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A 40-Year-Old Woman With Multiple Sclerosis Consulting for Postoperative Epidural Following Laparoscopic Converted to Open Colectomy

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Stem Case and Key Questions Content

A 40 year old, 64 kg woman with relapsing-remitting MS presents for laparoscopic resection of a colon mass. Past medical history is only significant for MS and rectal bleeding that prompted diagnostic colonoscopy. Patient has no past surgical history and takes no prescribed medications. Laboratory analysis is unremarkable.

What is the typical presentation of MS?
What is the pathophysiology of MS?
What are the types of MS?
What is known to exacerbate MS symptoms?
How does the type of MS impact the patient's perioperative risk of symptom exacerbation?
How does the presence/absence of current symptoms impact the risk of perioperative symptom exacerbation?

The patient is currently stable from an MS perspective and without any symptoms. She last experienced MS symptoms of fatigue and dizziness two years ago. Surgical difficulties necessitate conversion from a laparoscopic to an open procedure. Patient is currently in the PACU in 9/10 pain and surgical team is requesting an epidural for postoperative pain management.

What are the options for postoperative analgesia following open abdominal procedures?
What are the risks of a Transversus Abdominis Plane (TAP) Block relative to an epidural block?
How does the patient's diagnosis of MS impact the decision to offer an epidural versus a TAP block for postoperative analgesia?
Would a lidocaine infusion for postoperative pain control be appropriate?

Since the patient's planned surgical procedure was to be performed laparoscopically, no preoperative conversation was had with the patient regarding interventional pain management strategies. The patient appears appropriate in the PACU and consents to thoracic epidural placement.

What are the elements of informed consent?
What is the evidence regarding obtaining informed consent in patients who are sedated or otherwise under duress?

What are some strategies to ensure that patients receive appropriate information to make informed decisions regarding postoperative analgesia?

A T9-10 epidural is uneventfully placed and an epidural infusion of ropivacaine and hydromorphone is initiated in the PACU. The patient is transferred to the floor with good pain control and stable hemodynamics. On POD #1, the patient complains of left leg numbness and poorly controlled abdominal pain.

What is the appropriate mechanism to evaluate pain in the setting of epidural analgesia?
What are additional analgesic options in patients with epidural analgesia?
What is the appropriate evaluation of neurologic symptoms in a patient with an epidural?

Model Discussion Content

Pathophysiology of Multiple Sclerosis (MS)

Multiple sclerosis (MS) is an autoimmune multifocal demyelinating disease of the central nervous system (CNS). It typically presents in early adulthood and affects women more frequently than men. Several types of MS have been described each with variable prognosis. In MS, damage to myelin sheaths results in scar and plaque formation throughout the CNS blocking or slowing conduction of nerves. The ultimate result of this demyelination and plaque formation is muscle weakness, loss of coordination, fatigue and cognitive impairment, but the disease can also impact the brain stem, renal, gastrointestinal, cardiac and musculoskeletal systems as well. The peripheral nervous system may also be affected in patients with MS. The course of MS is largely unpredictable and is oftentimes characterized by periods of remission where myelin regenerates and symptoms regress. Ultimately, progressive myelin destruction results in irreversible defects and progressive disability and up to fifty percent of patients will require help walking within 15 years of the onset of symptoms.[1]

Multiple sclerosis most commonly affects young adults in their third through fifth decade of life. It is more common in women than men by a 2:1 ratio. Caucasians are also disproportionately affected with 86% of new MS diagnoses in people of Caucasian ethnicity. Most cases occur in patients that live 40 degrees north or south of the Equator with the highest prevalence in northern Europe, southern Australia and the middle part of North America.[1,2] One million patients are affected with MS worldwide with 250,000 - 350,000 of these patients residing in the United States. The reasons for the variation in the incidence of MS are not well understood. Genetic, environmental, infectious agents, especially viral, and cigarette smoking have been implicated as causative agents for MS. It is generally believed to occur in genetically susceptible people through an immune-mediated pathway.

