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Abstract Title: Expert panel consensus guidelines of the German Society of Neuroradiology on the use of magnetic resonance imaging in the diagnosis and monitoring of multiple sclerosis

Abstract Category: 3. IMAGING & NON-IMAGING BIOMARKERS - 3.1 MRI

Preferred Presentation Type: Oral or poster presentation

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Study Group:

Introduction:

The 2021 MAGNIMS-NAIMS-CMSC consensus recommendations for magnetic resonance imaging (MRI) in patients with multiple sclerosis (MS) provided authoritative guidance on standardization and harmonization of MRI applications for MS diagnosis and treatment monitoring in clinical routine settings world-wide. The recent draft on the 2024 revisions of the McDonald criteria suggested additional MRI measures such as the optic nerve (ON) and paramagnetic rim lesions (PRLs) as well as the central vein sign (CVS) for the diagnosis of MS. Furthermore, certain MRI measures such as slowly expanding lesions (SELs), particularly with paramagnetic rims, are increasingly used in the clinical trial setting and may enter in routine clinical imaging in the near future. These developments suggest a further expanding role of MRI in the management of patients with suspected and proven MS.

Objectives/Aims:

To establish Expert panel consensus guidelines of the German Society of Neuroradiology in collaboration with the German Society of Neurology (DGN) on the use of magnetic resonance imaging in the diagnosis and monitoring of multiple sclerosis in the context of the German health care system.

Methods:

Guidelines were developed based on literature research and consensus sessions.

Results:

We suggest the continuous use of the acquisition protocol established by the 2021 MAGNIMS-NAIMS-CMSC consensus recommendations for the patients with a conclusive MS diagnosis. For patients with inconclusive imaging findings to diagnose MS, we recommend changes in MRI acquisition protocols incorporating susceptibility weighted imaging (SWI) sequences for demonstration of PRLs and CVS as well as ON imaging. Additionally, we provide updated recommendations regarding the use of MRI for treatment monitoring purposes including the follow-up of progressive MS patients.

Conclusion:

These guidelines will provide a guidance on standardization and harmonization of MRI applications for MS diagnosis and treatment monitoring in clinical routine setting in Germany and elsewhere.

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Travel / Abstract Grant Application and Young Scientific Investigators' Session: No -

Date of Birth:

Addition Grant Request:

Expert panel consensus guidelines of the German Society of Neuroradiology on the use of magnetic resonance imaging in the diagnosis and monitoring of multiple sclerosis



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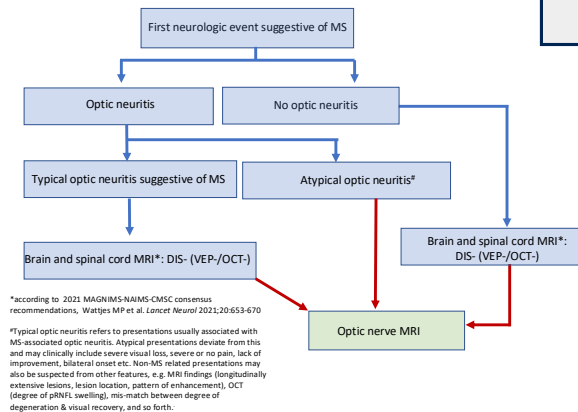
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Introduction:

Multiple sclerosis (MS) is the most frequent chronic inflammatory disease of the central nervous system (CNS) in young adults.¹ In addition to clinical presentation as well as neurological examination and cerebrospinal fluid (CSF) analysis, magnetic resonance imaging (MRI) of the brain and the spinal cord is crucial for the diagnosis of MS. Here, dissemination of MS lesions in space (DIS) and time (DIT) are demonstrated by MRI according to the McDonald criteria, currently published in their 2017 revision.² The 2021 MAGNIMS-CMSC-NAIMS consensus recommendations on the use of MRI in MS have proposed further image acquisition protocols and guidelines for diagnostic and monitoring purposes.³

The recently proposed 2024 revisions of the McDonald criteria include the optic nerve as a fifth anatomic location for the demonstration of DIS.⁴ In addition, these revisions advance that presence of paramagnetic rim lesions (PRLs) and central vein signs (CVS) may be used for MS diagnosis in patients with typical symptoms and typical lesions in at least one DIS topography. However, diagnostic performance of these measures in the context of MS criteria have, so far, not yet been tested. Stringent application of these criteria in clinical routine settings will increase utilization of required resources such as MR scans (for ON-MRI) and acquisition times (for PRLs / CVS) considerably which cannot necessarily be granted in every country. Furthermore, consequent and correct implementation according to consensus recommendations will require a high degree of expertise and training in terms of image acquisition and analysis as well as substantial time and effort for MRI postprocessing.^{5,6}

