

Supplementary Material

Table S1: Subject demographics: TP = Time point; EDSS = Expanded Disability Status Scale. Note, the number of QSM+ lesions changed (from 12 to 14) for case 10, no others changed.

ID	Age	Sex	EDSS TP1	EDSS TP2	EDSS change	# QSM+ lesions	Medications
1	35	F	2.5	3	0.5	61	Tysabri
2	30	F	0	1.5	1.5	19	Tecfidera
3	24	F	1	1.5	0.5	25	Gilenya
4	35	F	2	2	0	7	Amantadine, Baclofen
5	38	F	1	1.5	0.5	35	Tecfidera
7	35	M	1	1	0	12/14	Copaxone
8	51	F	3	3	0	29	Copaxone
9	39	F	1	1	0	0	Rebif
10	37	M	0	1.5	1.5	46	Tecfidera
11	35	F	2.5	2.5	0	24	Gilenya
12	26	F	0	1	1	4	Cell cept
13	31	F	1.5	1.5	0	10	Tecfidera
14	55	F	3	3	0	0	Gabapentin
15	54	F	4	3.5	-0.5	5	Copaxone
16	36	F	2	2	0	33	Tecfidera
17	48	M	2	3.5	1.5	33	Tecfidera
18	37	F	1	2	1	6	Copaxone
19	37	M	1.5	2.5	1	19	-
20	39	M	6	6	0	6	Tysabri
21	33	F	1.5	3	1.5	6	Copaxone

Table S2: Imaging parameters for the MRI protocol

Sequence Name	Low FA SWI	High FA SWI	T2 FLAIR	T2 TSE	MTC	Pre/post T1 MP RAGE	MWF	DTI
Orientation	Axial	Axial	Axial	Axial	Axial	Axial	Axial	Axial
Acquisition type	3D	3D	3D	2D	3D	3D	3D	2D
TR (ms)	25	25	6000	5100	37	1680	650	8400
TE (ms)	7.5, 17.5	8.75, 18.75	397	80	11	3.61	18 echoes	107
TI (ms)	N/A	N/A	2200	N/A	N/A	900	N/A	N/A
FA (degree)	6	24	N/A	120	15	9	90	N/A

Base Resolution	384	384	256	384	384	512	160	96
FOV phase (%)	75%	75%	100%	75%	100%	100	75%	100%
Matrix size	144 x 384	144 x 384	256 x 256	144 x 384	144 x 384	256 x 512	192 x 256	96 x 96
FOVphase x FOVread	192 x 256	192 x 256	192 x 256	192 x 256	192 x 256	256 x 256	120x 160	256 x 256
Slice Gap %	-	-	N/A	0%	20%	0%	50%	0
TH (mm)	2.0	2.0	1.34	2	2.7	1	5	2.7
No of Slices	80	80	80	80	80	160	24	56
Voxel size (mm³)	1.33x0. 67x2.0	1.33x0. 67x2.0	1.33x0.67 x1.34	1.33x0.6 7x2.7	1.33x0. 67x2.7	1.0x0.5 x1.0	1.6 x 1.6 x 5	2.7 x 2.7 x 2.7
Interpolation	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
#DTI dir	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30
measurements	1	1	1	1	1	1	1	N/A
Concatenations	1	1	1	3	1	1	1	1
# Acq/averages	1	1	1	1	1	1	1	1
Fat Suppr	None	None	None	None	None	None	Fat Sat	Fat Sat
Water Suppr	None	None	None	None	None	None	N/A	N/A
Phase resolution	50%	50%	50%	50%	50%	50%	100%	100
Slice Resolution	100%	100%	100%	N/A	100%	75%	100%	N/A
Slice Over-sampling	10%	10%	0	N/A	0%	0%	0%	N/A
Phase Over-sampling	0.00%	0.00%	100%	0%	0%	0%	0%	0
Phase Enc. Dir	R>>L	R>>L	R>>L	R>>L	R>>L	A>>P	R>>L	A>>P
Accel. factor PE2	1	1	1	N/A	N/A	1	N/A	N/A
Accel. factor PE	2	2	2	2	2	2	N/A	2
Partial Fourier (phase)	OFF	OFF	7/8	OFF	OFF	OFF	OFF	OFF
Partial Fourier (Slice)	OFF	OFF	7/8	OFF	OFF	OFF	3/4	N/A
Ref. lines PE	24	24	24	35	24	24	N/A	40
BW (Hz/Px)	270	270	781	221	70	180	976	1860
Flow Comp	yes	yes	no	no	no	slice	N/A	N/A
Echo train per slice	N/A	N/A	1	5	N/A	N/A	N/A	N/A
b - Value s/mm²	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0, 1000, 2000
Slice Turbo/Turbo/ EPI Factor	N/A	N/A	2, 141, N/A	N/A, 18, N/A	N/A	N/A	N/A, N/A,3	N/A, N/A, 80
Scanner Acquisition Time (sec)	3:04	3:04	5:14	3:09	5:13	3:55	7:48	9:02

