✋ Congenital Cardiology Solutions

ALTERED STRAIN AND TORSION IN PATIENTS WITH LEFT VENTRICULAR NONCOMPACTION: USE OF A NEW TECHNIQUE FOR ANALYZING MYOCARDIAL CONTRACTION AND RELAXATION

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Background: Left ventricular (LV) noncompaction is a cardiomyopathy characterized by prominent trabeculations and deep intertrabecular recesses, with thinning of the epicardium at the apex. Some patients develop intractable failure, fatal ventricular arrhythmias, and LV thrombus with emboli. To test the hypothesis that noncompaction is associated with LV dysfunction, even in asymptomatic patients, we studied controls and patients with noncompaction using traditional 2-D echocardiograms and a novel customized tracking software developed in our laboratory.

Methods: Echocardiograms were performed on 18 patients with LV noncompaction and 15 controls. Ages ranged from newborn to 16 years. M-mode measurements and longitudinal and circumferential strain were obtained using an iE33 machine and Q-Lab (Philips, Andover, MA). Echocardiograms were then evaluated using software written in MATLAB (MathWorks, Natick, MA), capable of tracking individual points and selected groups of points within the LV throughout systole and post-systole. Velocity and strain were measured from a parasternal short-axis view at the base, and when available--at the apex as well. Between 10-50 points from each region were tracked to calculate median velocity of wall motion.

Results: Using commercial software, values for longitudinal and circumferential strain were inconsistent for controls and patients with noncompaction. Using our new software, controls and noncompaction patients with normal systolic function (M-mode), showed clear separation between contractions and relaxation and the contractions comprised 18-19% of the cardiac cycle. In patients with noncompaction and decreased systolic function, contractions were prolonged to 25-40% of the cardiac cycle, and relaxation was prolonged-- at times into the beginning of the next contraction. There was adequate resolution to separate epicardial from myocardial contractions.

Conclusions: Tracking software developed in our laboratory demonstrates both systolic and diastolic dysfunction in noncompaction patients with abnormal systolic function by M-mode. This technique may allow detection of LV dysfunction when patients are still asymptomatic.