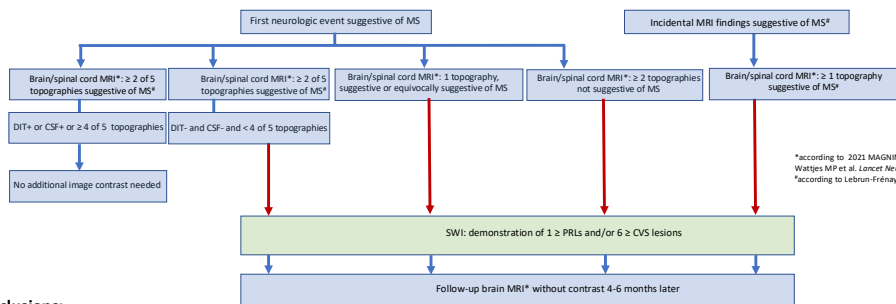
Flow chart on the use of optic nerve MRI



*according to 2021 MAGNIMS-NAIMS-CMSC consensus recommendations, Wattjes MP et al. Lancet Neurol 2021;20:653-670

*Typical optic neuritis refers to presentations usually associated with MS-associated optic neuritis. Atypical presentations deviate from this and may clinically include severe visual loss, severe or no pain, lack of improvement, bilateral onset etc. Non-MS related presentations may also be suspected from other features, e.g. MRI findings (longitudinally extensive lesions, lesion location, pattern of enhancement), OCT (degree of pRNFL swelling), mis-match between degree of degeneration & visual recovery, and so forth.

Flow chart on the use of SWI for MS diagnosis



Conclusions:

We suggest continuous use of the acquisition protocol established by the 2021 MAGNIMS-NAIMS-CMSC consensus recommendations. For patients with conclusive MS, this protocol is diagnostically sufficient. For patients with inconclusive MRI findings to diagnose MS, we recommend to incorporate:

- optic nerve MRI to detect optic nerve lesions (when VEP / OCT are not available or indecisive) and
- phase-sensitive SWI sequences to detect PRLs and / or CVS lesions.

For MS monitoring, demonstration of PRLs and slowly expanding lesions (SELS) may become prognostically relevant.

References:

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2. Thompson AJ, Barkhof F, Barkhof F, et al. Diagnosis of multiple sclerosis: 2017 revisions of the McDonald criteria. Lancet Neurol 2018;17:362-373.
3. Wattjes MP, Coccia M, Bartsch A, et al. 2021 MAGNIMS-CMSC-NAIMS consensus recommendations on the use of MRI in patients with multiple sclerosis. Lancet Neurol 2021;20:653-670.
4. Montalban X. 2024 revisions of the McDonald criteria. Presented atECTRIMS Copenhagen, 18 SEP-2024.
5. Sati P, Chh L, Constable RT, et al. The central vein sign and its clinical evaluation for the diagnosis of multiple sclerosis: a consensus statement from the North American Imaging in Multiple Sclerosis Cooperative. Nat Rev Neurol 2016;12:714-722.
6. Bagnato F, Sati P, Hemond CC, et al. Imaging chronic active lesions in multiple sclerosis: a consensus statement. Brain 2024;147(9):2913-2933.

Objectives:

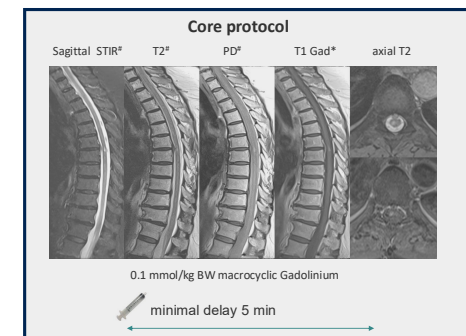
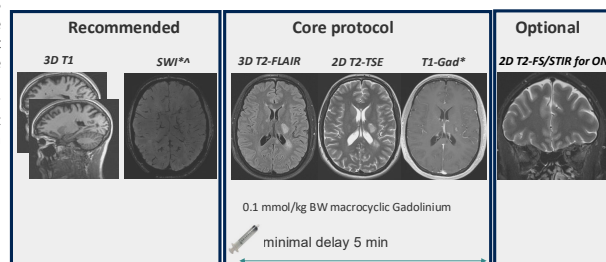
To establish expert panel consensus guidelines of the German Society of Neuroradiology in collaboration with the German Society of Neurology (DGN) on the use of MRI in the diagnosis and monitoring of MS in the context of and applicable to the German health care system.

Methods:

Guidelines were developed based on literature research and during a series of videocall sessions and discussions to establish consensus between academic centers and outpatient practitioners involved in and with extensive experience in diagnosis and follow-up of MS patients.

Results:

MRI acquisition protocols



Magnetic field strength: ≥ 1.5T, brain 3T recommended
Spatial resolution:
2D: 3 mm slice thickness (no gap), in-plane ≤ 1x1 mm²
3D: ≅ isotropic voxel size ≤ 1x1x1 mm³

* 3D or 2D acquisition; * incl. phase reconstructions;
* combination of at least two of these sequences;
D= dimensional, STIR= short tau inversion recovery,
FS= fat saturated, PD=Proton density, FLAIR=fluid attenuated inversion recovery, Gad=Gadolinium,
BW=body weight, T=Testa