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Relationship between three-dimensional speckle-tracking echocardiography-derived left ventricular rotation and twist and aortic stiffness

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Introduction: Left ventricular (LV) twist is the wringing motion of the heart, and has an important, but not fully evaluated role in the systolic and diastolic LV function. LV twist is the result of clockwise rotation of the LV base and counterclockwise rotation of the LV apex. It is well-known that stiffening of the aortic wall leads to changes in blood pressures compromising coronary perfusion and LV function. Three-dimensional (3D) speckle-tracking echocardiography (3DSTE) is a new clinical tool with which LV rotational and twist parameters could be quantified non-invasively. The present study was designed to find a relationship between 3DSTE-derived LV rotation and twist and echocardiographic aortic elastic properties in healthy subjects.

Methods: The present study comprised 26 healthy volunteers (mean age: 36.0±11.3 years, 13 men). All subjects had undergone complete 2-dimensional Doppler echocardiographic study extended with aortic stiffness measurements and 3DSTE. From 3D datasets basal and apical LV rotation and LV twist were assessed. Echocardiographic aortic stiffness parameters were calculated from systolic and diastolic ascending aortic diameter and blood pressure data.

Results: Mean aortic strain (0.131±0.094), aortic distensibility (3.61±2.54 cm^2/dynes 10(-6)) and aortic stiffness index (ASI) (4.08±0.79) were in normal range, as well as basal (-2.42±1.43 degrees) and apical LV rotation (8.56±1.43 degrees) and LV twist (11.01±5.19 degrees). Apical LV rotation correlated with aortic distensibility ($r = -0.36$, $p < 0.05$) and ASI ($r = 0.41$, $p < 0.05$), while LV twist showed similar correlation with ASI ($r = 0.42$, $p < 0.05$).

Conclusions: Correlations exist between 3DSTE-derived apical LV rotation and LV twist and echocardiographic aortic elastic properties in healthy volunteers.