Table S3: Quantitative susceptibility map (QSM) positive and negative lesions and normal appearing white matter (NAWM) results. TP: represents time point.

Lesions							
Sequences	QSM positive (18 subjects)						
	Mean lesion volume (mm ³)		Mean Signal		Mean SD		Z-score
	TP1	TP2	TP1	TP2	TP1	TP2	
T2 FLAIR	553	474	215	216	18	18	-0.54
T2	422	431	853	861	115	116	-0.70
MTR	302	310	0.32	0.32	0.03	0.03	-0.10
QSM	213	193	18	18	14	13	0.10
FA	239	238	0.35	0.35	0.09	0.09	-0.04
ADC	273	266	0.93	0.96	0.14	0.15	-0.40
RD	272	267	0.58	0.59	0.12	0.12	-0.18
MWF	247	231	8.26	8.66	3.67	3.63	-0.24
STAGE T1MAP	380	400	1431	1427	307	299	0.15
STAGE PSDMAP	379	401	2482	2496	213	228	-0.63
Sequences	QSM negative (11 subjects)						
	Mean lesion volume (mm ³)		Mean signal		Mean SD		Z-score
	TP1	TP2	TP1	TP2	TP1	TP2	
T2 FLAIR	478	433	206	212	25	26	-0.40
T2	452	417	788	801	91	100	-1.39
MTR	274	273	0.35	0.34	23	24	0.40
QSM	365	347	-9	-9	12	12	0.10
FA	252	238	0.34	0.32	0.09	0.09	0.41
ADC	259	241	0.90	0.94	0.15	0.14	-0.46
RD	260	241	0.55	0.57	0.11	0.11	-0.38
MWF	374	362	10.65	9.96	3.59	3.21	0.54
STAGE T1 Map	394	369	1336	1367	229	244	-1.29
STAGE PSD Map	394	369	2490	2501	188	195	-0.56
NAWM							
Sequences	MS (contralateral to lesions)						
	Mean Vol. of ROI (mm ³)		Mean signal		Mean SD		Z-score
	TP1	TP2	TP1	TP2	TP1	TP2	
T2 FLAIR	268	305	159	154	9	9	1.14
T2	289	313	548	545	39	37	0.56

MTR	265	253	0.41	0.41	0.01	0.01	-0.01
QSM	169	157	-7	-6	9	9	0.08
FA	186	177	0.62	0.63	0.10	0.10	-0.25
ADC	204	190	0.68	0.70	0.09	0.09	-0.37
RD	204	190	0.34	0.33	0.07	0.07	0.26
MWF	221	205	14.77	15.77	3.61	3.74	-0.55
STAGE T1 Map	262	293	940	940	100	90	0.02
STAGE PSD Map	262	293	2077	2082	98	99	-0.45
Sequences	HC (drawn across 4 different brain regions)						
	Mean Vol. of ROI (mm³)		Mean signal		Mean SD		Z-score
	TP1	TP2	TP1	TP2	TP1	TP2	
T2 FLAIR	679	723	152	151	15	16	0.93
T2	679	723	502	505	50	47	-1.04
MTR	386	420	0.40	0.41	0.02	0.02	0.00
QSM	368	406	-8	-8	8	9	0.19
FA	145	193	0.57	0.57	0.15	0.14	-0.27
ADC	145	193	0.69	0.68	0.10	0.12	0.59
RD	145	193	0.34	0.33	0.09	0.08	0.60
MWF	325	294	15.94	17.64	4.33	4.13	-3.57
STAGE T1 Map	622	654	998	1003	126	117	-0.45
STAGE PSD Map	622	654	2199	2115	109	84	0.83