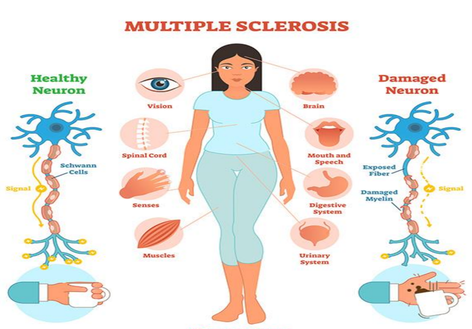
Anesthesia Management in Patients with Multiple Sclerosis

Kaci Waller, SAA

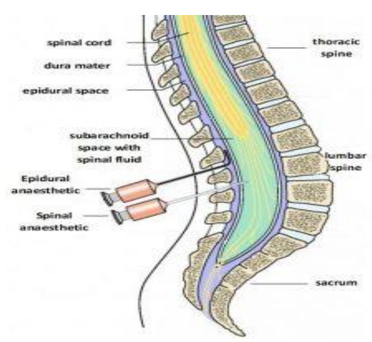
Nova Southeastern University Tampa, FL

ABSTRACT

Multiple Sclerosis is an autoimmune disease affecting an individual's central nervous system. Its high prevalence worldwide makes it probable for an anesthesia professional to take care of a patient diagnosed with MS at some point during their career. General, epidural, and spinal anesthesia are generally deemed safe when used in patients with the disease. General anesthesia is the most common anesthetic technique used. There is more controversy surrounding spinal anesthesia, but it seems spinal anesthesia can be administered safely without any additional increased risk of disease relapse. Understanding how to keep a patient safe during anesthetic management is crucial to providing the best care possible. The anesthetic agents used should be determined based on a patient's symptoms and the presence of acute exacerbations of MS. Temperature increases and stress are the two most common triggers of disease exacerbation and should be avoided as much as possible. Ultimately, an MS diagnosis is not a contraindication to anesthesia. The patient should be informed of the risks and advantages of different anesthetic options and should be included in discussions with their anesthesia and physician care team.



The difference between a normal neuron and a neuron affected by MS and what organ systems the disease can affect (Brain institute).



Epidural versus spinal anesthesia diagram (Obstetric Excellence).

INTRODUCTION

Multiple Sclerosis affects white matter in the CNS by demyelinating axons and producing inflammation. Damage to the axons is permanent, although periods of remission may be characterized by some regeneration of myelin (Schneider, 2005). Scar tissue replaces lost myelin, resulting in demyelinating plaques (Schneider, 2005). The mechanism of axonal damage stems from dendritic cells that cross the blood-brain barrier and induce T-cells into becoming inflammatory cells (Barash et al., 2017). These inflammatory cells then activate cytokine-producing macrophages that cause demyelination in oligodendrocytes (Barash et al., 2017). As demyelination progresses, the transmission of impulses along nerves slows and diminishes. Decreased nerve conductance often leads to manifestations of muscle weakness, loss of coordination and balance, fatigue, and cognitive impairment (Schneider, 2005).

Physiological manifestations of the disease reflect its involvement in multiple organ systems. Organ system involvement, and signs and symptoms, are unique to the individual (Hines et al., 2018). For example, inflammation around the optic nerve may result in visual disturbances. Injury around the cerebellum may lead to balance and gait dysfunction. A patient may have any number of combinations of symptoms ranging from a motor impairment, fatigue, pain, and even mood disorders (Schneider, 2005). Multiple Sclerosis may affect just about every organ system of the body, from voluntary skeletal muscle control to involuntary smooth muscle organ systems such as the bladder and bowel.

Symptoms often develop over a short period of time, remain stable for a period of a few weeks, and then improve (Hines et al., 2018). However, the progression of the disease is characterized by an exacerbation of symptoms at random intervals throughout a patient's life (Barash et al., 2017). There is no definitive cure for the disease; treatment focuses on controlling the symptoms of the patient and preventing the progression of the disease.

