

FULL DESCRIPTION

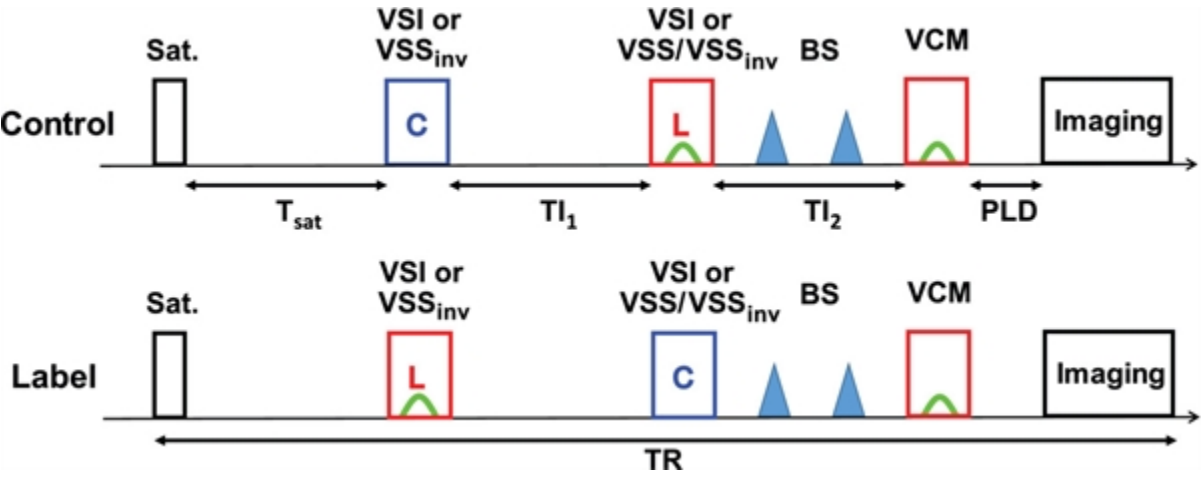
Background

Velocity selective arterial spin labeling (VSASL) is a category of arterial spin labeling (ASL) methods that label arterial blood based on its velocity. VSASL is insensitive to arterial transit time (ATT) effects and has a signal-to-noise ratio (SNR) advantage when arterial blood supply is significantly delayed. VSASL can be performed with VS saturation (VSS) or VS inversion (VSI) labeling. Despite the advances in VSASL methods two major challenges remain:

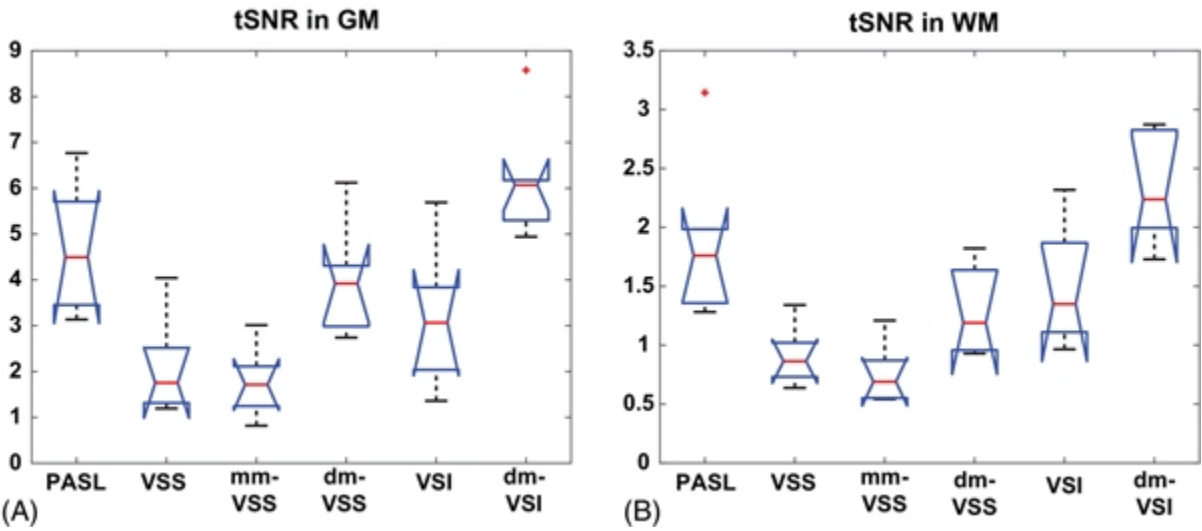
- ▶ labeling efficiency is relatively low; and,
- ▶ artifacts compromise the robustness and accuracy of VSASL.

Technology

Prof. Jia Guo has developed a novel, dual-module labeling strategy (dm-VSASL) to address the major challenges presented above. dm-VSASL is applicable with VSS and VSI labeling modules and their combinations. The two modules are designed to have more balanced gradient configuration under the label and control conditions to compensate for eddy current and diffusion attenuation effects.



The new dual-module VSASL scheme, where the VS modules under the control conditions are labeled with C (blue) and the ones under the label condition are labeled with L (red) with green shapes representing flow sensitive gradient pulses. The pulse sequence on the top is for acquiring a control image and the one on the bottom is for acquiring a label image. T_{I1} and T_{I2} are the time between the 2 VS modules and between the second VS module and vascular crushing module (VCM). Other abbreviations are BS - background suppression, PLD - post labeling delay and VSS_{inv} - velocity selective saturation that can invert stationary magnetization.



Comparison boxplots of the averaged temporal SNR in the gray matter (GM) and white matter (WM) regions of interest.

ADVANTAGES

The **unique aspects** of this technology - dm-VSASL based MRI imaging solution are:

- ▶ Insensitive to transit delay artefacts that challenge conventional ASL methods.
- ▶ Doubles the tempoal SNR of perfusion imaging compared to the state of the art VSASL methods.
- ▶ Significantly reduces artefacts from cerebrospinal fluids and provides a more accurate perfusion measurement.

Benefits

- ▶ Significantly improved SNR and quantification accuracy.
- ▶ Reduction of imaging cost by reducing scan time.
- ▶ Increased throughput in hospital and imaging labs.
- ▶ Improves diagnostic accuracy and confidence.

STATE OF DEVELOPMENT

The dm-VSASL technology has been successfully implemented into a prototype pulse sequence on an MRI platform and tested on healthy human subjects. The preliminary in-vivo data confirms the temporal SNR improvement.

The team is actively seeking collaboration partners to further the pulse sequence developmnt and for commercial ready development.

SUGGESTED USES

Non-invasive, perfusion imaging using MRI machines.

RELATED MATERIALS

- ▶ [Robust dual-module velocity-selective arterial spin labeling \(dm-VSASL\) with velocity-selective saturation and inversion](#)

INFORMATION

- ▶ Please review [all inventions](#) by Prof. Guo and team at the University of California.
- ▶ Please visit [Prof. Guo's profile page](#) to learn more about this research.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,282,080	04/22/2025	2022-878

RELATED TECHNOLOGIES

- ▶ [Improving Perfusion Magnetic Resonance Imaging Using Ultra-Fast Arterial Spin Labeling](#)

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