Understanding Multiple Sclerosis

A disease of the central nervous system

What is multiple sclerosis (MS)?
MS is an autoimmune disease of the central nervous system (CNS), brain and spinal cord, where the body recognizes myelin in the CNS as a foreign object. Myelin allows the body to transmit electrical impulses from neuron to neuron quickly. With loss of myelin the brain’s ability to transmit impulses to the rest of the body is disrupted. Depending on where in the brain or spinal cord myelin is lost, different symptoms can result such as difficulty walking or vision loss.

What causes MS?
We do not yet understand why MS begins, and there are likely several factors that may contribute to developing the disease. Genetics, environment, and viruses may play a role. In MS, disease-fighting cells enter the brain and also cause damage to the myelin sheath. When scar tissue (sclerosis) replaces the myelin sheath as a result of being attacked the brain’s ability to transmit signals to the rest of the body is disrupted.

Types of MS
Relapsing-Remitting (RR-MS): RR-MS is the most common type of MS in people under 40 and accounts for about 70% of people with MS. RR-MS patients have episodes of acute worsening of symptoms (relapses) with recovery and stable course (remissions) between relapses.

Primary-Progressive MS (PP-MS): PP-MS accounts for approximately 10% to 15% of patients and is characterized by progressive worsening from the onset of symptoms without interposed relapses. Patients with PP-MS are more likely to be men and older than 40 years of age at symptom onset.

Secondary-Progressive MS (SP-MS): After living with the disease for 10 to 20 years (and usually after the age of 40), some RR-MS patients may develop SP-MS. A patient with SP-MS may still experience relapses but does not stabilize between relapses, and their condition gradually worsens.

How is MS diagnosed?
Your doctor will perform a thorough investigation involving several tests, including:

- **Magnetic resonance imaging (MRI):** An important diagnostic tool is MRI, which is used to examine the brain and spinal cord for MS lesions. An MS lesion is an area of inflammation or damage within the CNS. T1, T2, T1 with gadolinium, FLAIR, and proton density refer to different MRI sequences, each providing different information regarding MS lesion location and activity.

- **Evoked potential tests:** These tests measure electrical signals to the brain as a response to hearing, touch, or visual stimuli and can detect lesions before symptoms become obvious.

- **Lumbar puncture (spinal tap):** If MRI findings are non-specific and clinical history is not diagnostic, healthcare professionals may obtain a sample of cerebrospinal fluid and look for proteins and inflammatory cells associated with MS.

Management of MS
MS is not curable, but new disease-modifying therapies can help in decreasing relapses, MRI activity, and slowing disease progression. Early intervention is key. MS differs from patient to patient, and healthcare providers may try several medications to find what works best for an individual patient.

SYMPTOMS OF MS
- Anxiety
- Cognitive impairment
- Depression
- Dizziness
- Loss of muscle coordination
- Muscle spasms
- Numbness or tingling
- Problems with:
  - bladder control
  - speech
  - vision
  - walking
  - Sexual dysfunction
  - Weakness and fatigue

Credit: Yochum TR, Rowe LJ. Yochum and Rowe’s Essentials of Skeletal Neurology, 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2002. Figure 5-4. (Courtesy of Drs. C. Ford and W. Brooks, Department of Neurology and the Center for Non-invasive images is most likely from an earlier episode of MS.

Credit: Cohen H. Neuroscience for Rehabilitation. 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2002. Figure 5-7.

Credit: Yochum TR, Rowe LJ. Yochum and Rowe’s Essentials of Skeletal Neurology, 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2002. Figure 5-4. (Courtesy of Drs. C. Ford and W. Brooks, Department of Neurology and the Center for Non-invasive Medicine, University of New Mexico, Albuquerque, New Mexico.)

Myelin, an insulating sheath, surrounds the axon and allows for faster conduction of electrical impulses

Exposed axons are unable to send impulses effectively

Immune cells enter the brain or spinal cord and damage the myelin sheath

Immune cells

Myelin sheath, damaged creating scars ("sclerosis")