THE MRI INSTITUTE

NEUROVASCULAR IMAGING CENTER OF EXCELLENCE (NICE)

A FOCUS ON MULTIPLE SCLEROSIS (MS)

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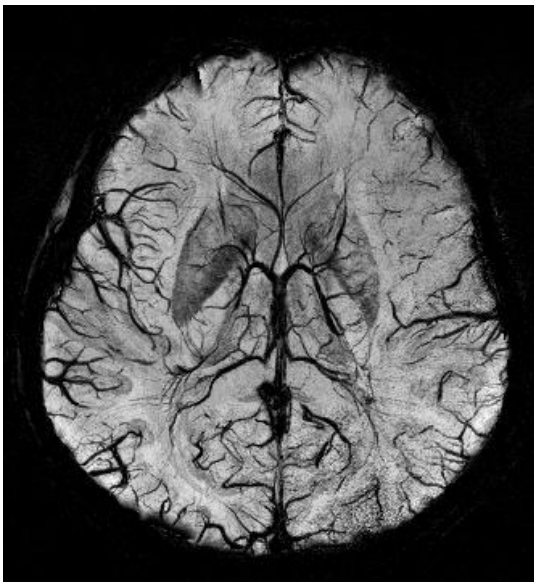
THE PROMISE OF SUSCEPTIBLITY WEIGHTED IMAGING (SWI)

SWI and other new MRI imaging techniques are superior to conventional scans for the diagnosis and monitoring of neurovascular structures and processes. These special data acquisition and image processing methods produce an enhanced contrast magnitude image which is exquisitely sensitive to venous blood, hemorrhage, and iron deposition. The result is finer differentiation of tissues, better visualization of boundaries, and more detailed characterization of vascular structures.

ABOUT THE CENTER



SWI

The Neurovascular Imaging Center of Excellence (NICE) develops new diagnostic tools for neurological and vascular disease through the application of innovative magnetic resonance imaging (MRI) techniques. Using a powerful imaging protocol, which includes Susceptibility Weighted Imaging (SWI), Perfusion Weighed Imaging (PWI), and Diffusion Tensor Imaging (DTI) the Center brings together researchers and clinicians investigating a variety of pathologies, including stroke, brain tumors, vascular dementia, and multiple sclerosis.

Together with its partners, the Center is building the world's largest SWI imaging database for neurovascular diseases. It is also actively leading new research and education projects to leverage SWI's advantages for clinical practice and the development of new treatments. The Center is coordinated by the Magnetic Resonance Imaging Institute for Biomedical Research, which is led by Dr. E. Mark Haacke, a world-renowned scientist in the development of new MRI techniques. There are presently many major medical institutions worldwide collaborating with the Center.

CURRENT PROJECTS

- **Multiple Sclerosis:** SWI provides more detailed characterization of lesions and also detects iron deposits — a finding that might lead to a better understanding of the etiology of the disease and to new treatments for MS and other neurodegenerative diseases.
- **Stroke:** Combined with other new MRI techniques, SWI permits clinicians to diagnose strokes more accurately than other available imaging methods, enabling them to quickly identify the most effective interventions, treatments, and rehabilitation protocols.
- **Vascular Dementia and Aging:** SWI can identify and track the progression of small "micro" hemorrhages in the brain, providing a highly sensitive mechanism to follow the progression of dementia and monitor the effectiveness of treatment interventions.
- **Atherosclerosis:** The Center is currently investigating the role of SWI in detecting atherosclerosis or vessel wall disease. SWI has the potential to clearly separate normal vessel wall from fiborous plaque, fatty plaque, hemorrhagic plaque, and calcified plaque.
- **Traumatic Brain Injury:** Conventional MRI misses up to half of neurotrauma injuries in the brain. SWI offers a more sensitive means to detect shearing and subtle forms of hemorrhage. This allows clinicians to quickly identify the most effective interventions, treatments, and rehabilitation protocols.
- **Brain Tumors:** The enhanced sensitivity of SWI to blood products allows for better contrast in detecting tumor boundaries and hemorrhage, significantly improving its usefulness for diagnosis and treatment decision-making over conventional MRI.

For these and other pathologies, the development of SWI biomarkers also has the potential to speed clinical trials and permit faster evaluations of treatment efficacy. SWI biomarkers could save billions of dollars and accelerate medical progress.

