

Novel Arterial Spin Labeling (ASL) Method with 30 Percent Reduction in Scan Time for Measuring Blood Perfusion and Transit Delay

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PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	8,965,480	02/24/2015	2010-177

BACKGROUND

Reduction in scan time for MRI translates to savings in machine usage and to patient’s comfort by shortening the time to stay motionless.

TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed a novel arterial spin labeling (ASL) method, which achieves significant reduction in total scan time (by ~30 percent) and in sensitivity to subject motion, for measuring blood perfusion and transit delay with MRI. Using the invention method, the measured blood flow is less sensitive to transit delay and does not require additional calibration scans, such as T1 or M₀ measurements. The technology utilizes the resulting attributes of pre-saturation pulse that saturates the imaging slice immediately before the labeling pulse. The pre-saturation pulse causes the tissue signal to recover from zero at the beginning of each repetition time (TR) which in turn results in the following properties:

The tissue signal intensity is independent of TR, thus shorter TR can be used for scans with short post-labeling delays (PLD, the time between the end of labeling pulse and the beginning of data acquisition) and TR can be increased as PLD increases. The tissue signal intensity at each PLD follows a saturation recovery curve determined by the tissue T₁; thus T₁ and M₀ can be estimated by using the equation below without the need for scans for T₁ measurement and scans for estimating M₀, and coil sensitivities.

$$S(t) = M_0(1 - e^{-t/T_1})$$

Where t is the acquisition time after the pre-saturation,

which is T+PLD, and T is the labeling duration.

APPLICATIONS

The technology is applicable to all pulse (such as FAIR and PICORE) and pseudo-continuous ASL (PCASL) for perfusion imaging for vascular, tumor, infectious, or inflammatory diseases involving wide spread of transit delay.

ADVANTAGES

Significant reduction in total scan time (by ~30 percent) and sensitivity to subject motion.

STATE OF DEVELOPMENT

The technology has been tested on several human subjects.

RELATED MATERIALS

Available upon request.

- K. Lu, T. T. Liu, and Y. Jung, Arterial Transit Delay Measurement Using Pseudo-Continuous ASL with Variable TR and Interleaved Post-Labeling Delays, 2010. ISMRM 18th Annual Meeting Abstract #4663 and Corresponding Poster.

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OTHER INFORMATION

KEYWORDS

MRI, fMRI, FAIR, PICORE, ASL,
PCASL, perfusion imaging

CATEGORIZED AS

- **Imaging**
- Medical
- **Medical**
- Diagnostics

RELATED CASES

2010-177-0

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