Noncontact Electrophysiologic Imaging of the Heart

Published date: Aug. 28, 2016

Technology description

Background
Sudden cardiac death is a major public health problem and the primary cause of death in the industrialized world claiming over 300,000 lives every year in the United States. It is usually caused by ventricular tachyarrhythmias, an abnormal heart rhythm that originates from the ventricles (the lower chambers of the heart). Another common arrhythmia that originates from the atria (the upper chambers of the heart) and can lead to major complications, including stroke, is atrial fibrillation. The "gold-standard" diagnostic modality in cardiac electrophysiology is cardiac electrophysiologic study. This is an invasive and highly complex procedure, which can be performed only in specialized hospitals by physicians trained in cardiac electrophysiology. This procedure has associated risks of complications, requires significant time and exposure to ionizing radiation (for imaging the wire positions in the heart).
Technology
This invention provides a method and system for noncontact electrophysiologic (electrocardiographic) imaging of the heart. This method uses the magnetization of the cardiac tissues in the external and, preferably, gradient magnetic fields to obtain the spatio-temporal distribution of the electromagnetic field generated by the heart and its dynamics during the cardiac cycle and to calculate the distribution of the electrical currents and electrical potentials generated by the heart during the cardiac cycle. Applying different orientations of the magnetic field gradients and then analyzing the differences results in information that can be used to construct the electrical potentials generated by the heart.

Application area

* Non-contact electrophysiologic imaging of the heart

Advantages

1) Provides the potential for accurate, noncontact (i.e., without the need for attaching multiple ECG electrodes to the surface of the skin) imaging of the cardiac electrical activity.
2) Can either complement or replace invasive cardiac electrophysiologic studies, which are substantially more time-consuming, risky and expensive.

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