

The Importance of Orthostatic Increase in Pulse Wave Velocity in the Diagnosis of Early Vascular Aging

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Abstract

Background/Objectives: Vascular aging can be assessed by arterial stiffness measured through pulse wave velocity (PWV). Increased PWV predicts arterial hypertension, cardiovascular events and all-cause mortality. Detection of early signs of vascular aging remains an unmet problem. To search for the most sensitive markers for the early increase in vascular stiffness in a healthy population. **Methods:** One-hundred and twenty healthy subjects were divided in three equal age groups: <30 years, 30-45 years and >45 years. Head-up tilt test (HUTT) protocol was applied, providing a standardized hydrostatic column height. PWV at the brachial-ankle artery site (baPWV) was measured using a multichannel sphygmomanometer **ABI System 100 PWV** in three positions: in the baseline horizontal (supine) position-baPWVb; during the head tilt-up with an individual angle of inclination-baPWVt; and when returning to supine. **Results:** The most sensitive marker of early stiffness increase in a healthy population is the relative orthostatic increase in baPWV, $\Delta\text{baPWV}/\text{baPWVb}$, where $\Delta\text{baPWV} = \text{baPWVt} - \text{baPWVb}$. The significance of differences in this parameter between the young and elderly groups reached $p = 0.000075$ and $p = 0.000006$, respectively.

Conclusions: The proposed index $\Delta\text{baPWV}/\text{baPWVb}$ can be considered as a promising sensitive early biomarker of vascular aging and as a potential effective indicator in cardiovascular prevention. A longitudinal cohort study is needed to confirm this assumption.

Keywords: arterial hypertension; head-up tilt test; orthostatic increase in vascular stiffness; preclinical orthostatic hemodynamic dysregulation; pulse wave velocity; risk-based prevention; vascular aging; vascular stiffness.