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Genetic and environmental determinants of longitudinal stability of arterial stiffness and wave reflection: a twin study

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Abstract

Background:

We aimed at evaluating the impact of genetic and environmental factors on longitudinal changes in aortic pulse wave velocity (aPWV) and aortic augmentation index (aAIx).

Method:

Three hundred and sixty-eight Italian and Hungarian adult twins (214 monozygotic, 154 dizygotic) underwent repeated evaluations of aPWV and aAIx (TensioMed Arteriograph). Within-individual/cross-wave, cross-twin/within-wave and cross-twin/cross-wave correlations were calculated; bivariate Cholesky models were fitted to calculate additive genetic (*A*), shared environmental (*C*) and unique environmental (*E*) components.

Results:

For both aPWV and aAIx, cross-twin correlations in monozygotic pairs (*r* between 0.35 and 0.56) were all significant and always higher than in dizygotic pairs, both at wave 1 and at wave 2. Heritability and unshared environmental proportion of variance at each wave were substantially time-invariant for aPWV (heritability 0.51, 95% CI 0.36–0.63 at wave 1; 0.49, 95% CI 0.34–0.62 at wave 2), whereas for aAIx, we observed a diminished genetic effect (heritability 0.57, 95% CI 0.45–0.67 at wave 1; 0.37, 95% CI 0.21–0.51 at wave 2). Overlapping genetic factors explained a high proportion (0.88, 95% CI 0.61–1.00) of longitudinal covariance for aPWV, and had a relatively lower impact on aAIx (0.55, 95% CI 0.35–0.70). Genetic correlations of aPWV (r=0.64, 95% CI 0.42–0.85) and aAIx (r= 0.70, 95% CI 0.52–0.87) between waves were lower than 1, suggesting a potential contribution of novel genetic variance on arterial stiffening.

Conclusion:

Changes in aPWV and aAIx over time are largely genetically determined. Our results might stimulate further studies on genetic and epigenetic factors influencing the process of vascular ageing.

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