



## Single-Shot Vascular MR Imaging Without Contrast Agent

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**The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a method for non-contrast-enhanced magnetic resonance angiography and venography that can be performed within a single cardiac cycle.**

### Overview

Acquiring diagnostic images of a patient's vasculature can be difficult and time consuming. Some magnetic resonance imaging (MRI) techniques employ contrast-enhancing agents, such as gadolinium, that can be injected into the subject just prior to scanning to improve image quality. The agent's concentrated mass (or bolus) then must be tracked through the vasculature.

Even if the bolus can be tracked, such contrast-enhanced approaches provide only a short imaging window. Also, some agents may cause discomfort, pain, renal impairment and disorders like fibrosis of the skin, joints and organs.

Due to these drawbacks, non-contrast-enhanced MR techniques have been explored for angiography (MRA) and venography (MRV). Still, the process can take too long, be sensitive to motion and suffer from flow artifacts within vessel segments. One technique called quiescent-interval single-shot (QISS) MRA works for arteries but cannot provide venous imaging. Furthermore, QISS MRA may have trouble visualizing arteries that follow complex pathways or run counter to the image slice acquisition order.

### The Invention

UW-Madison researchers have developed a non-contrast-enhanced MR angiography and venography (MRAV) method that can acquire arterial-specific signals in one imaging slice and venous-specific signals in another slice during a single cardiac cycle.

In the MRAV approach, radio frequency (RF) saturation pulses may be applied to one or more slabs to selectively suppress MR signals flowing into a selected imaging slice. In this way, the pulses may be selected and timed to suppress venous blood signals in an arterial imaging slice, or to suppress arterial blood signals in a venous imaging slice.

The RF saturation pulses and single-shot acquisitions may be timed to occur during substantially steady state inflow into the respective imaging slice.

### Applications

- Non-contrast-enhanced MR angiography and venography

### Key Benefits

- Improved diagnostics
- Fast and clear imaging of veins and arteries
- No invasive contrast agent

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- Enables acquisition of directionally-opposed arterial and venous signals within a single cardiac cycle
- Insensitive to blood flow velocities, patient motion and other imaging artifacts
- Visualizes vein anatomy and complex vessel pathways
- Suited to any anatomical location, especially long arm and leg vessels

## Additional Information

### Related Technologies

- [WARF reference number P97087US describes a method for performing contrast-enhanced MRA with improved image quality.](#)

### Tech Fields

- [Medical Imaging : MRI](#)

For current licensing status, please contact Jeanine Burmania at [jeanine@warf.org](mailto:jeanine@warf.org) or 608-960-9846

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