

Stiffening of aortic wall linked with increased risk of high blood pressure

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An analysis of the relationship between several vascular function measures and blood pressure levels finds that certain measures including higher aortic stiffness were associated with a higher risk of new hypertension; however, initial blood pressure was not independently associated with risk of progressive aortic stiffening, suggesting that vascular stiffness may be a precursor rather than the result of hypertension, according to a study in the September 5 issue of *JAMA*.

"Vascular stiffness increases with advancing age and is a major risk factor for age-related morbidity and mortality. A compliant aorta provides an important buffer for each ventricular contraction that maintains pulse pressure at low levels. Stiffening of the aortic wall and improper matching between aortic diameter and flow are associated with unfavorable alterations in pulsatile hemodynamics, including an increase in forward arterial [pressure wave](#) amplitude, which increases pulse pressure," according to background information in the article. "The association between vascular stiffening and blood pressure is particularly interesting because the functional relationship is likely bidirectional. Elevated blood pressure may cause [vascular damage](#) and accelerated conduit artery stiffening. Conversely, aortic stiffening increases pressure pulsatility and therefore affects systolic blood pressure. However, temporal relationships between vascular stiffness and blood pressure remain incompletely elucidated. In particular, whether vascular stiffness antedates [hypertension](#) or vice versa is unclear."

Bernhard M. Kaess, M.D., of the National Heart, Lung, and Blood Institute's [Framingham Heart Study](#), Framingham, Mass., and colleagues the examined temporal relationship between vascular stiffening and blood pressure by evaluating vascular stiffness, central hemodynamics, peripheral blood pressure, and incident hypertension. The investigation was based on the 2 latest examination cycles (cycle 7: 1998-2001;

cycle 8: 2005-2008 [last visit: January 25, 2008]) of the Framingham Offspring study (recruited: 1971-1975). Temporal relationships among blood pressure and 3 measures of vascular stiffness and pressure pulsatility derived from arterial tonometry (carotid-femoral pulse wave velocity [CFPWV], forward wave amplitude [FWA], and augmentation index) were examined over a 7-year period in 1,759 participants (average age, 60 years). The primary outcome measures were blood pressure and incident hypertension during examination cycle 8. The secondary outcomes were CFPVW, FWA, and augmentation index during examination cycle 8.

The researchers found that aortic stiffness, central FWA, and wave reflection were jointly associated with future systolic blood pressure, [pulse pressure](#), and incident hypertension. Initial blood pressure traits were associated with future FWA and augmentation index but not with aortic stiffness assessed by CFPWV.

Brachial artery measures of microvascular resistance and endothelial function were jointly associated with incident hypertension after considering [blood pressure](#) and tonometry variables.

"Our data suggest that aortic stiffness, central pressure pulsatility, peripheral wave reflection, large artery endothelial function, and microvascular function jointly antedate and potentially contribute to the development of clinical hypertension. Arterial stiffness and function may therefore be important potential targets for interventions aimed at preventing incident hypertension," the authors write.

In an accompanying editorial, Debabrata Mukherjee, M.D., M.S., of the Texas Tech University Health Sciences Center, El Paso, writes that the "implications of the study by Kaess et al for prevention may be substantial."

"By concentrating on the underlying drivers of chronic diseases like hypertension and atherosclerosis, clinicians may be able to move from today's sick care system to a true health care system that encourages health and well-being. If prospective studies validate both prevention of hypertension and improved cardiovascular outcomes using lifestyle modifications as well as a combination therapy approach in individuals with [vascular stiffness](#), endothelial dysfunction, or both, before hypertension develops, such a strategy could become a cornerstone of a national preventive strategy."

More information:

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