Primary Category: Neuroradiology

Secondary Category:MAGiC

Estimation of white matter hyperintensties with synthetic MRI myelin volume fraction in patients with multiple sclerosis and non MS white matter hyperintensities

Nisha Syed Nasser[1], Sriram Rajan[2], Bhairav Mehta[3], Vasanthakumar Venugopal, Vidur Mahajan[1], Harsh Mahajan[1]

[1]CARPL.ai, C6/8, Block C 6, Safdarjung Development Area, SDA, New Delhi, Delhi 110016
[2]Department of Radiology, Mahajan Imaging, E-19, Defence Colony, New Delhi, India
[3]GE Healthcare, India

Abstract

(2110/2200 characters, including spaces)

PURPOSE

To evaluate the synthetic MRI (SyMRI) generated Myelin (MyCY) to White matter (WM) ratio performing normative brain volumetry to investigate MyCY loss in patients with Multiple Sclerosis (MS) in a clinical setting

MATERIALS AND METHODS

Synthetic MRI images were acquired from 15 subjects with MS and from 15 non-MS patients on a 3T MRI scanner (Discovery MR750w; GE Healthcare; Milwaukee, USA) using MAGiC, a customised version of SyntheticMR's SyMRI software. A fast multi delay multi echo acquisition (MDME) was performed with a 2D axial pulse sequence with different combinations of TEs and saturation delay times. The total image acquisition time was 6 minutes. SyMRI image analysis was done using SyMRI software (SyMRI Prototype 21Q3 SP2 ; Synthetic MR, Linköping, Sweden).

Fifteen patients with MS and 15 non-MS patients were included retrospectively. Synthetic MRI images were acquired using MAGiC, a customized version of SyntheticMR's SyMRI software on a 3T MRI scanner (Discovery MR750w; GE Healthcare; Milwaukee, USA). A fast multi delay multi echo acquisition (MDME) was performed with a 2D axial pulse sequence with different combinations of TEs and saturation delay times. The total image acquisition time was 6 minutes. SyMRI image analysis was done using SyMRI software (SyMRI Prototype 21Q3 SP2 ; Synthetic MR, Linköping, Sweden). Synthetic MR imaging data were used to generate the MyCY partial maps and WM fractions. MyCY-to-WM ratio was calculated to quantify the signal intensities of the NAWM in MS and non-MS patients and their mean values were recorded. All the subjects also underwent conventional diffusion weighted imaging (DWI), T1w and T2w imaging.

RESULTS

Differences in the means of MyCY-to-WM fraction were assessed using Independent samples t-test. In Patients with MS, the MyCY-to-WM fraction was lower than in the non-MS patients (3.316 ± 0.16% vs. 3.51. ± 0.52%, p = 0.189). Although the MyCY-to-WM fraction was lower in the MS group than in the non-MS group, the difference was not statistically significant. Also, there were no significant differences in mean GM fraction, BPF and BPV between the MS and non-MS groups.

CONCLUSIONS
We observed MyCY-WM loss in MS patients using quantitative synthetic MRI.

Clinical Relevance statement
(151/200 characters, including spaces)

Thus, myelin loss in MS patients can be quantitatively evaluated using synthetic MRI.

FIGURE (OPTIONAL)

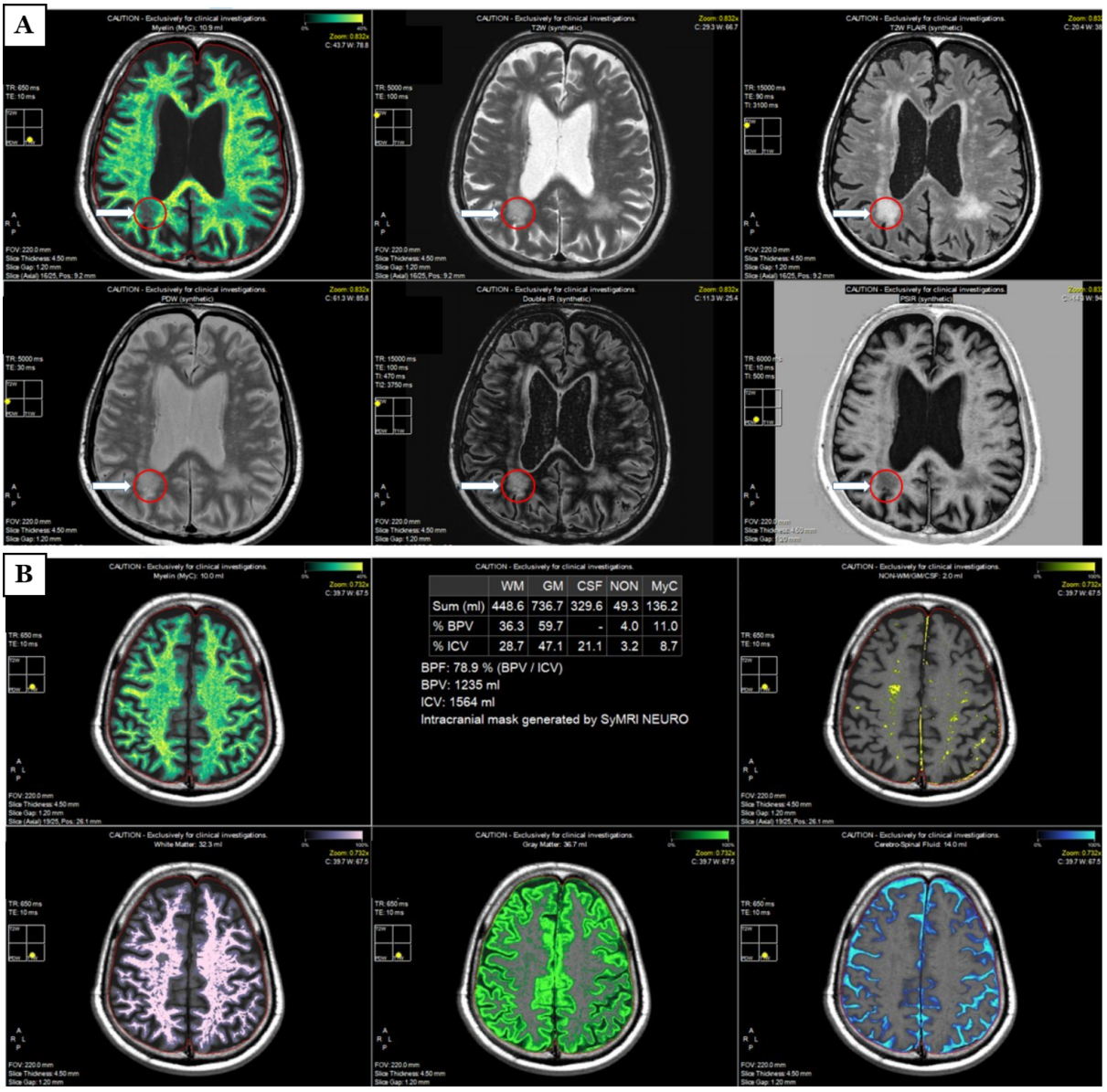

Figure 1. (A) Synthetic generated T1w, T2w, T2w FLAIR, PDW, double inversion recovery, and phase-sensitive inversion recovery images in a patient with chronic ischaemic changes in bilateral frontoparietal subcortical, periventricular & deep white matter regions. (B) Brain segmentation maps generated by SyMRI.