Diagnosis of MS first involves the elimination of other etiologies as causative mechanisms for the patient's symptoms. MRI evaluation, visual evoked potentials, somatosensory evoked potentials or lumbar puncture can then be used as confirmatory tests. There is no cure for MS although several treatment strategies have been developed. Current treatment involves corticosteroids for significant relapses, plasma exchanges for catastrophic episodes, immune

modulating agents and antineoplastics to prevent relapses, and other agents targeting specific symptoms such as spasticity. It should also be noted that this patient population is at significant risk for depression and that the suicide rate for this group is relatively high.[1]

Types of MS

There are two main subtypes of MS, relapsing-remitting MS (RRMS) which is characterized by acute neurologic deterioration followed by partial or complete recovery, and chronic progressive which is characterized by chronic and steady neurologic deterioration. Many of the chronic progressive patients start as RRMS.[3] In 1996, the National Multiple Sclerosis Society Advisory Committee on Clinical Trials of New Agents in MS completed an international survey to better define the various types of MS. They proposed a formal classification as follows;[4]

1. Relapsing-remitting - "clearly defined disease relapses with full recovery or with sequelae and residual deficit upon recovery; periods between disease relapses characterized by a lack of disease progression."

2. Primary-progressive - "disease progression from onset with occasional plateaus and temporary minor improvements allowed."

3. Secondary-progressive - "initial relapse-remitting disease course followed by progression with or without occasional relapses, minor remissions, and plateaus."

4. Progressive-relapsing - "progressive disease from onset, with clear acute relapses, with or without full recovery; periods between relapses characterized by continuing progression."

5. Benign MS - "disease in which the patient remains fully functional in all neurologic systems 15 years after disease onset."

6. Malignant MS - "disease with a rapid progressive course, leading to significant disability in multiple neurologic systems or death in a relatively short time after disease onset."

Anesthesia Factors Responsible for Influencing Relapse Rates in MS

The National Multiple Sclerosis Society (NMSS) states that surgery itself will not influence MS disease progression but subsequent infection or febrile illness can exacerbate symptoms. General anesthesia is often selected as the "most safe" method for MS patients presenting for elective surgery. The NMSS states that MS patients should be able to receive local anesthetics without fear of exacerbations.[5] However, many Anesthesiologists and patients still fear that regional anesthesia techniques, in particular spinal anesthetics, represent an increased risk for relapse or remission that should be discussed with patients.

Any increased risk is likely related to the type and severity of MS and the planned location and duration of the regional anesthesia technique. In addition, a large number of other perioperative factors may impact the risk of MS disease progression including surgical trauma, tourniquet

application and positioning.[6]

Regional Anesthesia and MS in the Literature

Unfortunately, randomized controlled trials outlining the relative risks of different anesthesia techniques in MS patients are currently lacking. Currently, medico-legal concerns mandate that the anesthesiologist have a thorough conversation regarding the risk of disease progression with anesthesia and regional techniques with their patients. Attempts should be made to include patients in the decision making process and documentation of their understanding should be carefully completed.

Multiple case reports have highlighted both successful administration of and difficulties that may be encountered while providing regional anesthesia to patients with MS. For example, Finucane et al report an incredibly prolonged and exaggerated paravertebral block in a patient who was later found to have MS.[7] Marshak et al report the successful and uncomplicated delivery of thoracic epidural analgesia to a patient scheduled to undergo thoracotomy.[8] Successful and uncomplicated delivery of femoral and sciatic nerve blockade to multiple patients with MS was reported by Ingrosso et al.[9] However, Koff et al offer a chilling story of a serious neurological deficit following an interscalene block in a patient with MS.[10] This case report was met with a number of letters to the editor that suggested that perhaps surgical factors may have played a role in the nerve injury.[11, 12]

Recommendations from experts suggest limiting neuraxial concentrations and volumes of local anesthetics as MS patients appear to be more sensitive to these agents. However, this may increase the risk of insufficient anesthesia. In addition, epidural anesthesia may be a safer alternative to spinal anesthesia. The avoidance of vasoconstricting local anesthetic additives may also be beneficial in patients with pre-existing neurologic disease.[13, 14]

Relative Risk of Peripheral/Neuraxial/Opioid Analgesia

Fortunately, the risk of complications secondary to analgesic regimens is relatively low. However, careful consideration should be given to the possible risks to ensure that patients are appropriately selected and informed. With regard to serious complications, a 1997 study by Auroy et al estimated the risk of cardiac arrest following spinal, epidural and peripheral nerve blocks to be 0.06, 0.01 and 0.01%. Seizure occurred after spinal, epidural and peripheral nerve blocks in 0, 0.01 and 0.08% of cases. Neurologic injury occurred following spinal, epidural and peripheral nerve blocks in 0.06, 0.02 and 0.02% of cases.[15,16] This low rate of severe complications was echoed by a closed claims analysis from Finland.[17] However, a study by Pumberger et al demonstrated a risk of epidural hematoma of 0.07%, a rate higher than previously reported.[18]

