# Supplementary Information
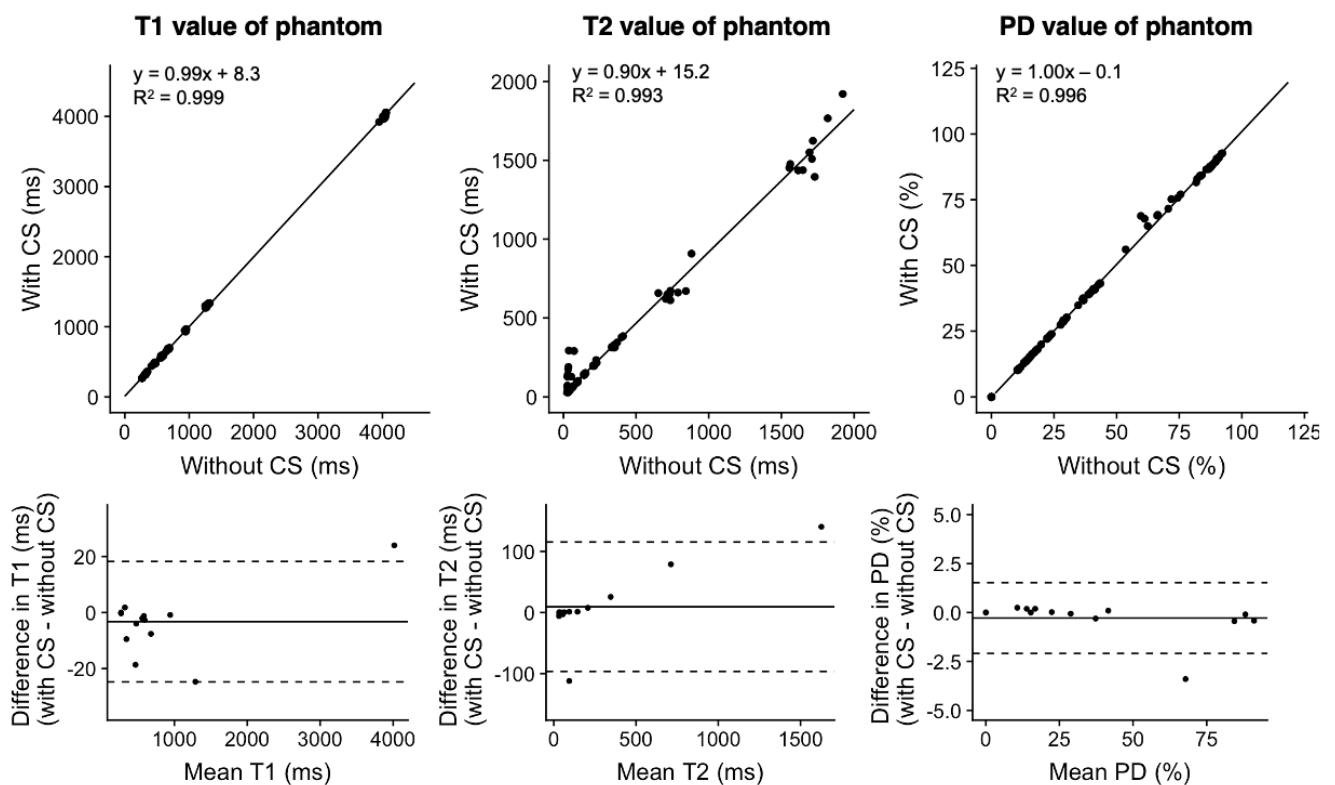
Supplemental Digital Content Figure 1. A schematic illustration of reconstruction based on the serial combination of CS and PI. First, the k-space data is randomly undersampled, with full Nyquist sampling in the center of k-space (left). Next, the unacquired data are filled with CS reconstruction to restore the missing samples and fill a uniformly undersampled k-space data (middle), using a total variation sparsifying transform and an iterative non-linear conjugate gradient method. Finally, PI fills the rest of the k-space (right). PI in this study was based on the Autocalibrating Reconstruction for Cartesian imaging (ARC) method. CS, compressed sensing; PI, parallel imaging; 3D-QALAS, 3D-quantification using an interleaved Look–Locker acquisition sequence with a T2 preparation pulse.
