

Myelin imaging in clinical practice

How knowledge of the degree of myelination can aid in diagnosis and monitoring of disease severity.

"This represents just the beginning of what synthetic MRI has to offer."



David Lefkowitz, M.D.
Medical Director of MRI
SimonMed Imaging

Dr. Lefkowitz has been at SimonMed Imaging since 2008, having previously held positions at Creighton University and The University of Maryland. Topics of interest for Dr. Lekfowitz have included stroke imaging, brain tumor imaging, multi-modality image co-registration, spectroscopic imaging, fiber tractography, resting state functional connectivity, and machine learning.

Myelin

Myelin is one of the most important components of the brain; insulating nerve cell axons to ensure healthy brain development and functionality. Delayed myelination, or loss of myelin, can be a sign of - or contributor to - developmental delay, brain atrophy and dysfunction.

Conventional clinical MR sequences (e.g. T1W, T2W, FLAIR etc.) lack the proper contrast to accurately distinguish between different myelin diseases or disorders. Access to accurate and quantitative myelin mapping metrics can therefore aid in initial diagnoses and provides a tool for more objective assessment, follow up and monitoring of disease progression and treatment efficacy.

As important as myelin is, however, there is currently a lack of quantitative myelin mapping techniques for routine clinical use. Enter SyMRI®, the world's first regulatory cleared rapid, accurate myelin mapping solution.

About SimonMed Imaging

SimonMed Imaging is one of the largest outpatient medical imaging providers and largest physician radiology practices in the United States. SimonMed's practice consists of over 200 highly experienced subspecialty-trained radiologists, and operate across 9 states with over 150 accredited facilities that are ACR-RADSITE certified with certified technologists and equipment. SimonMed specialize in using the newest diagnostic imaging technologies and bringing them to the community in an affordable and accessible way.

