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Meeting abstract

2043 Could a novel 3D evaluation of dyssynchrony offer an advantage over a 2D approach? A cardiovascular MRI method for dyssynchrony quantification

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Introduction

Detection of cardiac dyssynchrony is primarily performed by 2D and/or tissue Doppler echocardiography, sampling the myocardium in selected, limitedbasal segments. This technique is currently in its infancy and further demonstrated clinical utility may be limited by technical factors underpinning the imaging modality, not necessarily the physiologic prinicple. Limited approaches for dyssynchrony have been performed by cardiovascular magnetic resonance (CMR) imaging and may serve to help elucidate the beneficial effects of resynchronization.

Hypothesis

We hypothesize that a 3D global assessment of dyssynchrony and the effect of indirect surgical resynnchronization is more sensitive than conventional regional 2D analysis.

Methods

At baseline, 8 patients (47 ± 9 yrs) with mean NYHA Class 2.3 ± 0.5 on optimal medical therapy (maintained throughout the study) underwent 3D CMR to assess LV function. Using Medis Mass software (Leiden, The Netherlands), endo and epicardial boundaries were outlined in multiple contiguous short-axis slices. For each slice the myocardium was circumferentially divided into 16 equally spaced segments. End-systolic (ES) time was automatically identified as time of maximal wall thickening and the dyssynchrony index taken as the dispersion of ES times. Following the baseline CMR, all patients underwent HeartNetTM (Paracor Medical Inc, Sunnyvale, CA), an LV/RV Nitinol epicardial wrap placement designed to thwart cardiac remodeling which we have previously demonstrated to be effective. A follow-up CMR was performed at 6 months. In total >800 data points were generated for each heart (as compared to 6 by standard echocardiography). The dispersion of the ES time was analyzed for pre to post treatment effect for the basal region separately using all measured points and for 4, 6, or 8 equally spaced circumferential regions, each set starting at several offset values, resulting in 11 regional data sets.

Results

All patients survived HeartNet™ placement and were available for follow-up at 6 months. When using all segments in a 3D manner to describe the dispersion of ES time pre to post, a statistically significant change in the dyssynchrony index was observed (254 vs. 220 ms, $p < 0.001$) When assessed using the separate 2D analysis, a pre-post change in dyssynchrony was only detected in 3 out of 11 data series (36%).

Conclusion

By its nature, dyssynchrony is a heterogeneous phenomenon. Following a novel surgical technique to indirectly reduce ventricular dysschrony, a pre to post advantageous treatment effect was detectable when assessed using a 3D CMR approach. However, when restricting measurements to 4, 6, or 8 equally spaced regions (i.e., 2D echocardiography), the chance of detecting the change in dyssynchrony dropped to 36%, indicating that dyschronony and subsequent resynchronization should be assessed using a global 3D as opposed to regional 2D approach, irrespective of assessment modality.