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A decade of testing arterial stiffness parameters: key results and insights

Abstract: P623

A decade of testing arterial stiffness parameters: key results and insights

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Introduction: The overall goal of our investigations was to prove that the new oscillometric device provides a reliabile and feasibile alternative to measuring arterial stiffness parameters noninvasively in the clinical practice. We used arterial stiffness parameters to identify preclinical organ damage, to determine cardiovascular (CV) risk in different diseases. We also followed changes of similar stiffness parameters due to age or physical exercise in young healthy volunteers.

Methods: Serial measurements of stiffness parameters (aortic pulse wave velocity (PWVao), and aortic augmentation index (AIXao) were performed noninvasively, using Arteriograph. We first determined the reference values of PWVao and AIXao in a large (3374 subjects) healthy population aged between 3–18 years, to analyse the physiological background of the observed age-related changes. We also determined the effect of single-bout exercise on aortic stiffness parameters in 108 young male subjects (mean age: 14.2±3.4 years). We investigated relationship between increased arterial stiffness and asymptomatic carotid atherosclerosis (ACA) and also compared central (ao) and local carotid (car) stiffness parameters in 361 patients. Further, we investigated the prognostic information provided by oscillometrically measured PWVao in 4146 healthy subjects during a follow-up period that lasted 5.5 years on average. In the clinical practice we first established a novel method for the continuous, 24-hour ambulatory measurement of stiffness parameters and the applied it to patients with verified obstructive sleep apnea syndrome (OSA).

Results: We found that mean PWVao values increased from 5.5±0.3 to 6.5±0.3 m/s ($p<0.05$) in boys and from 5.6±0.3 to 6.4±0.3 m/s ($p<0.05$) in girls. The increase, however, was not constant, and the values exhibited a flat period between the ages of 3 and 8 years in both genders. Moreover, between the ages of 3 and 8 years, the brachial SBP and mean blood pressures increased continuously and gradually, whereas the PWVao remained unchanged. In young sportsmen we found significant increase of PWVao which was measured after dynamic exercise compared to those values which were measured at rest (8.06±0.55 m/s vs. 5.82±0.14 m/s; $p<0.001$). In patients with ACA PWVao (9.3±1.6 vs 7.9±1.3 m/s, $p<0.001$) and AIXao (27.6±14.6 vs 24.1±14.1%; $p=0.118$) were significantly different than subjects without ACA. In a stepwise logistic regression analysis PWVao (1.88 [1.44; 2.50], $p<0.001$) remained independently associated with ACA. PWVao was associated with a 1.49-fold increased risk for the primary composite endpoint non-fatal MI, stroke or all-cause mortality; the risk for all-cause mortality was increased 1.71-fold.

Conclusion: Our findings encourage practitioners to apply single, serial and 24-hour measurements of arterial stiffness parameters in clinical practice in patients with CV diseases.