**POSTER PO-643: Posters: Heart Failure at Pod 15**

Friday, April 29, 2022
3:00 PM - 5:00 PM

**PO-643-01**

**ELECTRICAL DYSSYNCHRONY MAPPING IN CARDIAC RESYNCHRONIZATION THERAPY**

Alan J. Bank MD; Christopher Brown; Kevin Burns PhD and Emanuel Espinoza

**Background:** There is no clinical method for measuring electrical dyssynchrony over a wide range of atrial-ventricular delays (AVD) and ventricular-ventricular delays (VVD) in cardiac resynchronization therapy (CRT) patients.

**Objective:** To describe a new methodology, based on wavefront fusion, for mapping electrical synchrony in CRT.

**Methods:** The area between combinations of 9 anterior/9 posterior electrograms (area under curve; AUC) was quantified and cardiac resynchronization index (CRI) was defined as % change in AUC compared to native AUC. CRI was measured in 20 ms steps over a wide range of atrial-RV pace (A-RVp) and atrial-LV pace (A-LVp) intervals in 90 patients 3.4 ± 3.7 years post-CRT to generate electrical dyssynchrony maps (EDM). An optimal synchrony line (OSL) depicted the combination of AVD/VVD producing the highest CRIs.

**Results:** CRI at baseline programming was 54 ± 39%. Patients with complete heart block (n=20) had an OSL parallel to the VV line at short AVD (fusion of RVp and LVp wavefronts), upward curving at intermediate AVD (fusion of native and LVp wavefronts) and vertical at long AVD except for the patients with poor LV lead position (n=6). On average, the LVp wavefront was 38 ± 26 ms behind the RVp wavefront and 87 ± 24 ms behind the native wavefront.

**Conclusion:** We describe a new methodology of EDM for quantifying and graphing electrical synchrony over a wide physiologic range of AVDs/VVDs. This methodology offers a noninvasive, practical, clinical approach for mapping electrical dyssynchrony and optimizing CRT programming.

**PO-643-02**

**CARDIAC RESYNCHRONIZATION THERAPY OPTIMIZATION IN NON-RESPONDERS USING ELECTRICAL DYSSYNCHRONY MAPPING**

Alan J. Bank MD; Christopher Brown; Kevin Burns; Emanuel Espinoza and Matthew D. Olson MD

**Background:** Cardiac resynchronization therapy (CRT) non-response occurs in ~30% of patients. There are no well-accepted methods for optimizing CRT in non-responders.

**Objective:** To assess effects of CRT optimization using electrical dyssynchrony mapping (EDM) on left ventricular (LV) function in CRT non-responders.

**Methods:** We studied 33 patients with underlying LBBB/IVCD who had an EF, 45%, 3.5+/−3.4 years after CRT. The area under the curves (AUC) between 9 anterior/9 posterior electrograms was measured at multiple combinations of atrial-ventricular and ventricular-ventricular delays (AVD, VVD). Electrical dyssynchrony was quantified by cardiac resynchronization index (CRI), calculated as % change in AUC compared to native. EDM depicted CRI over the wide range of settings tested. Patients were programmed to highest CRI setting with echos read blinded pre-optimization and ~6 months post-optimization.

**Results:** EDM (Figure) of nonresponder with LBBB, programmed simultaneous biventricular pacing at AVD 120 ms (CRI 47%) and optimized to LV-only pacing at AVD 110 ms (CRI 95%). EF improved from 21% to 28%. Table shows significant improvements in systolic function, LVEF, global and regional strain and interventricular mechanical dyssynchrony (AVO - PVO) in the study cohort.

**Conclusion:** CRT non-responders are 51% electrically resynchronized at baseline and improve to 90% with CRI-guided optimization. CRT optimization using a novel EDM technology results in significant improvements in LVEF, LVEF, LV global strain in multiple planes, anteroseptal/septal regional strain, and interventricular mechanical dyssynchrony. This methodology offers a non-invasive, practical clinical approach to treating CRT nonresponders.