**A PATH TO SAFE MRI SCANNING OF CARDIAC PACEMAKER PATIENTS: A ROLE FOR COMPUTER MODELING**

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Objective: To develop a computer model to evaluate pacemaker lead tip heating (LTH) in the MRI environment via the probability for MRI-induced change in pacing capture threshold (PCT).

Background: Approximately 3 of 4 pacemaker patients will become indicated to receive a MRI but unable to receive one due to contraindications. Safety concerns due to significant change in PCT that are a result from MRI-induced LTH are well-documented. Randomized clinical trials provide evidence of safety and efficacy, but alone are not practical due to the complex environment and multitude of patient, scanner, and pacemaker system configurations.

Methods: To quantify LTH during MRI, a computer model was developed using models of RF coils, 22 human bodies, and pacemaker leads of 100 lead paths. Quantification of LTH was predicted for over 400,000 multivariate combinations at magnet strengths of 1.5 Tesla and up to 2 W/kg specific absorption rate. Additionally, in-vivo canine studies were performed to establish probability for PCT change as a function of RF power.

Results: Testing was performed on the 4074/4574 passive fixation leads and 5086 active fixation lead connected to Medtronic SureScan pacemakers specifically designed for use in MRI. The probability of a 1.0 Volt PCT change during MRI was extremely low for all three leads, <1:20,000.

Conclusion: Computer modeling is able to predict the probability for pacing capture threshold change in the MRI environment, thus allowing for robust assessment of cardiac leads not feasible in clinical studies.