GENERAL ANESTHESIA CONSIDERATIONS

General anesthesia is the most frequently used technique in patients with Multiple Sclerosis. There are no unique interactions between MS and the drugs used for general anesthesia (Hines et al., 2018). Likewise, there is no evidence suggesting that either inhalational or intravenous induction is better than the other (Schneider, 2005). The main concern surrounding the disease and a general anesthetic is the effect of paralytics on a patient (Makris et al., 2014). For patients exhibiting motor weakness, succinylcholine should be avoided (Makris et al., 2014). There is an increased risk of hyperkalemia in patients with MS (Makris et al., 2014). The risk is greater in those with severe disease progression, or those experiencing an acute exacerbation (Makris et al., 2014). However, succinylcholine can be used successfully in patients in remission or exhibiting mild symptoms (Makris et al., 2014). Patients with MS may display increased resistance to non-depolarizing muscle relaxants as well (Makris et al., 2014). This may be due to increased amounts of postjunctional muscle receptors (Makris et al., 2014). Likewise, there may be an increased sensitivity to the muscle relaxants due to an increased amount of nicotinic acetylcholine receptors in skeletal muscle (Makris et al., 2014). Therefore, it is important to administer the non-depolarizing paralytics with care and to titrate to effect (Makris et al., 2014).

REGIONAL ANESTHESIA CONSIDERATIONS

Epidural anesthesia is generally deemed safe by the anesthesia community. Currently, there is no evidence that epidurals affect the course of Multiple Sclerosis. Epidural techniques have been the most studied in the obstetric population (Makris et al., 2014). Since Multiple Sclerosis is prevalent in women of childbearing years, anesthetic management during labor and delivery is clinically relevant. Current studies suggest that there is no increased risk of disease relapse following administration of epidurals (Lu et al., 2013). However, it is important to consider the fact that stress from surgery and the postpartum period is associated with disease relapses (Perlas & Chan, 2005). Common anesthetic agents used for epidurals include bupivacaine, lidocaine, ropivacaine, chloroprocaine, opioids, and epinephrine.

Intravenous administration of lidocaine has been known to exacerbate negative MS symptoms, although the effect is both transient and reversible (Perlas & Chan, 2005). At the same time, intravenous lidocaine may also decrease symptoms such as spasticity (Makris et al., 2014).

Some past studies suggest that administering spinal anesthesia unmasks undetected demyelinating plaques (Perlas & Chan, 2005). As in epidural administration, negative symptoms following a spinal technique are transient and reversible, suggesting that the technique itself does not worsen disease progression (Perlas & Chan, 2005). Additionally, disease relapse rates do not seem to be as high as previously feared (Makris et al., 2014). Agents used for spinal anesthesia are the same as epidural techniques, minus epinephrine and chloroprocaine.

CONCLUSIONS

Both general and regional anesthesia may be administered safely in patients diagnosed with MS. Multiple Sclerosis is not a contraindication to any of the described anesthetic techniques. However, general contraindications to each technique, especially regional anesthesia, should be considered in the decision-making process. The most important concept to keep in mind is the fact that the choice of anesthetic technique needs to be based on the individual. The patient in the decision-making process. They should be informed of the risks and benefits of each option and allowed to express their preferences to their clinical providers. Finally, while any anesthetic carries a risk of exacerbating disease symptoms, the most common triggers such as stress and increased temperature should be prevented as much as possible.

REFERENCES

Barash, P. G., Cullen, B. F., Stoelting, R. K., Cahalan, M. K., Stock, M. C., Ortega, R. A., … Holt, N. F. (2017). Rare Coexisting Diseases. In *Clinical anesthesia* (pp. 1560–1563). essay, Wolters Kluwer.

Brain Institute. (n.d.). Retrieved December 18, 2020, from https://www.ohsu.edu/brain-institute/understanding-multiple-sclerosis

Hines, R. L., Marschall, K. E., & Stoelting, R. K. (2018). Diseases Affecting the Brain. In *Stoelting's anesthesia and co-existing disease* (pp. 296–298). essay, Elsevier.

Lu, E., Zhao, Y., Dahlgren, L., Preston, R., van der Kop, M., Synnes, A., ... & Tremlett, H. (2013). Obstetrical epidural and spinal anesthesia in multiple sclerosis. *Journal of neurology*, *260*(10), 2620-2628.

Makris, A., Piperopoulos, A., & Karmaniolou, I. (2014). Multiple sclerosis: basic knowledge and new insights in perioperative management. *Journal of anesthesia*, *28*(2), 267-278.

Multiple Sclerosis FAQs. (n.d.). Retrieved November 27, 2020, from https://www.nationalmssociety.org/What-is-MS/MS-FAQ-s

Perlas, A., & Chan, V. W. (2005). Neuraxial anesthesia and multiple sclerosis.

Schneider KM. (2005). AANA Journal course 2: update for nurse anesthetists. An overview of multiple sclerosis and implications for anesthesia. *AANA Journal*, *73*(3), 217–224.

What Are Epidural and Spinal Anaesthetics? (2020, April 21). Retrieved December 18, 2020, from https://www.obstetricexcellence.com.au/labour-delivery/epidural-spinal-anaesthetics/