Susceptibility Weighted Magnetic Resonance Imaging for Single-scan MR Angiography and Venography

Category

Technology: Medical Devices – Diagnostic and Bioanalytic

Problem

Current MRI for arterial and venous vasculature is acquired in separate scans with low resolution.

Technology Overview

Simultaneous data acquisition of arterial and venous vasculature with improved image quality.

IP Status

- Patent issued
- Available for Exclusive Licensing

Value Proposition

- Simultaneous display of venous and arterial vasculature
- Effective detection of venous vasculature
- Improved image quality

Market Attractions

- MRI market of $6.285 billion in 2018
- CAGR of 1.02%
- Strong market drivers of increased incidence of cardiac, neurological, and GI disease

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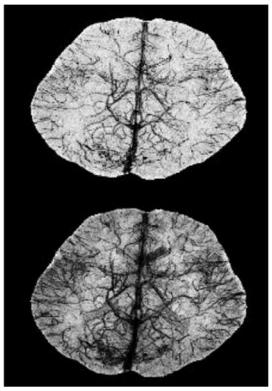
Problem: Currently, magnetic resonance (MR) data for the imaging of arterial and venous vasculature must be acquired in separate scans – MR angiography (MRA) must be used to acquire arterial vasculature data and MR venography (MRV) must be used to acquire venous vasculature data. The time to perform either a MRA or a MRV scan may be relatively long, lasting approximately 10-20 minutes; these long scan times may cause patient discomfort as well as errors in data acquisition. Furthermore, conventional MR imaging of venous vasculature is displayed using minimum intensity projection (mIP). This method has several disadvantages such as certain veins being not detectable or visible and venous segments in some peripheral regions becoming lost during the display. These and other issues create the strong need for the simultaneous acquisition of both MRA and MRV data in a single scan session that also can enhance the visibility of vasculature data.

Solution: Yiping Du at the University of Colorado has created a new technique for MR imaging of venous vasculature enabling the simultaneous data acquisition of both arterial and venous vasculature in a single scan using a dual-echo acquisition approach. Using this approach, the data for both arterial and venous vasculature are acquired without increasing the scan time. Dr. Du has also developed an image-domain high-pass filter for enhancing the visibility of venous vasculature. The filtered 3D dataset can be used to provide a positive venous contrast and can be displayed using maximum intensity projection (MIP) which allows for background density of nearly zero and highlighted venous vasculature.



Studies have shown that the high resolution image is far superior to the mIP of the 3D phase mask with the regular resolution (figure). Furthermore, Dr. Du has improved upon his previous technology by presenting an echo-sharing approach and a view-sharing technique to improve the image quality, along with other advancements that can further reduce scan time in muti-slab acquisition.

Advantages and Value Propositions

This technology provides positive contrast of venous vasculature, effective detection and display of the venous vasculature, effective detection and display of the venous vasculature in peripheral regions, and the simultaneous display of both arterial and venous vasculature (displayed in different colors for differentiation). The United States MRI market was USD 6.285 Billion in 2018 and is projected to grow at a CAGR of 1.02% to USD 6.678 Billion in 2024.

Additional Documents and Sources:

"Susceptibility Weighted Magnetic Resonance Imaging of Venous Vasculature." U.S. 8,674,691 issued [March, 18], 2014; available under NDA.

"Multi-Echo Acquisition of MR Angiography and Venography of Brain at 3 Tesla." J Magn Reson Imaging. 2009 Aug; 30(2):449-54. PDF available upon request.

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