Left Ventricular Endocardial Pacing: A Direct Comparison Of The Second Generation Of The Novel Wireless CRT System (WiSE-CRT) With The Original System

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Introduction: The WiSE-CRT system is a leadless endocardial pacing system for cardiac Resynchronization therapy. It uses ultrasound technology to transfer energy from a subcutaneously pulse generator (transmitter) to a receiver-electrode implanted on the Left Ventricle (LV) endocardial wall. This converts acoustic energy to an electrical pulse. The original hardware has been revised and Generation 2 system (Gen2) now contains the Model 4100 transmitter. (see table 1). Early data for generation 2 of the system suggested greater efficiency and reduced battery energy requirement to achieve LV capture. A small number of patients have had the generation 1 transmitter explanted and replaced with generation 2 system. We compare and describe energy requirement for LV capture for the 2 systems in these patients

Methods: Patients studied were those who underwent removal of the original system and replacement with Gen 2 at the same intercostal location. Electrode-transmitter distance and pacing parameters were measured post Gen 2 implant and compared with the parameters of the original system immediately prior to explanation.

Result: 16 patients underwent removal of the original system /replacement with Gen 2 at the same intercostal location. Parameters are shown in table 1. There is no conventional direct voltage threshold - Energy requirement for electrical capture is calculated via function of amplitude/ pulse width/ aperture of sound beam, power required per transmit level of the transmitter and efficiency of conversion of battery energy to transmitter energy. Energy required for capture with gen 2 was less for all cases. Mean (SD) was 1.97 (0.98) mJ original vs. 0.62 (0.36) mJ for Gen 2 (p = 0.000048). When corrected for the improved conversion efficiency of Gen 2 transmitter (0.75 v 0.55) this difference remains significant 1.08 mJ v 0.48mJ, (p =0.00037). This demonstrates that the reduced energy requirement for capture is not due to improved energy conversion within the transmitter alone. there was no difference in distance from transmitter to electrode or in superior / inferior angle of beam. However medial-lateral beam angle was reduced by mean 12.9 degrees (p=0.0003). This reduced angulation of the ultrasound beam results in far greater efficiency of energy delivery to the endocardial LV electrode.

Conclusion: Generation 2 of the Wise-CRT system requires far less energy to achieve capture than original system when compared head to head. This increased efficiency exceeds that due solely to improved efficiency of conversion of battery energy to transmitter energy and is likely to reflect other improvements within the 4100 model, including the angulation of the transmitter head that results in a reduction medial-lateral beam angle.