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Reduced-power SWIFT Magnetic Resonance Imaging (20140052, Dr. Jinjin Zhang, Dr. Garwood)

Technology No. 20140052

Reduces Specific Absorption Rate and Radio Frequency Power

Gradient-Modulated Sweep Imaging with Fourier Transformation (GM-SWIFT) is an extension of SWIFT technology. SWIFT is an MRI pulse sequence that uses nearly simultaneous transmit and receive and frequency swept pulses, to achieve significantly quieter image acquisition. Moreover, it is able to visualize tissues with ultrashort transverse relaxation time (e.g. bone, tendon, meniscus, lung, teeth, and nanoparticles) not achievable by conventional MRI sequences. GM-SWIFT includes arbitrary gradient modulation (vs. constant gradient), which makes implementing SWIFT easier by reducing the requirement on T/R switch rate. The SWIFT MRI pulse sequence and reconstruction uses time-varying gradients in the excitation to offer several benefits:

- Up to 90% reduction in specific absorption rate (SAR) and 70% reduction in the radio frequency (RF) amplitude
- Suppression of halo artifacts that can occur in some SWIFT images due to ultra-short T2 signals
- Up to 45% reduction in scan time while maintaining image quality

SWIFT MRI Enhancements

SWIFT and other imaging can be limited by RF peak power, SAR and excitation bandwidth, which may result in blurring and an inability to resolve some T2 signals in regions of inhomogeneous tissue. GM-SWIFT provides much more flexibility than standard SWIFT, shortening acquisition time and enhancing SWIFT performance in many areas (e.g. dynamic study, T1-contrast generation, multiple-parametric mapping of short T2 tissues, etc.). The time-varying gradient modulation of GM-SWIFT is easier to implement on clinical scanner (due to lower bandwidth during excitation period), offers a much lower SAR and RF amplitude, and has controllable short-T2 sensitivity.

BENEFITS AND FEATURES:

- Enhances SWIFT performance
- Arbitrary gradient modulation; time varying gradient
- Faster scan time; >45% reduction in acquisition time
- Reduction in SAR by nearly 90% and RF amplitude by 70%
- Suppresses halo artifacts in some SWIFT images
- Easier to implement on clinical scanners than standard SWIFT
- Controllable short-T2 sensitivity
- Quiet dynamic contrast enhanced MRI (DCE-MRI) acquisition; in contrast to RUFIS and PETRA, a single scan can be used to generate images of both the time-course of the contrast enhanced images and high resolution spatial images

APPLICATIONS:

- Clinical MRI scanners
- SWIFT applications
- Dynamic contrast enhanced MRI (DEC-MRI) studies
- T1-contrast generation
- Multiple-parametric mapping of short T2 tissues

Phase of Development - Pre-market validation

Researchers

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Publications

Gradient-modulated SWIFT
Magnetic Resonance in Medicine, 2016 Feb;75(2):537-46. doi: 10.1002/mrm.25595. Epub 2015 Mar 20