Intra-operative ultra high-frequency ECG in relation to left ventricular reverse remodelling after cardiac resynchronization therapy

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Funding Acknowledgements: Type of funding sources: None.

Aims: Ultra-high-frequency electrocardiography (UHF-ECG) has evolved as a potential tool for the assessment of ventricular dyssynchrony. We sought to determine whether changes in ventricular dyssynchrony at the time of cardiac resynchronization therapy (CRT) device implantation, measured using UHF-ECG, relate to post-implantation left ventricular reverse remodelling (LVRR).

Methods and Results: Patients undergoing CRT (n = 46; aged 70.3 ± 11.2 years; 37/46 male) underwent intra-operative UHF-ECG assessment of ventricular dyssynchrony before and after CRT. Multiple frequency bands (n=16) within the 150 to 1000Hz range were used to create ventricular depolarization maps (Figure). Ventricular dyssynchrony (e-DYS) was assessed using the maximum time difference in ms between the QRS complex centres of mass of leads V1 to V6. Left ventricular reverse remodelling was defined in terms of a reduction in left ventricular end-systolic volume (LVESV) at 3 months post-implantation. During implantation, CRT led to a 103% reduction in e-DYS from 36.6 ms during AAI pacing to 1.4 ms during CRT (P < 0.001). CRT also led to a reduction in QRS duration (from 156.3 ms during AAI pacing to 119.9 ms during CRT [P < 0.001]) and QRS area (from 100.5 ms*mV (or µVs) during AAI pacing to 65.6 ms during CRT [P < 0.001]). In regression analyses, intra-operative Δ e-DYS (ms) was associated with ΔLVESV at 3 months (Figure). In contrast, no associations were observed between intra-operative ΔQRS duration or ΔQRS area and ΔLVESV.

Conclusion: Intra-operative Δ e-DYS derived from UHF-ECG, relates to LVRR after CRT. In contrast, no such relationship emerged for ΔQRS or ΔQRS area.