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Multiple Sclerosis and the Implications of Anesthesia

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Introduction

Multiple Sclerosis (MS) is an autoimmune process characterized by inflammation and demyelination of axons in the brain and spinal cord (Schneider, 2005). According to Maclean (2010), MS is one of the most common debilitating neurological disorders in young adults. My intent of this research project is to explain the pathophysiological process and become familiar with the implications of anesthesia related to MS. This research will enable me to prepare a safe, individualized anesthetic plan, taking all essential precautions when caring for a patient with multiple sclerosis.

Symptomology

Symptoms associated with MS are expressed with varying degrees of severity and can originate at different times and locations throughout the disease process. The variability and ambiguous nature of the symptoms pose a challenge to physicians when attempting to diagnose an individual with MS. The symptomology of MS can be categorized as subjective or objective.

Subjective symptoms:

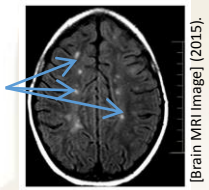
- Pain
- Fatigue
- Trigeminal Neuralgia
- Muscles Spasms
- Weakness
- Parasthesias
- Cognitive Deficits
- Visual Disturbances
- Mood Instability
- Sexual Dysfunction
- Bladder and Bowel Dysfunction

(Maclean, 2010)

Objective Symptoms:

- Tremors
- Ataxia
- Dysarthria

(Maclean, 2010)

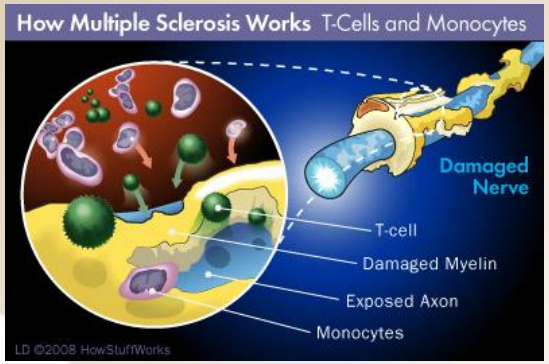


MS Lesions

[Brain MRI Image] (2015). Retrieved from http://www.hindawi.com/journals/cripe/2012/684064.fig.002.jpg

Pathophysiological Process

Underlying pathophysiology:
The etiology of MS is unclear, however there is speculation that the activation of auto-reactive T lymphocytes occur secondary to the exposure to environmental factors, an infectious process or viruses (Ward-Abel, Vernon, & Warner, 2014). After T lymphocytes are activated, they infiltrate the central nervous system (CNS), by breaking through the blood brain barrier. T lymphocytes also activate an inflammatory cascade, which encompasses CD4+ and CD8+ T cells, B cells, interleukin 1, 6, and 11, and tumor necrosis factor, leading to the destruction of oligodendrocytes and myelin (Gupta et al., 2014). Destruction of oligodendrocytes, cells that produce myelin, inhibits the body's ability to remyelinate neurons over time, leading to scar tissue formation on the neuron and the development of MS lesions (Schneider, 2005). Demyelination impedes conduction and transmission of nerve impulses, thus creating cognitive and motor complications throughout the body.



[How Multiple Sclerosis Works] (2008). Retrieved from http://s.hswstatic.com/gif/multiple-sclerosis-monocytes.jpg

Significance of pathophysiology related to anesthesia:
The pathophysiological significance of MS is individualistic. The severity of ones illness ranges from benign symptoms to a debilitating disease process, which guides healthcare providers in their plan of treatment. The four conceptions that are thought to provoke a relapse of MS symptoms are, infection, the post partum period, high stress environments, and hyperthermia (Ward-Abel et al., 2014). Therefore, it is paramount that anesthesia providers conduct an extensive review of one's surgical, medical and family history in order to create a safe plan for anesthesia. In combination with a detailed history, the nurse anesthetist (NA) must also conduct a thorough head to toe assessment. The physical assessment provides insight regarding physical frailties, such as respiratory, cardiovascular, neurological or bowel complications that the individual may experience, which further guides the nurse anesthetist's plan for anesthesia. Patient education is also vital to the prevention of MS relapse during the pre and postoperative phases.