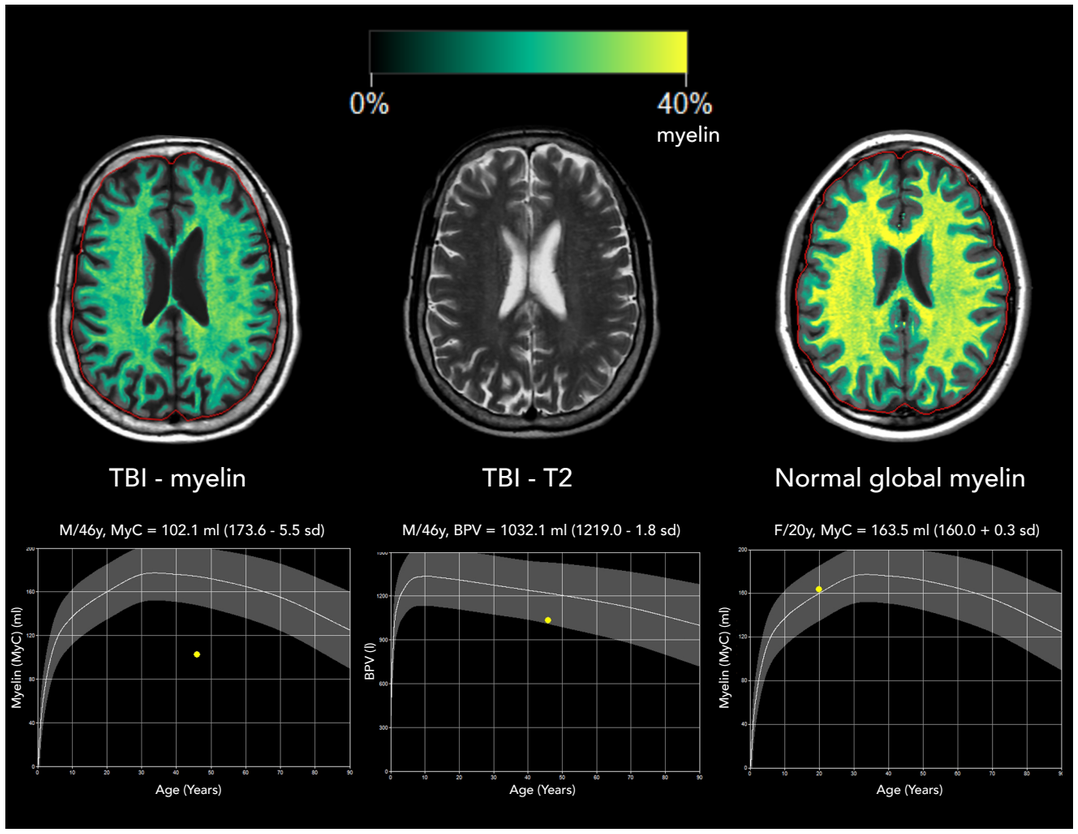
SyntheticMR

SyMRI: Accurate myelin detection with one rapid scan

Myelin correlated volumes can be easily be integrated into clinical routine using SyMRI. Using a single 4-6 minute scan, SyMRI measures the absolute tissue properties (T1,T2 and PD) of the brain. Based on that, it can calculate myelin correlated volumes, as well as whole-brain volumes of white matter, gray matter, cerebrospinal fluid and brain parenchymal fraction. The myelin-correlated volumes are CE-marked, FDA cleared and have been validated in several histological and in-vivo studies.

