



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

PROPOSED 2009 REVISED GUIDELINES

Purpose: MRI is widely used to aid in the diagnosis of multiple sclerosis (MS) and increasingly in follow-up. Guidelines for a standardized brain and spinal cord MRI protocol had been previously proposed in 2001 and 2003. A follow-up consensus meeting was convened in 2008 to review and update the guidelines. The new guidelines incorporate new information and practice recommendations that will benefit patients and will be useful for physicians and care providers.

Methods: Sponsored by the Consortium of MS Centers, an international group of neurologists and radiologists (including members from the American Academy of Neurology, American Society of Neuroradiology and Radiological Society of North America) met in Vancouver, BC, October 10-11, 2008 to revise and update the guidelines and indications for standardized brain and spinal cord MRI for MS that were published in 2006. A survey of the usefulness, usability and use of the previous guidelines was conducted prior to the meeting.



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

For Patients with a Clinically Isolated Syndrome (CIS) and suspected MS:

Recommendations for the Baseline evaluation:

- A Brain MRI with gadolinium
- A Spinal Cord MRI if there is persisting uncertainty about the diagnosis and/or the findings on Brain MRI are equivocal.
- A Spinal Cord MRI if presenting symptoms or signs are at the level of the spinal cord.

Recommendations for a follow-up evaluation:

- A Brain MRI with gadolinium to demonstrate new disease activity.

For Patients with an established diagnosis of MS:

Recommendations for the Baseline evaluation:

- A Brain MRI with gadolinium

A brain MRI with gadolinium is recommended for the follow-up of MS patients:

- To evaluate an unexpected clinical worsening concerning for a secondary diagnosis.
- For the re-assessment of the original diagnosis.
- For the re-assessment before starting or modifying therapy.
- To assess subclinical disease activity should be **CONSIDERED** every 1-2 years. The exact frequency may vary depending on clinical course and other clinical features.

A spinal cord MRI with gadolinium is recommended for the follow-up of MS patients with clinical evidence of disease activity referable to the spinal cord and who do not have MRI evidence of disease activity in the brain.



II. REVISED MRI PROTOCOLS for Brain and Spinal Cord

Field Strength	No specific recommendations on magnet size or strength. Scans should be of good quality, with adequate signal noise ratio (SNR) and resolution (in slice pixel resolution of $\leq 1\text{mm} \times 1\text{mm}$)
Slice thickness and gap	$\leq 3\text{mm}$, no gap for brain and spinal cord, except $\leq 4\text{mm}$, no gap for axial spinal cord
Core Brain MRI Sequences	Sagittal FLAIR (FLuid Attenuated Inversion Recovery) Axial FLAIR Axial T2 Axial T1 pre and post gadolinium
Gadolinium	Single dose 0.1 mmol/kg given over 30 seconds Minimum 5 minute delay before obtaining post gadolinium T1 One of the other sequences (e.g. FLAIR, T2) can be acquired during the 5 min post gadolinium delay
Options for Brain MRI	Axial proton density (PD) 3D IR prepared T1 gradient echo (1.0-1.5mm thickness)
Brain MRI Scan Prescription and Coverage	Whole brain coverage Use subcallosal plane on sagittal localizer to prescribe the axial slices
Core Spinal Cord MRI Sequences	Cervical Cord coverage Sagittal T2 Sagittal PD or STIR (Short Tau Inversion Recovery) Sagittal T1
Options for Spinal Cord MRI	Post Gadolinium T1 3D IR prepared T1 gradient echo (1.0-1.5mm thickness) Thoracic Cord and Conus coverage Gadolinium does not need to be given for a spinal cord MRI if it follows a contrast Brain MRI study.

MRI Requisition:

- Request the standardized brain and/or spinal cord protocol
- Indicate the clinical question being addressed.
- Provide relevant clinical history, physical findings, MS medications, date and place of previous MRI if any.

Radiology Report:

Use standardized terminology

Description of findings:

- Lesion number, location, size, shape, character
- Whether MRI dissemination in space (DIS) criteria are met (avoid statements like “McDonald diagnostic criteria met”).
- Whether MRI dissemination in time (DIT) criteria are met.
- Qualitative assessment of brain atrophy, overall T2 and T1 hypointense lesion burden severity.
- Comparison with previous studies for new lesion activity and atrophy.

Interpretation (typical, atypical, or not MS) and differential diagnosis if appropriate.



Recommendations for Archival and Storage:

Copies of these MRI studies are encouraged to be retained permanently and be available.

They should be stored in a standard readable format (DICOM).

It may be useful for patients to keep their own studies on portable digital media.

References;

<http://www.msca.org/cmssc/images/pdf/MRIprotocol2003.pdf> and Simon JH et al. *AJNR* 2006;27:455-461