Analysis of Cardiac Resynchronization Therapy Device Settings on Dyssynchrony Characteristics Using Non-Invasive Activation Map Reconstruction

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Reconstruction of a realistic map of cardiac ventricular activation may be important when adjusting CRT device settings. This study presents an innovative approach towards the analysis of Cardiac Resynchronization Therapy (CRT) device settings and their impact on dyssynchrony characteristics. Building upon our previously developed algorithm for non-invasive reconstruction of cardiac activation maps using 12-lead electrocardiogram (ECG) and computed tomography data, we focus on the application of this method to Left Bundle Branch Block (LBBB) activation map reconstruction on five patient retrospective data.

Our methodology involves utilizing the reconstructed LBBB activation map to derive parameters for computational models, subsequently using it for the simulation of CRT device pacing. We wonder whether a noninvasive activation map can be used to assess subsequent biventricular stimulation. Using retrospective patient data for different CRT device settings and corresponding ECG, we investigate their effects on dyssynchrony characteristics, aiming to discern optimal configurations for patient-specific treatment. To validate resulting activation map we are compare patient ECGs with different device setting and simulated ECGs.

We are showing that QRS duration biomarker is often doesn't lead to optimal ventricular dyssynchrony. The optimal delay between left and right electrodes using intraventricular dyssynchrony index is depending on LV lead localization. The correlation between patient ECG during biventricular pacing and simulated ECG is **0.77**.

This preliminary study evaluates the feasibility of using non-invasive mapping based on forward ECG problem solving to optimize CRT device parameters. We show that ECG calculated at different device parameters shows high correlation and can be used to adjust the parameters of the CRT device.