

MS:

Multiple sclerosis (MS) is an immune-mediated inflammatory disease that attacks myelinated axons in the central nervous system, destroying the myelin and the axon in variable degrees and producing significant physical disability within 20-25 years in more than 30% of patients. The hallmark of MS is symptomatic episodes that occur months or years apart and affect different anatomic locations.

Signs and symptoms

Classic MS signs and symptoms are as follows:

- Sensory loss (ie, paresthesias): Usually an early complaint
- Spinal cord symptoms (motor): Muscle cramping secondary to spasticity
- Spinal cord symptoms (autonomic): Bladder, bowel, and sexual dysfunction
- Cerebellar symptoms: Charcot triad of dysarthria, ataxia, and tremor
- Optic neuritis
- Trigeminal neuralgia: Bilateral facial weakness or trigeminal neuralgia
- Facial myokymia (irregular twitching of the facial muscles): May also be a presenting symptom
- Eye symptoms: Including diplopia on lateral gaze (33% of patients)
- Heat intolerance
- Constitutional symptoms: Especially fatigue (70% of cases) and dizziness
- Pain: Occurs in 30-50% of patients at some point in their illness
- Subjective cognitive difficulties: With regard to attention span, concentration, memory, and judgment
- Depression: A common symptom
- Euphoria: Less common than depression
- Bipolar disorder or frank dementia: May be a late finding but is sometimes found at initial diagnosis
- Symptoms associated with partial acute transverse myelitis

Diagnosis

MS is diagnosed on the basis of clinical findings and supporting evidence from ancillary tests. Tests include the following:

- Magnetic resonance imaging: The imaging procedure of choice for confirming MS and monitoring disease progression in the CNS
- Evoked potentials: Used to identify subclinical lesions; results are not specific for MS
- Lumbar puncture: May be useful if MRI is unavailable or MRI findings are nondiagnostic; CSF is evaluated for oligoclonal bands and intrathecal immunoglobulin G (IgG) production

Classification

MS is divided into the following categories, principally on the basis of clinical criteria, including the frequency of clinical relapses, time to disease progression, and lesion development on MRI

- Relapsing-remitting MS (RRMS): Approximately 85% of cases
- Secondary progressive MS (SPMS)
- Primary progressive MS (PPMS)
- Progressive-relapsing MS (PRMS)

The following 2 subgroups are sometimes included in RRMS:

- Clinically isolated syndrome (CIS): A single episode of neurologic symptoms
- Benign MS: MS with almost complete remission between relapses and little if any accumulation of physical disability over time

Management:

Treatment of MS has 2 aspects: immunomodulatory therapy (IMT) for the underlying immune disorder and therapies to relieve or modify symptoms.

Treatment of acute relapses is as follows:

- Methylprednisolone (Solu-Medrol) can hasten recovery from an acute exacerbation of MS
- Plasma exchange (plasmapheresis) can be used short term for severe attacks if steroids are contraindicated or ineffective ^[5]
- Dexamethasone is commonly used for acute transverse myelitis and acute disseminated encephalitis

Most of the disease-modifying agents for MS (DMAMS) have been approved for use only in relapsing forms of MS. The DMAMS currently approved for use by the US Food and Drug Administration (FDA) include the following:

- Interferon beta-1a (Avonex, Rebif) ^[6]
- Interferon beta-1b (Betaseron, Extavia) ^[7]
- Peginterferon beta-1a (Plegridy) ^[8]
- Glatiramer acetate (Copaxone) ^[9]
- Natalizumab (Tysabri) ^[10, 11]
- Mitoxantrone ^[12]
- Fingolimod (Gilenya) ^[13]
- Teriflunomide (Aubagio) ^[14]
- Dimethyl fumarate (Tecfidera) ^[15, 16, 17, 18]
- Alemtuzumab (Lemtrada) ^[19, 20, 21]

A single-use autoinjector is also available for self-injection of interferon beta-1a (Rebif) in patients with relapsing forms of MS. [\[22\]](#)

The following agents are used for treatment of aggressive MS:

- High-dose cyclophosphamide (Cytoxan) has been used for induction therapy
- Mitoxantrone is approved for reducing neurologic disability and/or the frequency of clinical relapses in patients with SPMS, PRMS, or worsening RRMS

Treatment of the symptoms of MS involves both pharmacologic and nonpharmacologic measures. The following symptoms may be amenable to pharmacologic therapy:

- Fatigue: Off-label treatments include amantadine, methylphenidate, and fluoxetine
- Depression: Selective serotonin reuptake inhibitors are preferred
- Spasticity: Baclofen is effective in most cases
- Pain: Tricyclic antidepressants are first-line drugs for primary pain
- Sexual dysfunction: Oral phosphodiesterase type 5 inhibitors (eg, sildenafil, tadalafil, vardenafil)
- Optic neuritis: Intravenous methylprednisolone may speed recovery