**PO-643-07**

**DETERMINATION OF SENSED AND PACED ATRIAL-VENTRICULAR DELAYS IN CARDIAC RESYNCHRONIZATION THERAPY PATIENTS USING ELECTRICAL DYSSYNCHRONY MAPPING**

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**Background:** We hypothesized that electrical resynchronization occurs via wavefront fusion and, if so, then the time delay between atrial-sensed (As)-right ventricular (RV) sensed (AsRVs) and atrial-paced (Ap)-RV sensed (ApRVs) intervals should be identical to the time delay between optimally electrically-synchronized atrial-ventricular delays (AVD) during LV-only pacing (LVp).

**Objective:** To determine electrically optimal sensed AVD (SAVD) and paced AVD (PAVD) in CRT patients using the novel cardiac resynchronization index (CRI) metric, and compare the time difference in SAVD/PAVD to the difference in AsRVs/ApRVs intervals.

**Methods:** CRT patients \(n=40\) with LBBB/IVCD were studied. AsRVs/ApRVs intervals were calculated from intracardiac electrograms (iEGM). Electrical dyssynchrony was measured using a multi-lead ECG system to quantify CRI during LVp. CRI was calculated as % change (compared to native) in area under multiple combinations of anterior/posterior electrograms as compared to native.

**Results:** Peak CRI was 93±5% at SAVD of 109±29 ms and 92±5% at PAVD 170±40 ms. Mean AsRVs and ApRVs intervals were 181±31 ms and 242±42, respectively. Figure 1 shows CRI during As/Ap+LVp at different AVDs. The 68 ms difference between AsRVs and ApRVs by iEGM was identical to the difference in CRI-optimized AVD during As and Ap. Figure 2 shows strong linear correlation (slope 0.98, y-intercept 0.63) between AsRVs/ApRVs time difference and CRI-determined electrically-optimal SAVD/PAVD time difference \((r=0.979, p<0.001)\).

**Conclusion:** The AsRVs/ApRVs time difference is nearly identical to the CRI-determined optimal SAVD/PAVD time difference. This strongly supports the concept of wavefront fusion of native and LV-paced wavefronts during LVp.

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**PO-643-08**

**QUADRIPOLAR LEFT VENTRICULAR LEADS AND ELECTRICAL DYSSYNCHRONY IN HEART FAILURE PATIENTS WITH CARDIAC RESYNCHRONIZATION THERAPY**

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**Background:** Quadripolar left ventricular (LV) leads in cardiac resynchronization therapy (CRT) provide different electrical resynchronization.

**Objective:** To quantify electrical resynchronization when pacing from different quadripolar LV cathodes.

**Methods:** Electrocardiographic data from a 53 lead body surface mapping system in 62 CRT patients with quadripolar LV leads was used to compare cardiac resynchronization index (CRI), a novel metric quantifying electrical resynchronization, between pacing cathodes under otherwise identical pacing conditions. CRI was calculated as the % change in area under multiple combinations of anterior and posterior electrograms as compared to native.

**Results:** CRI changed in dose dependent manner with ventricular-ventricular delay (VVD) changes and varied across cathodes (Figure). Mean absolute difference in CRI of 14.3±10.7% \((p<0.001)\) was found when pacing biventricular or LV-only at the same settings but from different LV pacing cathodes. LV cathodes had optimal VVD that differed by 15.0±18.5 ms for sequential biventricular pacing settings at the same atrial-ventricular delay. Following VVD optimization, the difference in maximal achievable CRI between LV pacing cathodes was 10.7±12.0%. The spacing between LV pacing cathodes was directly related to the absolute difference in CRI when pacing at identical settings from 2 different cathodes. No universally superior cathode position was identified.

**Conclusion:** Electrical synchrony, as measured by CRI, varies greatly with LV pacing cathode. Patient-specific LV pacing vector optimization using CRI in patients with quadripolar leads may be a strategy to improve electrical resynchronization with CRT.