Abstract:

Full title: LV Energy Loss Throughout Diastole: Relation to Age, Flow Velocity, Cardiac Structure and Function

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Objective: Although LV diastolic filling incurs energy loss (EL), the relation between EL and age or echo parameters in specific diastolic phases remains uncertain. We performed vector flow mapping (VFM) to define the relation of EL to age and diastolic function in normals.

Background: EL is a new hemodynamic metric for assessing the hemodynamic effect of friction produced between flowing blood and myocardial wall shear and represents the sum of squares of the difference between adjacent flow vectors.

Methods: We examined 101 normal adults (37 men): 37 young (20-40 years), 32 middle (41-60 years), and 32 old (61-80 years). Standard echocardiogram and VFM, were performed using a commercial validated algorithm based on color and tissue Doppler. We calculated global diastolic EL in the apical long axis during two diastolic phases: Rapid Filling (RF-EL) and Atrial Contraction (AC-EL), and related them to heart rate (HR), blood pressure (BP), and standard clinical and echocardiographic parameters.

Results: Mean subject age was 48.5 and mean ejection fraction was 61%. Univariate analysis demonstrated a negative correlation between RF-EL and age (r = -0.59) and positive correlation between AC-EL and age (r = 0.59) (all p < 0.001). RF-EL had significant positive correlation to E velocity (r = 0.60), medial and lateral e’ velocity (both r = 0.54) (all p < 0.001). AC-EL had significant positive correlation to A velocity (r = 0.57) and negative correlation to E/A (r = -0.58) and lateral e’ velocity (r = -0.50) (all p < 0.001). No EL value correlated to BSA.

Conclusion: These data define normal values for EL. RF-EL decreases with aging while AC-EL increases, both are unrelated to BSA, LV structure or systolic function. EL relates most closely to transmitral flow velocity. EL may provide a tool to define pathophysiology.