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443
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CARDIAC RESYNCHRONIZATION THERAPY IN 3D USING ELECTROMECHANICAL WAVE IMAGING: A NOVEL NON INVASIVE ULTRASOUND-BASED IMAGING TECHNIQUE

Poster Contributions
Poster Hall, Hall A/B
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Session Title: Biventricular and His Bundle Pacing
Abstract Category: 05. Arrhythmias and Clinical EP: Devices
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Background: Immediate effect of cardiac resynchronization therapy (CRT) after biventricular pacemaker implantation is commonly based on narrowing of the QRS complex. Electromechanical Wave Imaging (EWI) is a high frame-rate ultrasound imaging technique that can provide a 3D ventricular activation map and assess the extent of myocardial resynchronization (MR).

Methods: 8 patients with heart failure, decreased left ventricular ejection fraction (LVEF), and left bundle branch block (LBBB) or RV pacing with planned CRT underwent EWI on the day of implantation with and without CRT. The percentage of MR within 120ms was calculated based on 3D rendered images of EWI results. QRS duration was assessed with 12 lead EKG before and after CRT.

Results: Mean age was 69±4.2 years of age, 75% were male, with mean LVEF of 22±1.7%. Presenting rhythm was sinus with LBBB in 5 patients and RV pacing in 3 patients. There was no significant difference in mean QRS duration with and without CRT (160.8±7.9 ms vs. 142±8.6 ms, p=0.08). There was significant change in MR detected with EWI: mean MR was 52±4.8% without CRT vs. 84.9±4.9% with CRT, p<0.01.

Conclusion: EWI may be an effective tool for 3D quantification of ventricular response to CRT. MR is able to detect immediate changes in ventricular activation patterns that are not reflected in QRS shortening.

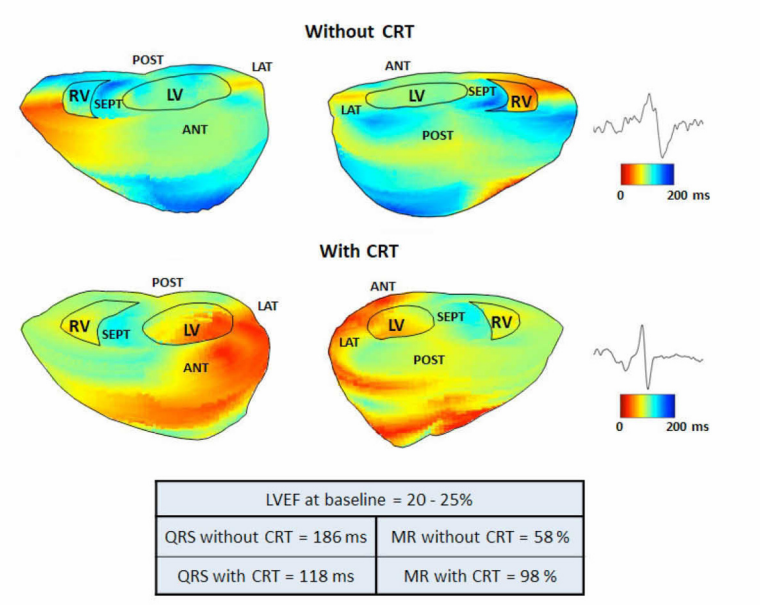

Figure 1: Two 3D rendered EWI isochrones of the same patient with and without CRT. Colors represent the time from QRS onset with red being earliest and blue being latest. ECG obtained during EWI with corresponding color bar is presented with each isochrone. Top images illustrates poor MR without CRT (MR = 58%) while bottom images illustrates good immediate resynchronization (MR = 98%).