

Bio-Admittance Characterization of Tissue

Published date: July 17, 2012

Technology description

Background

Radio frequency ablation (RFA) is a medical procedure where part of the electrical conduction system of the heart, tumor or other dysfunctional tissue is ablated using the heat generated from the high frequency alternating current to treat a medical disorder.

Invention

This invention relates to methods and devices to measure the bioadmittance and conductance of cardiac tissue providing more specific and controlled RF ablation. Using changes in several biophysical characteristics of cardiac tissue in vitro within 5–15 seconds of the onset of RF energy, the invention's algorithms can be used to predict size of lesion formation. RF energy was applied with a 50% duty cycle to measure heating and cooling behavior of the electrode temperature sensor. Changes in impedance, phase angle, and the resulting resistance and capacitance, power, and electrode temperature variation during RF ablation were analyzed. Results were reported in PACE 2010, vol. 33, p. 1082-1088. A combination of electrical-based parameters measured after onset of RF energy in vitro was found to explain up to ~80% of variability in lesion volume. These correlations were better than any single parameter, particularly impedance and target temperature. It is concluded that a combination of electrical-based parameters provides better correlation with lesion formation than a single parameter and is useful to predict lesion size during RF ablation in vivo.

Market

The Atrial Fibrillation (AFib) market is currently being treated surgically in a small percentage of AFib patients who have concomitant procedures requiring on-pump open-heart surgery. These procedures include mitral and aortic valve repairs and replacements and coronary artery bypass grafting (CABG). According to the studies up to 50% of all patients with mitral valve conditions have preoperative AFib. In 2000, there were 87,000 valve procedures conducted in the US. Worldwide estimates total 347,000. In addition, more than 9% of patients with coronary artery disease have preoperative concurrent AFib. 314,000 patients underwent CABG operations in 2000 in the US. Worldwide estimates total over 628,000. Therefore it is estimated, up to 230.6K patients undergoing open-heart surgery annually have AFib and are candidates for adjunct surgical ablation with an RF probe.

Advantages

There is no currently available technology to accurately predict ablation lesion size within seconds of onset of delivery of radiofrequency (RF) energy.

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