PO-643-05

TECHNICAL FEASIBILITY OF SEPTAL LEFT VENTRICULAR PACING VIA THE WISE-CRT SYSTEM: AN INITIAL MULTI-CENTRE EXPERIENCE

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Background: The WiSE-CRT system facilitates leadless endocardial LV pacing (via ultrasound-based communication between an electrode and submuscular transmitter) alongside continuous RV pacing to achieve CRT. The electrode has conventionally been placed on the lateral wall of the LV, however placement on the LV septum may allow leadless stimulation of the left bundle branch area.

Objective: To assess the technical feasibility of LV septal pacing using the WiSE-CRT system.

Methods: The WiSE-CRT generator, transmitter and endocardial electrode were implanted in either a single or two-stage procedure. The electrode was implanted on the septum via an inter-atrial trans-septal approach, with femoral venous access, and a Medtronic Flexcath, Boston POLARSHIELD or Acutus AcQGuide steerable sheath.

Results: 7 patients underwent septal electrode implant across 5 centres. Mean age was 65 ± 17 years and 71% were male. Mean LV ejection fraction was 31 ± 6%, 43% were in AF and 86% had non-ischemic aetiology of heart failure. Baseline ECG was LBBB in 43% of cases and RV-paced in 57%. Septal implant was successful and biventricular pacing achieved in all cases. In 4 cases, septal mapping was performed prior to electrode implant to target the left bundle branch. There was 1 pericardial effusion treated with a pericardial drain without further complication. QRS duration narrowed from 186 ± 38 ms at baseline to 145 ± 18 ms during biventricular pacing (P = 0.008). Post-implant fluoroscopy and ECGs from an example patient are shown in figure 1.

Conclusion: LV septal pacing via the WiSE-CRT system is technically feasible. Further work is required to assess the efficacy and safety of this procedure, and the optimal strategy to achieve capture of the conduction system.

PO-643-06

EVALUATION OF ELECTROCARDIOGRAPHIC AND INTRACARDIAC ELECTROGRAM CHARACTERISTICS FOR RESPONSE TO HIS-PURKINJE CONDUCTION SYSTEM PACING IN PATIENTS WITH LEFT BUNDLE BRANCH BLOCK CORRECTED BY HIS BUNDLE PACING

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Background: His-Purkinje conduction system pacing (HPCSP) has been proved to improve clinical outcomes in patients with left bundle branch block (LBBB) and heart failure. However, some patients still remain non-responsive to HPCSP.

Objective: We aimed to evaluate the effect of electrocardiographic and intracardiac electrogram characteristics for response to HPCSP in typical LBBB correctable by HBP.

Methods: Consecutively enrolled patients with typical LBBB and baseline LVEF ≤ 40% from January 2012 to June 2020 who were correctable during HBP and implanted HPCSP. Baseline QRS duration, paced QRS duration, ΔQRSd, H-QRSend and ΔQRSend/H-QRSend were measured during the implantation. A 1-year absolute increase in LVEF ≥ 15% identified super-response to HPCSP.

Results: 123 patients were included in the study (mean age 68.2 ± 10.6 years; male 52.0%). Baseline characteristics of patients with ΔLVEF ≥ 15% (N = 93) and ΔLVEF ≤ 15% (N = 30) were comparable except for larger ΔQRSend/H-QRSend (0.42 ± 0.07 vs 0.35 ± 0.08 ms, p = 0.001), smaller baseline QRS duration (161.9 ± 15.5 vs 172.3 ± 17.4 ms, p = 0.002) and paced QRS duration (100.9 ± 14.9 vs 110.5 ± 13.4 ms, p = 0.002) in patients with ΔLVEF > 15%. Receiver-operating characteristic curve analysis demonstrated that a cut-off value of 0.39 for ΔQRSend/H-QRSend is a novel and important predictor of LVEF increase after HPCSP.

Conclusion: HPCSP delivers favorable echocardiographic response in typical LBBB correctable by HBP. ΔQRSend/H-QRSend is a novel and important predictor of LVEF increase after HPCSP.
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 the curve of multiple paired anterior/posterior electrograms.

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.

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.