PO-643-03

ENDOCARDIAL PACING, HIS BUNDLE PACING AND LEFT BUNDLE BRANCH AREA PACING ACHIEVE SUPERIOR LEFT VENTRICULAR ELECTRICAL RESYNCHRONIZATION COMPARED TO CONVENTIONAL CARDIAC RESYNCHRONIZATION THERAPY

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Background: Endocardial and conduction system pacing are novel methods to deliver CRT and may improve electrical resynchronization over conventional epicardial CRT (CRT-epi). A direct comparison of electrical resynchronization for all the methods of CRT delivery has not yet been performed.

Objective: To compare LV electrical resynchronization during CRT-epi, endocardial pacing (CRT-endo), His bundle pacing (HBP) and left bundle branch area pacing (LBBAP) using electrocardiographic imaging (ECGi).

Methods: 7 patients underwent a temporary CRT and ECGi study. Reconstructed epicardial electrograms from ECGi were used to calculate LV activation time (LVAT) and LV dyssynchrony index (LVDI) [Fig 1A]. Relative changes from baseline were compared using repeated measures ANOVA and post-hoc Tukey’s tests.

Results: Mean patient age was 71 ± 6.6 years and 57% were male. 2 patients had ischemic heart disease, 1 patient had AF and mean LV ejection fraction was 28.7 ± 6.0%. Baseline rhythm was LBBB (4 patients) or RV-pacing (3 patients) with mean QRS duration 157 ± 20 ms. Compared to CRT-epi, there were greater reductions in LVAT during CRT-endo (-48.1 ± 13.1% vs -23.6 ± 11.3%; P = 0.009) and LBBAP (-44.3 ± 12.6%; P = 0.025) and a non-significant trend towards greater LVAT-reduction for HBP (-40.9 ± 13.0%; P = 0.088) [fig 1B]. There were greater reductions in LVDI versus CRT-endo during CRT-epi (-61.0 ± 15.5% vs -20.3 ± 20.0%; P = 0.002), HBP (-47.4 ± 17.7%; P = 0.045) and LBBAP (-55.3 ± 15.3%; P = 0.005) [fig 1C]. There were no differences in LVAT or LVDI between CRT-endo, HBP or LBBAP (P > 0.05).

Conclusion: CRT-endo, HBP and LBBAP provide superior LV electrical resynchronization compared to CRT-epi. Performance was comparable between the novel CRT techniques.

PO-643-04

MULTI-SITE PACING FOR CARDIAC RESYNCHRONIZATION THERAPY: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

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Background: Multi-site pacing (MSP) may provide more rapid LV activation by employing two LV leads during CRT. Randomized studies of MSP have shown conflicting results.

Objective: To perform a systematic review and meta-analysis of RCTs comparing MSP with conventional CRT.

Methods: A literature search was performed up to October 2021 using keywords “multi site pacing”, “triventricular pacing” and “triple site pacing”. Exclusion criteria included observational trials, studies with acute response metrics only, and those where CRT was performed with 2 RV leads + 1 LV lead. 251 unique records were identified, of which 5 met inclusion criteria. Meta-analysis was performed using the Stata 16 software package. Heterogeneity was assessed by the I² index and was considered low, moderate, and high for I² < 30%, 30-60% and >60% respectively.

Results: There was no difference between MSP and conventional biventricular CRT in LV end-systolic volumes at follow-up (mean difference [MD] -1.76 ml, p = 0.80, I² = 0.0%) [fig 1A]. Similarly there was no difference between groups in LV ejection fraction (MD 1.58%, p = 0.50, I² = 72.2%) [fig 1B], or in the proportion of patients in New York Heart Association Class III-IV at follow-up (log odds [OR] ratio 0.21, p = 0.67, I² = 64.4%) [fig 1C]. Mortality rates were comparable between groups (log OR 0.14, p = 0.71, I² = 0.0%) [fig 1D].

Conclusion: This meta-analysis does not support the use of MSP for CRT. However, sub-group analyses were not reported for all studies, and it is possible that MSP may provide benefit in specific patient cohorts.
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=593) 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 presented a sensitivity of 77% and specificity of 76% (AUC=0.776) to predict super-response to HPCSP. At multivariate analysis, larger ΔQRSend/H-QRSend, smaller paced QRS duration and baseline QRS duration remained predictors of super-response 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.