MULTIPLE SCLEROSIS (MS) RESEARCH

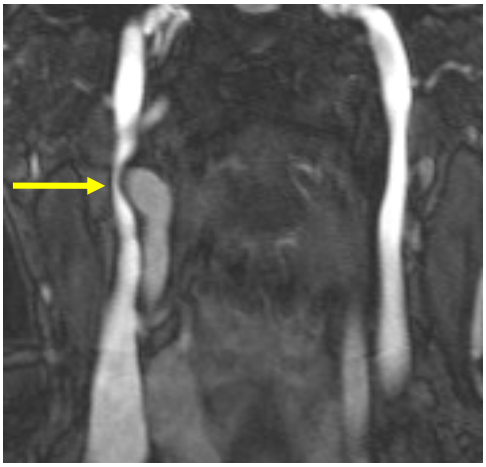
MEETING THE CHALLENGE

The clinical potential of SWI combined with other new MRI imaging techniques is well documented, but fully realizing their benefits will require extensive collaboration, data-sharing, and research by scientists and clinical investigators around the world. The Neurovascular Imaging Center of Excellence (NICE) was founded to meet these challenges by building the world's largest SWI imaging database, facilitating translational research, and providing support for training and education programs.

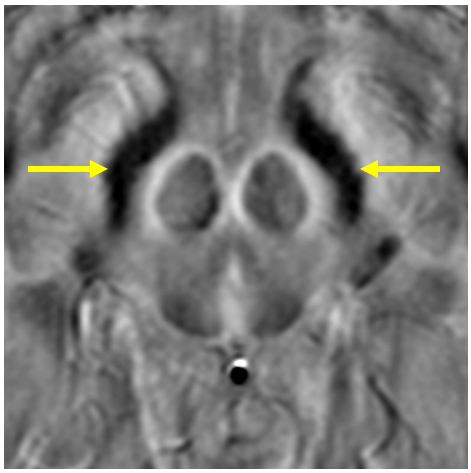
Chronic Cerebral Spinal Venous Insufficiency (CCSVI) is a theory proposed by Dr. Paolo Zamboni that suggests the source of MS is stenotic veins leading to abnormal blood flow in the brain or in the spine or both. Susceptibility Weighted Imaging (SWI), a method developed by Dr. Haacke, has shown vascular abnormalities and iron build up in the central venous drainage system in MS. His theory is that this iron build up represents the level of vascular endothelial damage caused by CCSVI.

THE CCSVI / SWI MRI PROTOCOL

In order to fully assess the theory of CCSVI using imaging, the following information would be ideal: an MR venogram of the head and neck, flow quantification (FQ) of the dural venous sinuses, jugular veins and azygous veins; perfusion measurements, and possibly oxygen saturation measurements. Ultrasound is also an important imaging method to evaluate flow and valvular function. To study the vascular problems, the damage to the tissue, abnormal perfusion and iron quantification, the following MR scanning procedures should be run: time resolved MRA of the head and neck, flow quantification, perfusion weighted imaging (PWI) and susceptibility weighted imaging (SWI).



An example of a pinched jugular vein



Iron buildup in the substantia nigra

HOW YOU CAN HELP

DONATE:

As a 501(c)(3) organization, the Center depends on contributions from donors to fund its activities. We gratefully invite organizations and individuals interested in supporting our vital mission to make a tax deductible contribution at any time via Paypal at the following link: http://mrimaging.com/donate.html

ADVISE:

We are currently assembling expert advisory boards to help guide new research on major pathologies and ensure the effective deployment of the international database. Researchers and organizations with relevant expertise in the imaging of these pathologies are invited to contact us to find out how they can be of help.

COLLABORATE:

Researchers and institutions interested in collaborating with the Center or The MRI Institute are encouraged to contact us at any time.

