Changes of left ventricular rotation from Infancy to Adulthood

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Introduction: Rotation is an important component of left ventricular deformation. We investigated the impact of heart rate and age on the amount and timing of rotation in healthy subjects.

Methods: 158 healthy children (78f, 0-20y, median 9.6y) were investigated with Speckle tracking echocardiography (STE) using apical and basal short axis loops. Data were recorded using a Vivid 7 machine (GE), calculation by dedicated Speckle-tracking software (Echopac). Peak systolic apical (Rotap) and basal rotation (Rotbas) as well as timing (TRotap, TRotbas) of these events were assessed. Statistical analysis was performed using Pearson’s correlation and LMS-method to create percentiles.

Results: There was a strong correlation between TRotap and TRotbas in comparison to heart rate (TRotap: r=-0.7, TRotbas: r=-0.6, p<0.001) and age (TRotap: r=0.6, TRotbas: r=0.5, p<0.001). Throughout all ages counterclockwise Rotap appears before clockwise Rotbas and with higher magnitude in infancy. Normalization to percentage of cardiac cycle results in less decrease of TRotap than TRotbas during maturation. Quantitative Rotap has two peaks in infancy and at the age of 10-12 ys, whereas TRotbas remains relatively constant.

Conclusions: Maturation of the myocardium during childhood strongly correlates with heart rate and age. The delay of timing between apical and basal rotation is higher in infancy whereas timings of all rotational parameters shorten if getting normalized to cardiac cycle length with aging. Creation of percentiles is a valuable tool to follow changes in individual patients especially in case of dyssynchrony.