



Myocardial Viability Functional Assessment

Technology No. 20170172

IP Status: US Patent Issued # 11,500,052

Late Gadolinium Enhancement Contrast Imaging

A magnetic resonance imaging (MRI) method enables imaging with late gadolinium enhancement (LGE) contrast throughout the entire cardiac cycle with high temporal resolution. LGE, the clinical gold standard for assessing focal fibrosis/scars, depicts scar tissue as an enhancement 10-20 minutes after contrast injection. Contrast-agent accumulates in the scar-tissue due to diminished washout and can be visualized using a specific T1-weighted contrast that nulls the signal of the healthy myocardium, which contrasts with the bright scar tissue. However, this contains no information about the functional behavior.

This technology allows assessment of scar tissue in multiple heart-phases and enables characterization of viability and functional properties of the heart simultaneously. The method involves two steps: 1) acquiring dynamic, semi-quantitative longitudinal relaxation maps through an initial inversion pulse and subsequent imaging, and 2) retrospectively synthesizing dynamic LGE images with a retrospectively chosen, virtual inversion time constant for all cardiac phases. The technique generates dynamic cardiac images depicting viability information in a functional manner (i.e., as a movie throughout the heartbeat).

Dynamic Images Through Entire Cardiac Cycle

LGE images are commonly obtained with a single temporal snapshot of the cardiac cycle. However, single temporal snapshot images hamper joint assessment of temporal and functional evaluation of diseased tissue in the myocardium and are prone to misinterpretation in the presence of artifacts. So far, sequence improvements largely focus on improving the quality of the single diastolic temporal snapshots. This new method, however, generates dynamic LGE images depicting the heart in a temporally resolved manner throughout the entire cardiac cycle.

BENEFITS AND FEATURES:

- Enables imaging with late gadolinium enhancement (LGE) contrast

- Images throughout the entire cardiac cycle
- High temporal resolution
- Assesses scar tissue in multiple heart-phases
- Characterizes viability and functional properties of the heart simultaneously
- Generates dynamic cardiac images depicting viability information in a functional manner (i.e., as a movie throughout the heartbeat)
- May shorten scan time and increase temporal resolution

APPLICATIONS:

- Conventional MRI scanners
- Focal fibrosis
- Myocardial infarction/heart attack assessments
- May use in-flow suppression to generate a black-blood contrast

Phase of Development - Pilot scale demonstration

Researchers

Mehmet Akcakaya, PhD

Assistant Professor, Electrical and Computer Engineering, Center for Magnetic Resonance Research

[External Link](http://ece.umn.edu) (ece.umn.edu)

Sebastian Weingartner, PhD

Post-doctoral Fellow, Electrical and Computer, Center for Magnetic Resonance Research

<https://license.umn.edu/product/myocardial-viability-functional-assessment>