Duke | TRANSLATION & COMMERCIALIZATION

Automatic inversion time adjustment method and apparatus using single-line acquisition for T1 assessment combined with automatic compartment detection and compartmental inversion time derivation for inversion-recovery magnetic resonance imaging

Duke File (IDF) Number

IDF #:T-004692

Meet the Inventors

Wendell, David
Jenista, Elizabeth
Kim, Raymond
Rehwald, Wolfgang

Department

Department of Medicine (DOM)(Dept. & CRU)

The field of the invention is Magnetic Resonance Imaging (MRI). The invention greatly simplifies the operation of an MRI scanner by automatically setting the timing parameter 'inversion time' (TI), which currently needs to be manually set by the scanner operator. This automation is applicable to all pulse sequences that employ an inversion-recovery pulse. Such sequences require the TI parameter to be set so that a region of tissue can be selectively suppressed, or "nulled". This disclosure employs myocardial delayed enhancement imaging in the presence of a T1-shortening contrast agent, with viable myocardium is the tissue to be nulled. This technique can be expanded to any region of the body and any conditioning prior to the inversion pulse. The current technique requires finding the optimal TI manually, which can be challenging and time-consuming. Following contrast administration the T1 of blood and tissue is changing as the agent is removed from the blood. therefore, the TI needs to be constantly re-adjusted to obtain the optimal image contrast. In viability imaging, differences in contrast delineate regions of myocardial damage, so improper selection of inversion times could lead to incorrect depiction of damaged tissue which could lead to missed abnormalities or wrong diagnoses. The invention solves this problem by automatic TI adjustment consistingof 1) acquisition of a single data line at a predetermined location, 2) calculation of pixel T1 values along the line, 3) compartment localization along the single line based on T1, 4) calculation of TI, and 5) setting the TI parameter for the subsequent imaging sequence. This is accomplished by a) applying a non-selective IR pulse and acquiring a single line of data repeatedly at specific times relative to the IR pulse, b) calculating the T1 values of each pixel along the line based on data in (a), c) detecting the compartment of interest to be nulled, d) calculating the inversion time to be used for the following imaging sequence.