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Multiple Sclerosis

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Introduction

Multiple Sclerosis (MS) is a chronic and progressive central nervous system (CNS) disease with a largely unknown etiology. It is a autoimmune demyelinating disorder that causes inflammation and scarring on the myelin sheaths of neuronal axons. Because it affects the CNS, it has many debilitating signs and symptoms that involve the sensory, motor, cognitive, and autonomic systems (Capriotti, Noel, & Brissenden, 2018).

- It is one of the most common causes of long-term disability for young adults in the United States (Capriotti, Noel, & Brissenden, 2018).
- It affects around one million people in the U.S. and up to 2.5 million in the world (Maloni, 2018).
- It affects women more than twice as much as men (Tur &Thompson, 2015).
- The median age of onset is around 29 years old (Wingerchuk & Carter, 2014).
- Cost associated with MS are more than 50,000 dollars per year per person (Saguil, Kane, & Farnell, 2014).

MS has been very visible to me for as long as I could remember. As a child I remember asking my parents why a young individual with MS was in a wheelchair. In high school and college, I ran races and raised money for MS research. The last eight years I have worked primarily as a neurological nurse and have seen and taken care of many MS patients. The strength and courage of individuals with MS is what motivated me to learn more about the disease and share it with others.

(National Multiple Sclerosis Society, 2018)

Table 1. Disease Courses of Multiple Sclerosis

Remitting Relapsing Multiple Sclerosis (RRMS)
- The most common type with about 85 percent of MS falling in this category (Sammarco, Logan, Remington, 2018).
- Characterized by periods of worsening neurological symptoms followed by recovery and remission (Sammarco, Logan, Remington, 2018).

Primary Progressive Multiple Sclerosis (PPMS)
- Continuous worsening without remission after onset (Sammarco, Logan, Remington, 2018).

Progressive Relapsing Multiple Sclerosis (PRMS)
- Continual neurological deterioration with episodes of worsening (Capriotti, Noel, & Brissenden, 2018).

Secondary Progressive Multiple Sclerosis (SPMS)
- Most RRMS transition to this continually progressive form (Capriotti, Noel, & Brissenden, 2018).

Disease Process

- There are several risk factors that seem to contribute to activation of the autoimmune response (Sammarco, Logan, Remington, 2018). These risk factors include genetic predisposition, heavy metal exposure, viral infections, and even higher latitudes (Capriotti, Noel, & Brissenden, 2018).
- MS varies throughout the course of the disease. It usually starts with periods of neurological impairment followed by remission. As it progresses, it can become continuously and irreversibly debilitating (Capriotti, Noel, & Brissenden, 2018).
- The various disease courses can be seen in table 1.

Diagnosis

- There is no single test or clinical presentation that is specifically diagnostic of MS (Capriotti, Noel, & Brissenden, 2018).
- The first suspected clinical presentation of possible MS is called clinically isolated syndrome (CIS) and is not enough for diagnosis of MS (Sammarco, Logan, Remington, 2018).
- Diagnosis of MS must include "two neurologic deficits separated in time and space, in the absence of fever, infection, or competing etiologies" (Saguil, Kane, & Farnell, 2014).
- The neurologic deficits must be in two separate parts of the CNS, last longer than 24 hours, and happened at least one month apart. All other etiologies must also be ruled out (Sammarco, Logan, Remington, 2018).
- Magnetic Resonance Imaging (MRI) is the gold standard for diagnostic imaging with evidence of possible MS (Saguil, Kane, & Farnell, 2014).
- These diagnostic guidelines are based on the McDonald MS diagnostic criteria. The revised version also includes new criteria that includes new sophisticated MRI testing to help speed up diagnosis (Sammarco, Logan, Remington, 2018).
- Other helpful diagnostic and treatment tests include evoked potential testing to measure response of specific sensory pathways to stimulus and cerebrospinal fluid analysis for specific immune system proteins (Capriotti, Noel, & Brissenden, 2018).

Pathophysiology

- Although the cause of MS is unknown, it thought to be a immune- mediated disease. Individuals that are susceptible to MS through various risk factors, including genetic predisposition, are exposed to an antigen that starts a immune response that causes inflammation and ultimately destruction of the myelin sheath that cover neuronal axons (Sammarco, Logan, Remington, 2018).
- TH1 cells are activated by an antigen in the periphery where they proliferate and release cytokines and metalloproteinases that let the T cells cross the blood brain barrier into the CNS (Sammarco, Logan, Remington, 2018).
- The T cells (TH2) in the CNS are presented with myelin proteins that resemble the antigen in the periphery. This reactivates the T- cells and along with B cells, CD8+ T cells, and macrophages starts an inflammatory response that ends in the destruction of the myelin sheath (Sammarco, Logan, Remington, 2018).
- This inflammation causes demyelination of the CNS neuronal axons and leads to axonal damage that causes neurological decline (Sammarco, Logan, Remington, 2018).
- The myelin heals after an exacerbation, but is eventually replaced by a fibrotic scar tissue (sclerosis). These are the white plaques commonly seen on MRI (Capriotti, Noel, & Brissenden, 2018).

