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Editorial

Arterial Stiffness: Is This a Marker for the Current Status or Future?

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Brachial-ankle pulse wave velocity (baPWV) can be measured using a simple and highly reproducible method; therefore, measurement of this parameter is highly feasible in clinical practice. However, the clinical significance of baPWV measurement is not yet completely established. Several cross-sectional studies have suggested that baPWV measurement may be a useful screening test for subclinical atherosclerosis. Other prospective studies have reported that baPWV is a useful predictor of future cardiovascular events. Two recent aggregate meta-analyses have confirmed that increased arterial stiffness as assessed by baPWV is an independent risk factor affecting cardiovascular prognosis[1, 2]. Two plausible explanations have been proposed for the association of baPWV with cardiovascular prognosis[3]. One is that baPWV reflects the atherosclerotic burden, including the formation of focal plaque lesions in the systemic arterial tree, and is therefore an acceptable marker to predict future cardiovascular events. This is also the reason why baPWV measurement has been suggested as a screening test for subclinical atherosclerosis. Another explanation is as follows: The conduit arteries are highly elastic. This elasticity has beneficial effects on the cardiovascular system, such as facilitating organ blood supply during diastole, particularly to the heart, reducing the cardiac afterload, and/or protecting the arterial wall and microvasculature from the mechanical stresses generated by cardiac contractions. Impaired arterial elasticity, i.e., increased arterial stiffness, causes increased cardiac afterload, impaired coronary blood supply, microvascular damage in the brain and kidney, and atherogenesis.

Some studies have reported the existence of a significant association of baPWV with coronary calcification/coronary atherosclerosis as assessed by coronary computed tomography or with carotid atherosclerosis as assessed by carotid ultrasound[4-6]. To establish the aforementioned notion that baPWV reflects the atherosclerotic burden in the systemic arterial tree, studies to examine the association of baPWV with the severity of atherosclerosis at multiple sites in the arterial tree are needed.

In the present study, Joo *et al* examined the association of baPWV with subclinical atherosclerosis not only in the carotid artery as assessed by ultrasound examination but also in the coronary arteries as assessed by computed tomography angiography in 773 subjects having components of the metabolic syndrome[7]. They found that baPWV was higher in subjects with composite subclinical atherosclerosis than in those without subclinical atherosclerosis and concluded that baPWV has a modest diagnostic potential for subclinical atherosclerosis (i.e., the crude odds ratio to predict composite subclinical atherosclerosis was 1.40, although this was not significant after adjustments). On the other hand, an aggregate meta-analysis conducted by Vlachopoulos *et al* demonstrated that an increase in baPWV by 100 cm/s corresponded to a 12%, 13%, and 6% increase in the frequency of total cardiovascular events, cardiovascular mortality, and all-cause mortality, respectively[1]. We conducted another aggregate data meta-analysis of 14 articles (13346 subjects) to examine whether baPWV can serve as a predictor of cardiovascular events or cardiovascular death. A random-effect model was used, and between-studies heterogeneity was estimated on the basis of I^2. The analysis identified baPWV as an independent marker to predict future cardiovascular events. The pooled odds ratio (95% CI) for cardiovascular disease/cardiovascular death was 2.74 (1.85−4.06) when the group with the highest baPWV was compared with that having the lowest baPWV in the random effects model (I^2=

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73%)[2].

Both the results of Joo's study and those of the aggregate meta-analysis suggest that baPWV is more suitable as a predictor of the prognosis rather than as a marker for subclinical atherosclerosis screening. Even so, the significance of baPWV as a marker for subclinical atherosclerosis screening in subjects with some risk factors for cardiovascular disease (e.g., smoking, hypercholesterolemia, and chronic kidney disease) other than metabolic syndrome should be clarified. In addition, these results may indirectly lend support to the concept that arterial stiffness contributes to the prognosis via arterial stiffness-related pathophysiological abnormalities (i.e., increased cardiac afterload, impaired coronary blood supply, microvascular damage in the brain and kidney, and atherogenesis). Further studies are required to establish the significance of baPWV measurement in the management of cardiovascular disease and/or its related risk factors.

Conflict of Interest Statement

Hirofumi Tomiyama received fees for lectures from Omron Health Care company.

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