Types of Multiple Sclerosis

Types of MS	Primary progressive	Relapsing-remitting	Secondary progressive
Percentage of people	15	85	N/A
Description	Symptoms appear and get worse (progression) from the start. Relapses are rare. For those people who have relapses as well as progression from the start, the term 'progressive relapsing MS' is used.	Symptoms appear (relapse) then resolve, partially or fully (remission). Relapses last for at least 24 hours, but commonly last for weeks or months. Remissions can last for weeks or even years. A relapse is an episode of neurological disturbance, caused by inflammation or demyelination, which occurs at least 30 days after any previous episode began, lasts at least 24 hours and is not caused by infection or any other known cause (McDonald et al 2001).	More than 65% of people who are initially diagnosed with relapsing-remitting MS will enter this phase within 15 years of being diagnosed (Koch *et al* 2008). Secondary progression occurs when someone has a sustained progression of MS without any relapses having taken place. Some people may continue to have relapses.
(MacLean, 2010)			

Implications for Anesthesia

According to Schneider (2005), the stress of surgery and use of anesthetic agents will not lead to an exacerbation of MS symptoms, yet the complications of surgery, such as infection and hyperthermia have the potential to trigger a relapse. The anesthesia provider must consider the individual's severity of debilitation when devising an anesthetic plan. If the patient has respiratory weakness secondary to MS, then the NA would likely elect to place the patient under general anesthesia, to mechanically ventilate the patient (Schneider, 2005). Depending on the severity of weakness the patient may be difficult to extubate immediately after the operation, so a plan should be made with the intensive care team for postoperative care. Temperature control is crucial for all MS patients. Demyelinated axons are sensitive to increases in a patient's body temperature, further blocking the conduction of nerve impulses (Schneider, 2005). Studies show that an increase of 1° C can be significant and exacerbation of symptoms could ensue (Schneider, 2005). Therefore, the NA should have a cooling blanket under the patient prior to positioning for surgery.

Knowing an individual's degree of illness enables the NA to choose the appropriate neuromuscular blocking agent. Individuals who exhibit extreme muscle weakness and atrophy are known to release excessive potassium from their cells after administration of succinylcholine, which could be devastating to an individual with MS who also has heart disease (Schneider, 2005).

Nondepolarizing neuromuscular blocking agents have been proven to be safe for administration, but the effects can be prolonged or resistant depending once again, on the individual's degree of neuromuscular involvement (Schneider, 2005).

Important considerations when discussing regional anesthesia, often used during labor and delivery, cesarean sections, and orthopedic cases is the use of epidural versus spinal approaches to anesthesia. Studies have shown that the use of spinal anesthesia has led to exacerbations in MS symptoms along with having a higher risk of nerve damage (Schneider, 2005). Epidural anesthesia and peripheral nerve blocks are safe, effective and are the preferred routes of regional anesthesia, when caring for a patient with MS (Schneider, 2005).

Lastly, bowel dysfunction is a major problem for some individuals with MS. It is well known that general anesthesia often creates a temporary postoperative ileus. Consequently, it is important for the NA to ensure the patient is on a bowel regimen including ambulation, stool softeners, and prokinetic medications if needed.

Conclusion

In conclusion, Multiple Sclerosis is an autoimmune process leading to the demyelination of axons, which slows the conduction and transmission of nerve impulses throughout the body. A wide array of neuromuscular complications can occur secondary to neuronal damage. Nurse anesthetists must create an anesthetic plan for each MS patient he or she encounters individually, depending on the patient's complications and degree of disease progression.

It is our duty as healthcare providers to educate our patients to ensure they have the information necessary to make informative decisions, preventing postoperative complications and decreasing the risk for exacerbation of symptoms related to MS.

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