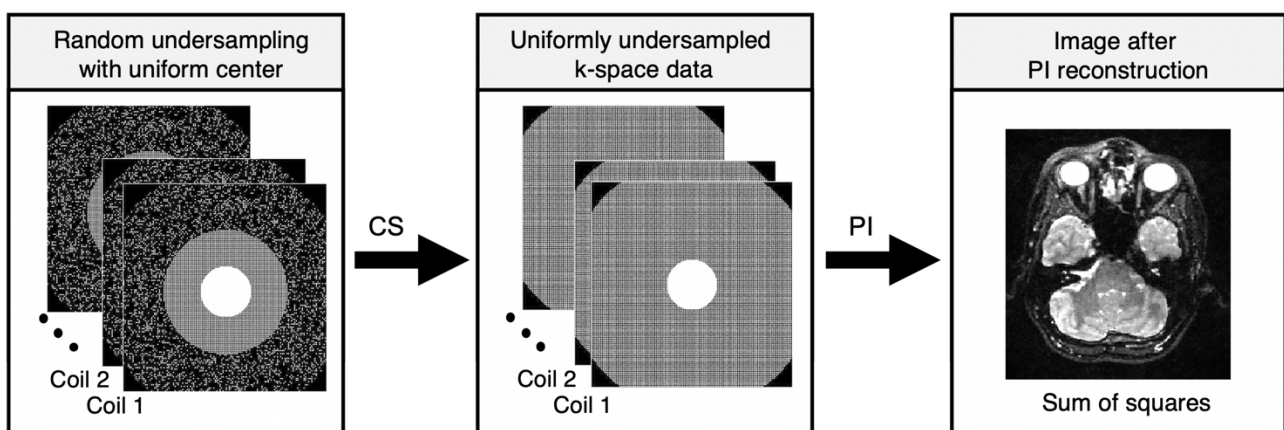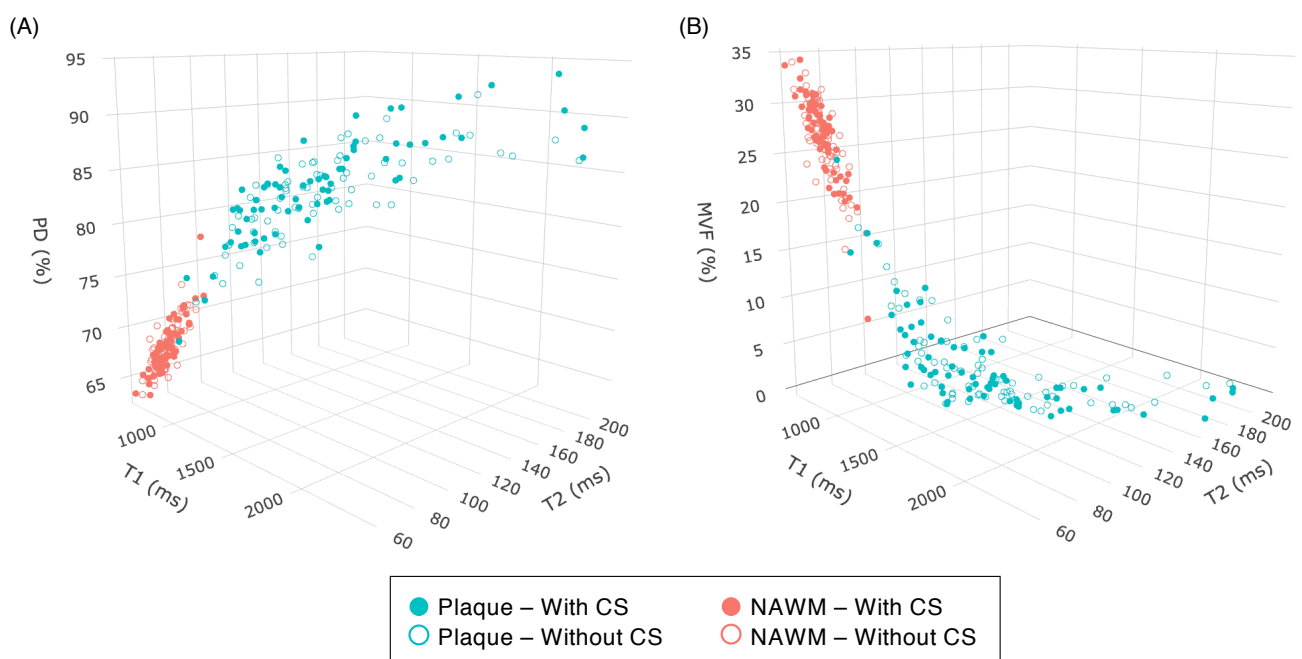
Supplemental Digital Content Figure 2. An example of spherical VOI placement in a patient with multiple sclerosis. A plaque (arrows) is shown on synthetic FLAIR images; a spherical VOI was placed in the center of the plaque (blue). The VOI was copied and pasted on the contralateral NAWM (red). VOI; volume of interest; NAWM, normal-appearing white matter; FLAIR, fluid-attenuated inversion recovery images.