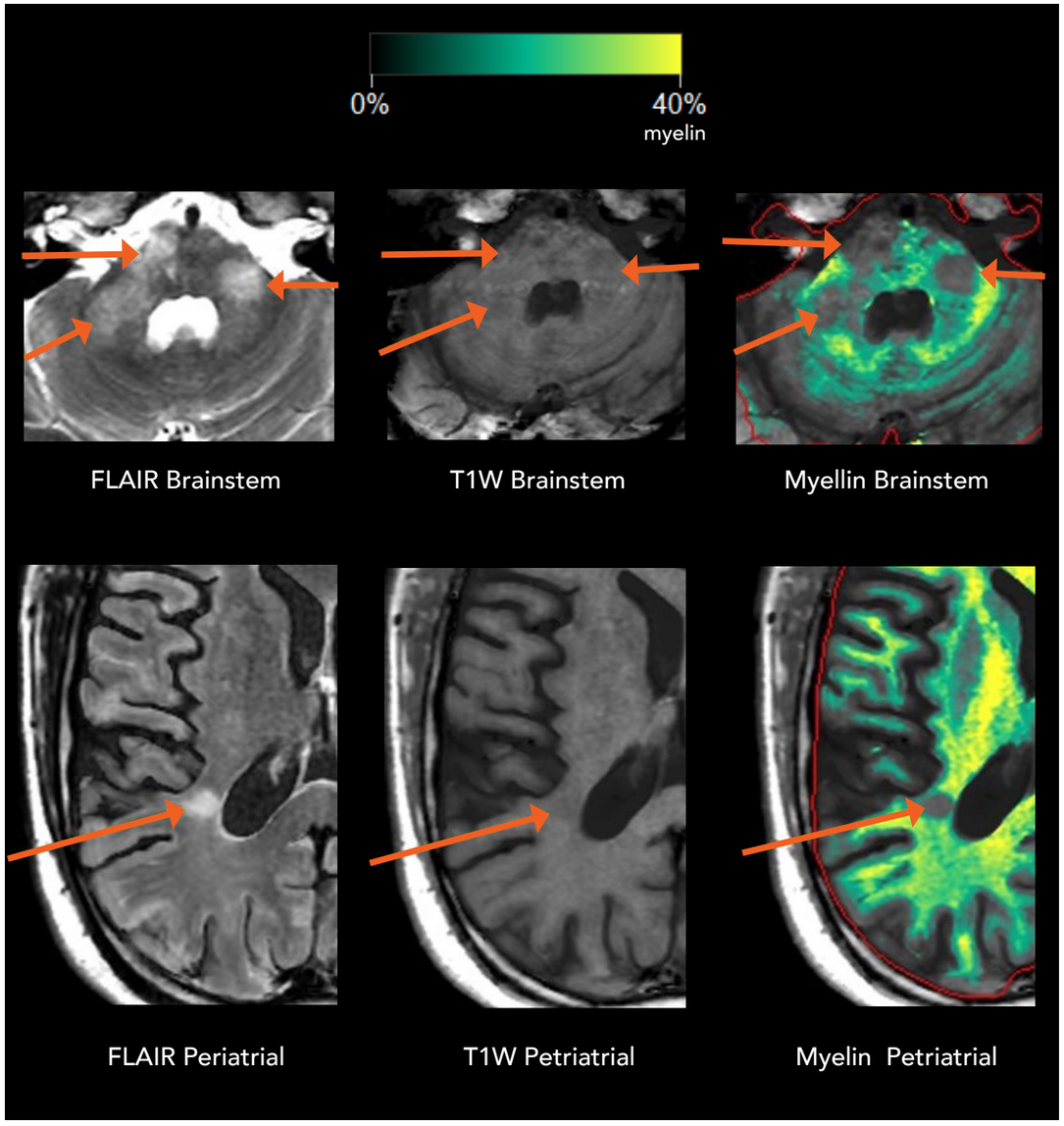
Case 1

A 46 year-old male with persistent headache following concussion. There is global myelin loss in an otherwise normal-looking brain. When this appearance is compared to the normal global myelin example, it is apparent that the amount of yellow (representing highest myelin concentration) is substantially decreased. The reference curve shows that this patient's myelin content is 5 standard deviations below the mean, suggestive of severe impairment.



Case 2

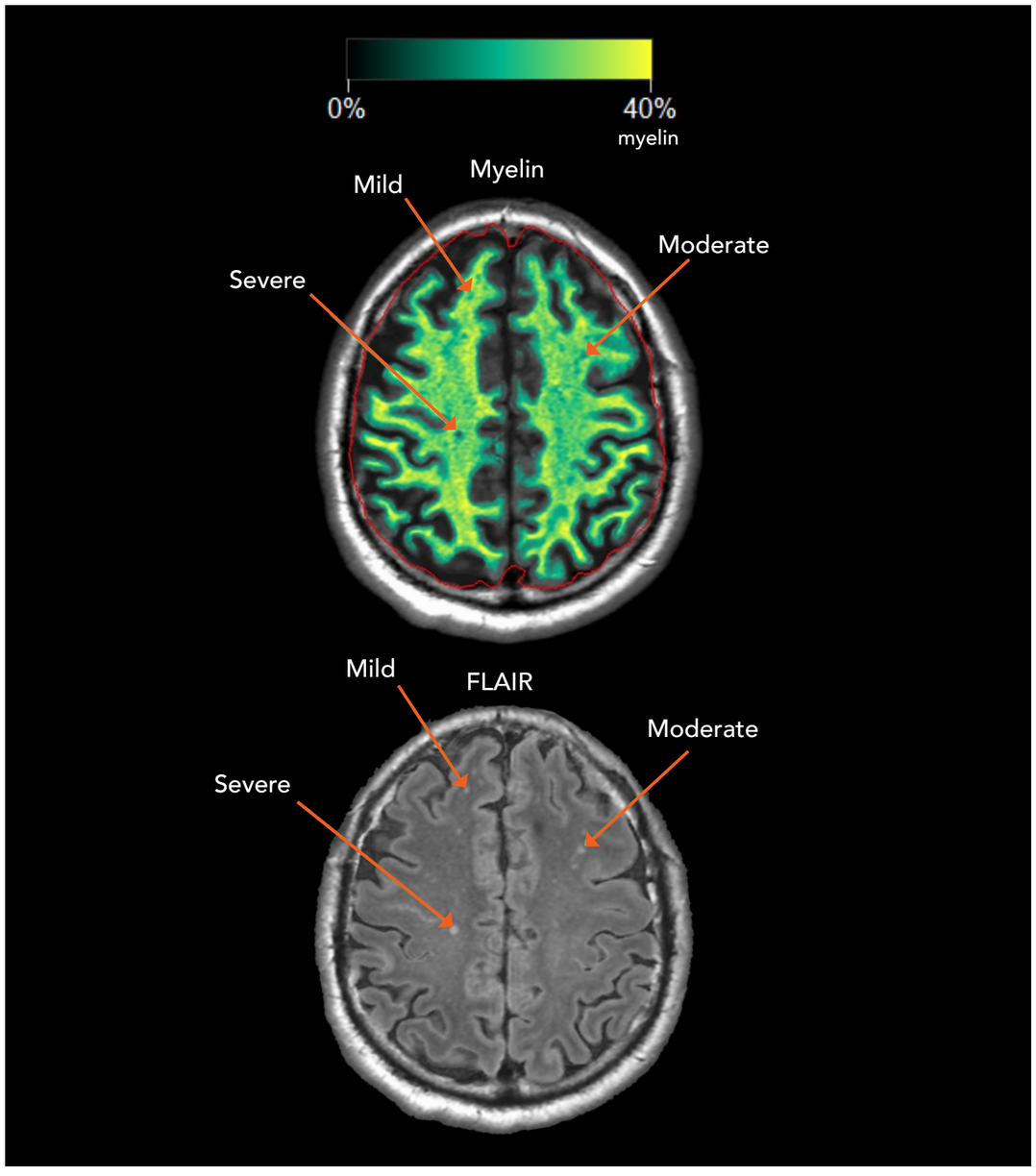
A 38 year-old male with sudden headache and apraxia of right hand and arm as well as dysequilibrium and left handed weakness; scans revealed multiple sclerosis. The patient has severe brainstem and mild supratentorial involvement. Most lesions on FLAIR exhibit complete loss of myelin, despite absence of black holes on T1-weighted images. Global myelin parenchymal fraction is 2.5 standard deviations below the mean in the reference curve (not shown). This supports the concept that myelin imaging is a more accurate biomarker of lesion significance and disease severity than conventional sequences.



