Ambulatory Arterial Stiffness Index and Stroke Prediction

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Arterial stiffness is a strong predictor of cardiovascular morbidity and mortality. Although several indexes of arterial stiffness are currently used, there is an ongoing debate with regard to their strengths and limitations. They remain underused in routine clinical practice for cardiovascular risk stratification, possibly because with the exception of pulse pressure, measurement of most indexes requires special equipment and highly trained observers.

In 2006, we proposed that the regression slope of diastolic on systolic blood pressure in individual ambulatory blood pressure recordings might reflect the elasticity of the large arteries. This new index, which was termed as “ambulatory arterial stiffness index” (AASI), was shown to be significantly correlated with carotid-femoral pulse wave velocity (cf-PWV, r=0.51, *P*<0.0001) in 166 volunteers recruited in Shanghai, and with central augmentation index (r=0.48, *P*<0.0001) and central pulse pressure (r=0.50, *P*<0.0001) in 384 Chinese from a general population sample.

Until now, 3 large prospective outcome studies have demonstrated that AASI significantly and independently predicted cardiovascular mortality and morbidity, especially for stroke. In the Dublin outcome study, 11 291 patients (mean age, 54.6 years; 5965 women) without antihypertensive therapy at baseline was followed up for a median of 5.3 years. After adjustment for other cardiovascular risk factors including sex, age, mean arterial pressure, body mass index, smoking, diabetes mellitus and a history of cardiovascular disease, a 1 SD increase in AASI was associated with a 14% (*P*<0.01) increased risk of cardiovascular mortality. Independent of 24-hour pulse pressure and other cardiovascular risk factors, AASI was a strong predictor for stroke (Hazard Ratio [HR] for 1-SD increase [95% CI], 1.21 [1.01 to 1.45]; *P*<0.05), especially in individuals (<135/<85mmHg) with normal daytime ambulatory blood pressure (HR [95% CI], 1.81 [1.18 to 2.78]; *P*<0.01). In the Danish Monica Study, in which 1829 subjects were followed up for 9.4 years, AASI was significantly related to an increased risk for fatal and nonfatal stroke (HR for 1-SD increase [95% CI],1.62 [1.14 to 2.28]; *P*=0.007). After adjustment for other covariables and mutual adjustment for cf-PWV, AASI remained predictive for stroke (HR, 1.68; *P*=0.01), while cf-PWV only predicted fatal and nonfatal cardiovascular events (1.15, *P*=0.03), but not stroke (HR, 0.91; *P*=0.62). The OHASAMA study in Japan provided further evidence that AASI could predict cardiovascular mortality and stroke mortality. However, the relation between AASI and cardiovascular and stroke mortality were nonlinear. The Hazard ratios (95%CI) for stroke mortality across the quartiles of AASI were 1.56 (0.98 to 2.47), 0.89 (0.54 to1.45), 0.52 (0.30 to 0.89), and 1.40 (0.94 to 2.08), respectively. In conclusion, AASI, as a noninvasive and indirect measure of arterial stiffness index, significantly and independently predicted cardiovascular mortality and morbidity, and was especially predictive for stroke events in normotensives and in general population. AASI adds value to risk stratification based on the ambulatory blood pressure monitoring.