Diastolic Myocardial Mechanics Correlate with Hemodynamics in Obstructive Hypertrophic Cardiomyopathy

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Background Hypertrophic cardiomyopathy (HCM) is characterized by myocardial hypertrophy, fiber disarray and fibrosis interfering with myocardial force generation and relaxation. Since conventional echo-Doppler methods inadequately assess diastolic function in obstructive HCM, we sought to determine LV diastolic mechanics in these patients, and correlate these to invasive hemodynamic diastolic parameters.

Methods We studied 30 patients with obstructive HCM undergoing septal ethanol ablation (SEA). We measured longitudinal and circumferential strain, strain rate (SR), and rotation. To assess early relaxation, early apical reverse rotation fraction (EARRF), related to apical suction, was measured using:

$$EARRF = \frac{\theta_{peak} - \theta_{t(peak)+10\%CL}}{\theta_{peak}}$$; CL denotes cycle length.

To isolate systolic-independent diastolic dysfunction we calculated an early diastolic to systolic strain-rate ratio (SR E/S ratio). Diastolic echo parameters and mechanics were correlated with LV end diastolic pressure (LVEDP) and negative dP/dt measured at the cath-lab prior to SEA.

Results Conventional echo parameters of diastolic dysfunction did not correlate with either LVEDP or –dP/dt. EARRF (figure) correlated with –dP/dt (R=0.73), and SR E/S ratio correlated with LVEDP (R=0.49).

Conclusions In obstructive HCM, biplane mechanics offer an improved estimate of diastolic function. EARFF probably relates to relaxation while SR E/S ratio to filling pressures and myocardial stiffness.