SyntheticMR

Case 3

A 56 year-old male with headaches following a motor vehicle collision. FLAIR image shows scattered similar-appearing FLAIR hyperintensities. The myelin image shows that the myelin content is variable, with mild, moderate, or severe loss.



References

1) Ouellette et al. Validation of Rapid Magnetic Resonance Myelin Imaging in Multiple Sclerosis. Ann Neurol. 2020;87:710-724.

2) Warntjes et al. Myelin Detection Using Rapid Quantitative MR Imaging Correlated to Macroscopically Registered Luxol Fast Blue-Stained Brain Specimens. AJNR Am J Neuroradiol. 2017;38:1096-1102.

3) Warntjes et al. Modeling the Presence of Myelin and Edema in the Brain Based on Multi-Parametric Quantitative MRI. Front Neurol. 2016;7:16.

About SyMRI

SyMRI, which is FDA cleared for patients of all ages, combines an MR sequence with post-processing MR software, and includes multiple contrast-weighted images, fully adjustable for TE, TR, and T1 values for optimal flexibility. This enables automatic segmentations and volume measurements of tissue such as white matter, gray matter, cerebrospinal fluid, and myelin to allow users to track disease progression or compare against control groups. Using a single 6-minute scan with a post-processing time of less than 10 seconds, SyMRI is available both as a stand-alone solution or be fully integrated into the clinical workflow.

SyntheticMR AB develops and markets innovative software solutions for Magnetic Resonance Imaging (MRI). SyntheticMR AB has developed SyMRI®, delivering multiple, adjustable contrast images and quantitative data from a single 6-minute scan. The SyMRI product is available in different packages. SyMRI NEURO delivers multiple contrast images, tissue segmentations and quantitative data on the brain. SyMRI MSK provides multiple contrast images and quantitative data for MSK anatomies. SyMRI NEURO is CE-marked and FDA 510(k) cleared and SyMRI MSK is FDA 510(k) pending and CE-marked.