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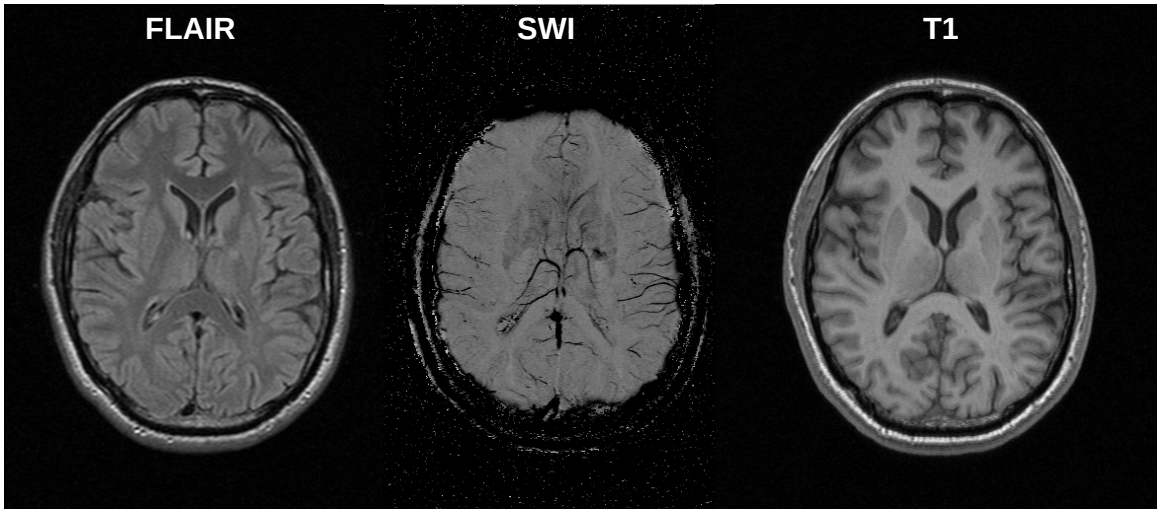
SWI IN CLINICAL PRACTICE

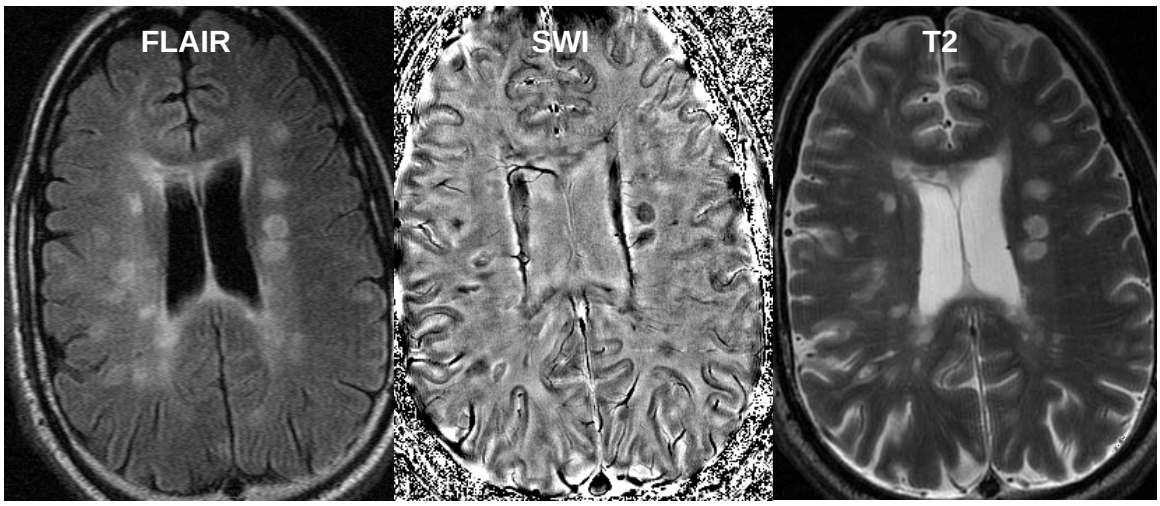
STROKE

MR imaging is a powerful means to image stroke. In the past SWI has agreed well with areas shown to be affected by diffusion weighted imaging. But there are those cases where the concentration of iron is so small that only one method picks up the location of the bleed — SWI.



MULTIPLE SCLEROSIS

Multiple sclerosis is thought to be associated with iron build up. SWI is able to clearly show this. Higher iron build up may indicate greater tissue damage in lesions. In the SWI data the lesions with high iron content are shown as dark in the filtered phase image (middle).



TRAUMA

Half of trauma is invisible to most imaging methods. SWI now finds much more of the trauma that was missed previously with conventional imaging methods. The image on the left is a conventional gradient echo image, the middle image is from an SWI dataset, and the image on the right is a T1 post contrast. SWI shows tears in the veins, particularly a large one in the septal vein, and several other tears in smaller veins. Knowledge of bleeding is important for a proper diagnosis of the damage done to the patient.