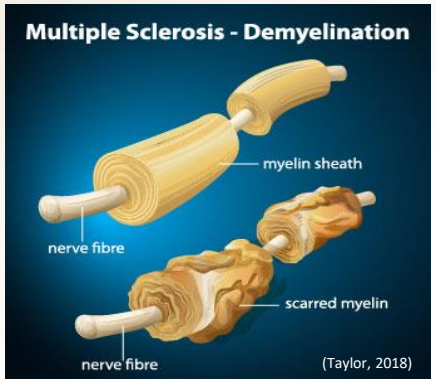

Table 2.

Signs	Symptoms
• Visual deficits (unilateral at onset) • Ataxia • Spasticity • Decreased sensation • Muscle weakness, decreased strength • Nystagmus *ALL SIGNS AND SYMPTOMS RELATED TO CNS IMPAIRMENT (Saguil, Kane, & Farnell, 2014).	• Fatigue • Sensory Impairment including numbness and paresthesia (early complaint) • Gait disturbances/Incoordination • Weakness • Visual disturbances • Heat sensitivity • Pain • Depression (more common) or Euphoria • Dizziness • Hearing loss or tinnitus • Urinary symptoms

Significance of Pathophysiology

- Knowing the pathophysiology of MS helps one understand the process in which the damage is being done to create the clinical signs and symptoms of MS.
- The process is thought to be autoimmune with the body turning on itself and destroying the myelin sheaths of the CNS nerves. So the main goal of treatment is to stop this from taking place.
- Majority of those with MS have RRMS, and up to 85% will have an exacerbation of severe symptoms (Saguil, Kane, & Farnell, 2014).
- With these exacerbations, the inflammation is actively injuring the myelin sheath as well as the axon. The most effective way to treat this is to help deescalate the inflammatory process with corticosteroids. When this is not enough, plasma transfers might be needed (Saguil, Kane, & Farnell, 2014).
- Since MS is considered an autoimmune disease, treatment involves immunomodulators, specifically disease modifying therapies (DMT) (Capriotti, Noel, & Brissenden, 2018).

Signs and Symptoms

- First symptoms are commonly unilateral optic, motor, or sensory deficits. These include optic neuritis, weakness, balance problems, and numbness/tingling (Capriotti, Noel, & Brissenden, 2018).
- The optic and cerebellar nerves are heavily myelinated and thus are the first to be attacked (Capriotti, Noel, & Brissenden, 2018).
- A unique sign of MS is the Lhermitte sign which is a jolt-like sensation that moves down the spine with the flexion of the neck (Saguil, Kane, & Farnell, 2014).
- Uhthoff sign is also unique to MS and is the worsening of symptoms when the body experiences a rise in core body temperature (Saguil, Kane, & Farnell, 2014).
- A full list of signs and symptoms can be seen in Table 2.

Implications for Care

- Due to the progressive, debilitating nature of MS. It takes a multidisciplinary approach to successfully care for an individual with MS (Sammarco, Logan, Remington, 2018).
- Prompt diagnosis and start of treatment is ideal in managing exacerbations and delaying the progression of MS. The goal is to get to diagnosis within 5 years (Saguil, Kane, & Farnell, 2014).
- It is important to rule out any other possible conditions because there are many that may mimic MS (Sammarco, Logan, Remington, 2018).
- Once there is a diagnosis of MS, it is important to start DMTs. The DMTs should be monitored by a specialist, usually a neurologist (Capriotti, Noel, & Brissenden, 2018).
- DMTs help to slow the progression and decrease the disease activity of MS, but symptom management is also needed so the individual can optimally live their lives (Sammarco, Logan, Remington, 2018).
- Educating the individual and the family about the MS diagnosis, treatments, and available resources is very important. It will help them understand the disease and what they could expect in the future.

Conclusions

- Multiple Sclerosis is a debilitating disease of the CNS that affects people in the prime of their lives.
- Accurate diagnosis and treatment followed by great interdisciplinary care is needed for a person with MS. Not only to slow the progression of the disease, but to help prevent disability and treat symptoms so that they can live a more fulfilled life.
- There is need for more research not only for more effective treatments, but for what causes MS. Without knowing what the cause is, it limits the possible treatment options

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