

A Novel Method to Increase the Perfusion Signal to Noise Ratio (SNR) in Velocity Selective Arterial Spin Labeling for MRI

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BACKGROUND

The ideal velocity selective arterial (ASL) method for MRI is one in which the tagging is: (1) continuous, (2) inverts blood, and (3) occurs right at the arterioles before the blood enters the capillary bed and tissue. An inherent advantage of velocity selective arterial spin labeling (VSASL) technique over other ASL methods is property #3—the tagging occurs all the way down the arterial tree to small arterioles, therefore intrinsically insensitive to transit delays and is useful in applications where transit delay can be long, such as perfusion imaging in white matter, and in stroke.

TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed a VSASL method to address the first property. In conventional VSASL, the tagging of arterial blood is applied once before imaging and the tagged blood undergoes uniform T1 decay prior to image acquisition. If two or more VSS modules are used, some of the recovered tagged blood will be saturated again at a later time. Multiple VSS modules produces tagging that more closely approximates the ideal situation of being continuous. The tagged blood is therefore closer to saturation at the time of image acquisition, resulting in the improvement of overall tagging efficiency and the signal to noise ratio (SNR). Using two VSS results in an increase of SNR by approximately 20 percent when compared to one VSS module. The UC San Diego method makes VSASL SNR competitive with other ASL methods, while maintaining the inherent insensitivity to transit delays.

ADVANTAGES

MR imaging of perfusion using VSASL with higher SNR, resulting in shorter scan times and/or higher resolution.

STATE OF DEVELOPMENT

The basic principles have been demonstrated with human volunteers. Inventors are currently working on parameter optimization.

APPLICATIONS

Imaging of perfusion in cerebrovascular disease including, but not limited to, stroke, TIA, carotid stenosis, and moyamoya syndrome.

RELATED MATERIALS

- ▶ Eric C. Wong, Matthew Cronin, Wen-Chau Wu, Ben Inglis, Lawrence R. Frank, and Thomas T. Liu, Velocity-Selective Arterial Spin Labeling, *Magnetic Resonance in Medicine* 55:1334-1341 (2006).
- ▶ Guo J, Wong, Increased Tagging Efficiency in Velocity Selective ASL Using Multiple Velocity Selective Saturation Modules, EC, 2011. ISMRM 19th Annual Meeting, Abstract #296.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	9,063,204	06/23/2015	2011-312

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OTHER INFORMATION

KEYWORDS

velocity selective arterial (ASL),
velocity selective arterial spin labeling
(VSASL), MRI, imaging, stroke, TIA,
carotid stenosis, moyamoya
syndrome

CATEGORIZED AS

- ▶ **Medical**
 - ▶ Diagnostics
 - ▶ Disease: Central Nervous System

RELATED CASES

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