



# Consortium of MS Centers MRI Protocol for the Diagnosis and Follow-up of MS

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June 2003

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## I. CLINICAL GUIDELINES for Brain and Spinal Cord MRI in MS

### Suspected MS:

Baseline evaluation:

- Brain MRI recommended (with gadolinium)
- Spinal Cord MRI if presenting symptoms are at the level of the spinal cord and have not resolved, or if the Brain MRI is non-diagnostic.

Follow-up evaluation:

- Brain MRI recommended to demonstrate new disease activity

### Established MS indications:

Baseline evaluation:

- Brain MRI recommended (gadolinium optional)

Follow-up of MS:

- Unexpected clinical worsening
- Re-assessment of disease burden before starting or modifying therapy
- Suspicion of a secondary diagnosis

## II. MRI PROTOCOLS for Brain and Spinal Cord

**Field Strength:** 1.0 Tesla or higher recommended for brain or spinal cord.

(Note: 1T open ring magnets have an effective field strength of approximately 0.7 Tesla and are only recommended when patients can not tolerate the closed magnet).

**Slice Thickness:**  $\leq 3\text{mm}$  and no gap and in plane resolution of  $\leq 1\text{mm} \times 1\text{mm}$  for both Brain and spinal cord. (Note:  $\leq 5\text{mm}$  and no gap is acceptable for Brain MRI for centers that are unable to acquire 3mm slices in the allotted time).

### Scan Orientation and Coverage:

Reproducible coverage and orientation for the axial slices using the subcallosal line as a reference on an appropriate Sagittal localizer is critical for longitudinal comparisons.



**Brain MRI Sequences:**

- 1<sup>st</sup>: Sagittal FLAIR (fluid attenuating inversion recovery).
- 2<sup>nd</sup>: Axial PD/T2 (proton density and T2 weighted T1 usually  $\leq 30\text{ms}$  and  $\text{TE2} \geq 80\text{ms}$ )
- 3<sup>rd</sup>: Axial FLAIR
- 4<sup>th</sup>: Gadolinium enhanced T1 (if suspicious lesions seen on FLAIR).

Note: all 4 sequences recommended for a diagnostic MRI in suspected MS. The Sagittal FLAIR and gadolinium enhanced T1 are optional in the follow-up study for established MS.

**Spinal Cord Sequences:**

- 1<sup>st</sup>: Sagittal PD/T2
- 2<sup>nd</sup>: Sagittal pre-Gad T1
- 3<sup>rd</sup>: Sagittal post-Gad T1
- 4<sup>th</sup>: Axial post-Gad T1 through suspicious lesions.
- 5<sup>th</sup>: Axial T2 through suspicious lesions.

**Gadolinium:**

- The recommended dose is 0.1 mmol/kg IV
- The minimum delay after giving gadolinium is 5 minutes before acquiring the axial T1 weighted axial post contrast images.
- Gadolinium does not need to be given for a spinal cord MRI if it follows a contrast Brain MRI study.

**Time saving strategies:**

- Omit the axial Fast Spin Echo PD
- Only cover the corpus callosum with the Sagittal FLAIR.
- Acquire the axial FLAIR after giving gadolinium and before the axial T1 weighted axial post contrast images.

**Report:**

The report should use common language and be descriptive including:

- Lesion number, location, size, shape, character and a qualitative assessment of brain atrophy.
- Comparison with previous studies for new, enlarging and/or enhancing lesions and atrophy.
- Interpretation and differential diagnosis.

An optional standardized reporting table may be helpful to the radiologist and neurologist.

**Archival and Storage:**

Copies of these MRI studies should be retained permanently and be available. They should be stored in a standard format (example DICOM). It may be useful for patients to keep their own studies on portable digital media.

**Table: Comprehensive MS MRI Report**

<b>BRAIN MRI</b>	MRI date:	MRI date:	MRI date:	MRI date:
	Baseline	Follow-up	Follow-up	Follow-up
With gadolinium (check)				
Normal (check)				
Total number of T2 lesions (> 3mm)				
New T2 lesions compared to baseline	NA			
Periventricular lesions				
Juxtacortical lesions				
Infratentorial lesions				
Corpus callosum lesions				
Enlarging lesions	NA			
Total number of enhancing lesions				
Non-enhancing T1 hypointense lesions				
Brain Atrophy (no, mild, moderate, severe)				
Other finding				

NA: not applicable;

International Criteria for MS diagnosis (3 out of 4 of the following on brain MRI):

- 1 gd-enhancing lesion or 9 T2 lesions      1 infratentorial lesion
- 1 juxtacortical lesion                              3 periventricular lesions

Diagnostic Follow-up MRI at  $\geq 3$  months following clinical attack (either of):

- 1 gd-enhancing lesion or 1 new T2 lesion

<b>SPINAL CORD MRI</b>	MRI date:	MRI date:	MRI date:	MRI date:
With gadolinium (check)				
Normal (check)				
Number of T2 lesions				
Number of enhancing lesions				
Atrophy (no/yes; level)				
Other finding				

Adapted from Dr. J. Simon