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MRI Pre-Scan Method for Imaging Metallic Devices

Technology No. 20180223

IP Status: Pending US Patent; **Application #:** 16/364,382

Measures RF induced currents on metallic leads

A new pre-scan method can measure radio-frequency (RF) induced currents flowing on metallic leads during an MRI excitation. The method first acquires low-power images around a metallic lead (including those used for Deep Brain Stimulation, or DBS) using conventional Gradient Echo Sequence (GRE) accelerated by parallel acquisition (i.e., GRAPPA). Then it analyzes the images and quantifies the magnitude and phase of the RF induced current. To do so, it uses the relative location of the B1+ null with respect to the lead position in axial images. Finally, it models/matches the null location at the vicinity of the lead. The calculated induced current is patient and lead location specific. The measurement can be used to predict safe excitation scenarios, reduce heating around the lead and may also significantly improve image quality.

Accurate and more time efficient

For patients with implanted devices, MRI scans can induce radio-frequency (RF) currents on implanted metallic leads which may critically increase the temperature at the lead tip and impact image quality. Current methods to address these issues include MR-compatible lead designs and MR excitation methods that minimize risk of heating. When combined with a variety of MR sequences, the method can improve the image quality and patient safety in clinical scenarios. The new method is not model based but is achieved in vivo for each particular patient and lead location. In addition, it can be used to calculate worst-case scenarios for lead heating, and replace the need to take temperature measurements.

Phase of Development

- Simulations and in vitro (cadaver) testing.

Benefits

- Patient and lead specific
- Predicts safe MR excitation scenarios
- Reduces heating around the lead
- May significantly improve image quality

Features

- Pre-scan method
- Measures RF induced currents flowing on metallic leads
- Quantifies magnitude and phase of the RF induced current
- Can be used with Deep Brain Stimulation (DBS) implants

Applications

- Deep Brain Stimulation (DBS)
- Metallic brain implants
- Replace lead temperature progression measurement studies
- Testing MR compatibility of implant leads
- Predicting safe excitation scenarios

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Publications

A simple geometric analysis method for measuring and mitigating RF induced currents on Deep Brain Stimulation leads by multichannel transmission/reception
NeuroImage, 2019 Jan 1;184:658-668

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