Arterial age and early vascular aging, but not chronological age, are associated with faster thoracic aortic aneurysm growth

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Background: Among people with thoracic aortic aneurysm (TAA), aneurysm size is an imperfect risk assessment tool, as many dissect before reaching the recommended size for elective repair. This highlights a critical need for improved prediction models in TAA. Prior studies have identified older age and hypertension (HTN) as independent predictors of acute aortic dissection. In this context, assessing arterial age may represent a clinical advantage for risk stratification, as it better reflects aortic health. Thus, we hypothesized that arterial age would correlate to TAA expansion, independently of chronologic age.

Purpose: To evaluate arterial age and early vascular aging (EVA, defined as arterial age greater than chronologic age) as predictors of faster TAA growth, independent of chronologic age and other potential confounders.

Methods: We examined 128 patients consecutively referred to our institution for assessment of TAA. Arterial age was estimated according to published validated equations, using patients’ blood pressure and carotid-femoral pulse wave velocity (from arterial applanation tonometry). Aneurysm growth rate (mm/yr) was retrospectively determined from available imaging studies, blinded to arterial age. Multivariable linear regression determined independent predictors of TAA growth, and multivariable logistic regression assessed whether having EVA was associated with accelerated aneurysm growth (defined as growth > median growth in the sample). Models were adjusted for chronologic age, sex, body surface area, aneurysm etiology, location and baseline size, follow-up time, concordant/discordant nature of the imaging modalities, history of hypertension, diabetes and smoking.

Results: Mean±SD for chronologic and arterial ages were 62±12 and 59±24 years, respectively. Thirty seven percent had EVA, 27% were women, and the ratio of participants with degenerative/heritable forms of TAA was 74/54. Mean baseline TAA size and follow-up time were 45.3±4.0mm and 3.2±3.0 years, respectively. Median (IQR) TAA growth was 0.26 (0.08, 0.86) mm/yr. In multivariable linear regression, older arterial age (β±SE for 5 years: 0.037±0.018, P=0.038) was independently associated with faster TAA growth, while chronologic age was not (P=0.109). In multivariable logistic regression, EVA was associated with a 2.92-fold increase in the odds of having accelerated aneurysm growth (95% CI: 1.10, 7.74, P=0.031).

Conclusion: Arterial age and EVA, reflecting arterial health, are independently associated with accelerated aneurysm expansion. Our results highlight assessment of arterial age, which can be done simply and inexpensively in the office, as a potentially useful tool for risk stratification and disease monitoring in TAA.
Future studies that incorporate arterial age as part of a TAA risk prediction algorithm are needed to translate our findings into clinical practice.