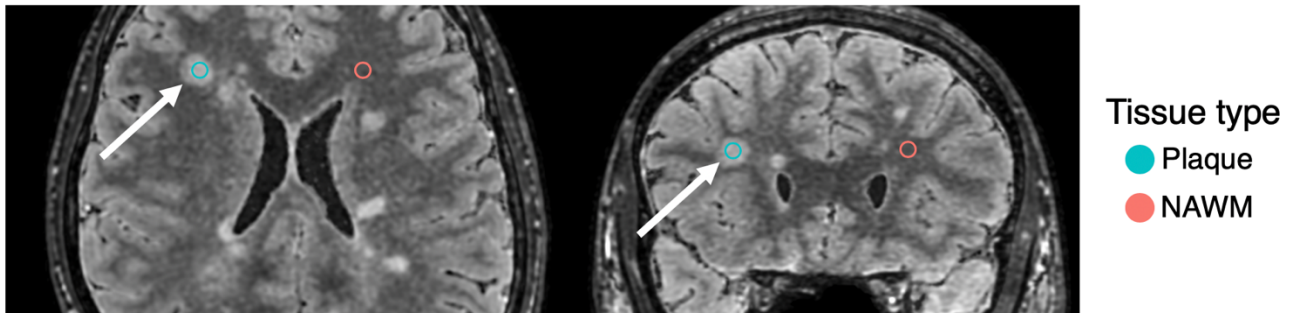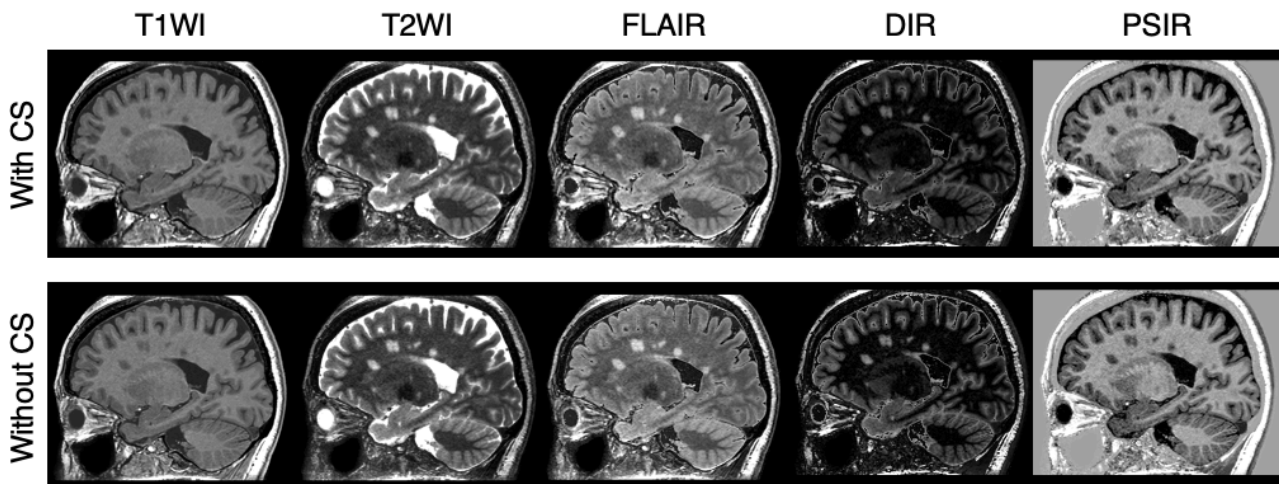
Supplemental Digital Content Figure 3. Scatterplots and Bland-Altman plots comparing T1, T2, and PD values of 10 repeated measurements that were calculated from 3D-QALAS with CS compared to those calculated without CS. Solid black lines in the scatterplots represent the linear regression fit, and the center solid lines in the Bland-Altman plots represent mean differences. The upper and lower dotted lines represent the agreement limit, which was defined as the mean difference ± 1.96 × SD of the difference between the values acquired with and without CS. SD, standard deviation; CS, compressed sensing; 3D-QALAS, 3D-quantification using an interleaved Look–Locker acquisition sequence with a T2 preparation pulse; PD, proton density.

Supplemental Digital Content Figure 4. 3D scatter plot of the quantitative properties of plaque and NAWM from 12 patients with multiple sclerosis. (A) Comparison of plaque and NAWM for variables T1, T2, and PD. (B) Comparison of plaque and NAWM for variables T1, T2, and MVF. There is a clear distinction between plaque and NAWM clusters, regardless of the usage of CS. CS, compressed sensing; PD, proton density; MVF, myelin volume fraction; NAWM, normal-appearing white matter.

Supplemental Digital Content Figure 5. A representative example of a multiple sclerosis patient, shown in reformatted sagittal views. The periventricular deep white matter lesions that are perpendicular to the lateral ventricles are delineated. CS, compressed sensing; T1WI, T1-weighted images; T2WI, T2-weighted images; FLAIR, fluid-attenuated inversion recovery images; DIR, double-inversion recovery images; and PSIR, phase-sensitive inversion recovery images.

Supplemental Digital Content Table 1. Reference T1, T2, and proton density (PD) values, confirmed by magnetic resonance spectroscopy, of NIST/ISMRM (National Institute of Standards and Technology/International Society for Magnetic Resonance in Medicine) system phantom.

Sphere no.	T1 (ms)	T2 (ms)	PD (%)
1	1879	1044	5
2	1432	623.9	10
3	1027	428.3	15
4	751.3	258.4	20
5	527	186.1	25
6	384.1	137	30
7	272.3	89.52	35
8	194.5	62.82	40
9	137.8	43.84	50
10	94.7	27.28	60
11	67	19.24	70
12	48.14	15.44	80
13	34.35	10.05	90
14	24.16	7.79	100