion: nonetheless, central BP and augmentation index shows diverse characteristics of BP behavior and has been shown the better predictive value of CV events and intervention-related outcome than BP at the brachial level.