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DIAGNOSTIC CRITERIA OF MULTIPLE SCLEROSIS: CURRENT APPROACHES AND CLINICAL SIGNIFICANCE

Yaqubov Ilyosbek Yaxyobek o`g`li
Andijan State Medical institute. Master`s student

Abstract
Multiple sclerosis (MS) is a chronic immune-mediated demyelinating disease of the central nervous system characterized by inflammation, demyelination, and neurodegeneration. Due to the heterogeneity of clinical manifestations and the absence of a single pathognomonic test, early and accurate diagnosis remains a major clinical challenge. The introduction of the McDonald diagnostic criteria has significantly improved diagnostic accuracy by integrating clinical, radiological, and laboratory findings. This thesis reviews the current diagnostic criteria for multiple sclerosis, emphasizing the role of magnetic resonance imaging (MRI), cerebrospinal fluid (CSF) analysis, and evidence of dissemination in space and time.
Keywords: *Multiple sclerosis, diagnostic criteria, McDonald criteria, MRI, cerebrospinal fluid, oligoclonal bands.*

INTRODUCTION

Multiple sclerosis is one of the most common non-traumatic causes of neurological disability in young adults, typically affecting individuals between 20 and 40 years of age. The disease course is highly variable, ranging from benign forms to rapidly progressive disability. Early diagnosis is crucial, as disease-modifying therapies can reduce relapse rates, delay disability progression, and improve long-term outcomes. Therefore, standardized and evidence-based diagnostic criteria are essential for clinical practice and research.

Pathophysiological Basis of Diagnosis

The diagnostic framework of MS is based on demonstrating inflammatory demyelinating lesions within the central nervous system that are disseminated in both **space** and **time**, while excluding alternative diagnoses.

Table 1. Pathophysiological Features Relevant to MS Diagnosis

Feature	Description	Diagnostic relevance
Demyelination	Immune-mediated damage to myelin	Causes characteristic MRI lesions
Axonal injury	Neurodegeneration accompanying demyelination	Explains irreversible disability
Inflammation	T-cell and B-cell mediated immune response	Reflected by CSF abnormalities
Gliosis	Chronic scarring of CNS tissue	Seen in long-standing lesions

Clinical Diagnostic Criteria

Clinically, MS is suspected in patients presenting with neurological deficits consistent with CNS demyelination, lasting at least 24 hours, in the absence of fever or infection. Common initial presentations include optic neuritis, sensory disturbances, motor weakness, and brainstem syndromes.

Table 2. Common Clinical Manifestations Suggestive of MS

System involved	Typical symptoms
Optic nerve	Visual loss, pain on eye movement
Spinal cord	Limb weakness, sensory level, bladder dysfunction
Brainstem	Diplopia, vertigo, dysarthria
Cerebellum	Ataxia, tremor, coordination impairment

McDonald Diagnostic Criteria

The McDonald criteria (latest revisions: 2017, with emerging updates in 2023) integrate clinical attacks, objective neurological findings, MRI features, and CSF analysis.

Dissemination in Space (DIS)

DIS is demonstrated by MRI evidence of lesions in at least two of the following CNS regions:

- Periventricular
- Cortical or juxtacortical
- Infratentorial
- Spinal cord

Table 3. MRI Criteria for Dissemination in Space

CNS region	Typical MRI characteristics
Periventricular	Ovoid lesions perpendicular to ventricles (“Dawson’s fingers”)
Cortical / Juxtacortical	Lesions abutting the cortex
Infratentorial	Brainstem or cerebellar plaques
Spinal cord	Short-segment, peripheral lesions

Dissemination in Time (DIT)

DIT reflects disease activity over time and can be demonstrated by:

- Simultaneous presence of gadolinium-enhancing and non-enhancing lesions on MRI
- New lesions on follow-up MRI
- Presence of CSF-specific oligoclonal IgG bands

Table 4. Methods to Demonstrate Dissemination in Time

Method	Diagnostic significance
Contrast-enhanced MRI	Differentiates active vs. chronic lesions
Follow-up MRI	Shows new lesion formation
CSF oligoclonal bands	Indicates chronic immune activation

Cerebrospinal Fluid Analysis

CSF examination plays a supportive but critical role in MS diagnosis. The most characteristic finding is the presence of CSF-restricted oligoclonal IgG bands, detected by isoelectric focusing.

Table 5. CSF Findings in Multiple Sclerosis

Parameter	Typical finding
Oligoclonal bands	Positive in ~85–95% of MS patients

Parameter	Typical finding
IgG index	Elevated
Cell count	Normal or mild lymphocytosis
Protein	Normal or mildly increased

Differential Diagnosis

Several conditions may mimic MS and must be carefully excluded.

Table 6. Differential Diagnosis of Multiple Sclerosis

Condition	Key distinguishing features
Neuromyelitis optica (NMO)	AQP4-IgG positivity, longitudinal spinal lesions
Acute disseminated encephalomyelitis (ADEM)	Monophasic, post-infectious
CNS vasculitis	Systemic inflammation, angiographic changes
Vitamin B12 deficiency	Metabolic abnormalities, symmetrical lesions

Conclusion

The diagnosis of multiple sclerosis requires a comprehensive and systematic approach that integrates clinical evaluation with advanced neuroimaging and laboratory investigations. The McDonald criteria provide a reliable framework for early and accurate diagnosis by emphasizing dissemination in space and time. MRI and CSF analysis remain cornerstone tools in modern MS diagnostics, allowing clinicians to initiate disease-modifying therapy at an early stage and improve long-term patient outcomes.

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