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Meeting abstract

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2112 Starburst MR venography

Robert R Edelman* and Ioannis Koktzoglou

Address: Evanston Northwestern Healthcare, Evanston, IL, USA
* Corresponding author

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Introduction

A novel non-contrast method is described for creating magnetic resonance (MR) angiograms based on the distinctive relation properties and flow characteristics of blood. The method, called STARBURST (Selectively Targeted Angiographic Rendering using Blood's Unique Relaxation properties and Subtraction Technique), can be used to image both veins and arteries together, arteries alone, or veins alone, without substantial signal contributions from other tissues.

Purpose

In this study, we demonstrate the feasibility of high resolution MR venography of the lower extremities with suppression of arterial signal and without the need for contrast administration.

Methods

The study was approved by the hospital Institutional Review Board. Imaging was performed on a 1.5 Tesla Siemens Avanto MR system with 32 channels. A peripheral array coil was used for imaging the lower extremities. The STARBURST method involves the complex subtraction of two acquisitions, in one of which tissue spins within the volume of interest undergo an inversion preparation using an adiabatic pulse. Data are acquired with a true-FISP sequence. An inflow period of 1400 msec allows inverted arterial spins within the volume to be replaced by fresh, fully magnetized spins. The delay of 1400 msec also allows for nearly complete recovery of the longitudinal magnetization of fat spins. Arterial, muscle, and fat spins have comparable signal intensity for both acquisitions and cancel with complex image subtraction, leaving only the signal from venous spins. Typical spatial resolution was approximately 2.0 mm × 1.7 mm × 1.7 mm which was interpolated to 1.0 mm × 0.9 mm × 0.9 mm. Data were acquired in a direct coronal or sagittal plane with scan times of approximately seven minutes for a high resolution 3D acquisition.

Results

The resultant images demonstrate the entire venous system with consistent visualization of submillimeter venous branches. Of interest was the fact that the subtracted images demonstrated no evidence of trueFISP banding artifacts that were of variable severity on the source images. An example from a healthy volunteer is given in Figure 1. In this example, data were acquired in a coronal orientation. However, the inversion was selectively applied to the right thigh, so that only the veins on this side are visualized.

Conclusion

STARBURST provides a new method for performing high resolution MR venography with unmatched detail. Image quality is far superior to that obtained with 2D time-of-flight methods and is independent of venous flow rate. Moreover, vessel detail is comparable to high dose contrast-enhanced MR angiography, but with the added capability of imaging veins without arterial contamination.

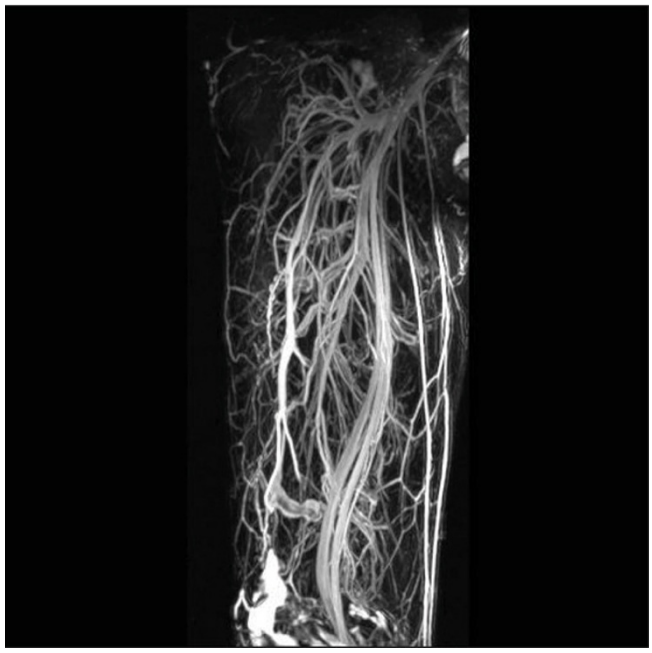

Figure 1
STARBURST is a novel method for selective non-contrast MR angiography of arteries or veins. We demonstrate the feasibility of high resolution MR venography of the lower extremities with detailed matched only by high dose contrast-enhanced techniques.