Recently published research may finally demonstrate increased safety benefits associated with ultrasound guided peripheral regional techniques versus nerve stimulation. Orebaugh et al followed over 14,000 peripheral nerve blocks and found that the incidence of nerve injury of greater than 12 month duration was similar with or without the use of ultrasound guidance, 0 vs

0.06%. More importantly, however, the use of ultrasound was associated with a decreased incidence of seizure and local anesthetic systemic toxicity, 0 vs 0.1%.[19] Nowakowski has found that with this increase in safety, the prevalence of ultrasound guided blocks increased from 8.6% in 2007 to 53.3% in 2012. In addition, ultrasound guidance allowed for decreased volumes of local anesthetic to be used, 22 vs 31 ml, while maintaining similar block success rates.[20]
Anesthesiologists and other health care providers often assume that non-interventional methods of postoperative analgesia and general anesthesia as compared to regional anesthesia techniques are without risk. This line of thinking can unfortunately expose patients to the non-inconsequential risks associated with opioid analgesia, airway management and volatile agents. While the administration of opioid analgesia and withholding of regional anesthesia techniques may shift the medico-legal responsibility associated with postoperative analgesia to another healthcare provider, it is misleading to assume or allow patients to believe that opioid analgesia is without risk. In fact, 29% of preventable adverse drug affects were associated with analgesics. In a study by Oderda et al, opioid related adverse drug events resulted in a 7.4% increase in hospital costs and a 10.3% increase in hospital length of stay. Of 40,368 surgical patients, 1.8% experienced an adverse drug event related to opioid administration. Mental status changes were present in 0.3% of patients, bradypnea in 0.3% of patients, hypoxia in 0.11% of patients and respiratory failure in 0.04% of patients.[21] Other research has demonstrated a 1.1% incidence of ventilatory impairment with the use of postoperative intravenous opioid administration. Life threatening ventilatory impairment secondary to opioid analgesia is reported to occur in 0.04% of cases. Short of life threatening events, postoperative ileus related to opioid administration has the potential to dramatically increase length and cost of hospital admission.[22] These complications may be more common in MS patients especially those with significant baseline muscle weakness and respiratory compromise.
When discussing analgesic options with MS patients, it is important that patients understand the risks and benefits associated with either a regional or opioid based technique and that no option is without risk, especially those MS patients that may have respiratory compromise.

Informed Consent:
Informed consent in patients who are under duress or the influence of pharmacologic agents is a complicated issue. Appropriate informed consent requires that a physician disclose pertinent risks and benefits of proposed therapeutic options to a patient. The risks of alternative procedures should also be explained to patients to allow for patients to make a decision that they are comfortable with. Appropriate information to disclose to patients would include risks that a reasonable patient would want to be aware of prior to electing to proceed with the proposed procedure. Typically, severe risks (death, paralysis, etc) should be communicated to the patient. Other frequently occurring risks should also be disclosed. Patients should also be competent and any decision should be voluntary. Patients should ideally be free of cognitive impairment (as a result of medication administration or intoxication), personal or emotional stress or external stress from physicians or family members. Those patients with appropriate decision making capacity can understand the benefits, risks and alternative procedures being proposed.[23]

Little literature exists that details the appropriate approach to patients potentially unable or lacking the capacity to make an informed decision regarding their health care. What little literature that does exist to describe management of these types of patients comes from the obstetric literature. Previous work has demonstrated that these patients have a wide range of expectations regarding disclosure of medical risk associated with epidural analgesia.[24] Women's ability to recall information regarding risks/benefits of epidural analgesia is variable. In studies by Jackson et al and Middle et al, women felt that they were able to make an informed decision and had reasonable recall of the consent process for epidural analgesia.[25,26] Recall of risk by women in labor has been found to be similar to recall in other patients and was not impacted by level of pain and 68% of anesthesiologists believe that women in active labor are able to consent to epidural analgesia.[27-29] This is in contrast to a study by Fröhlich et al that describes laboring women being unable to recall common complications of epidural analgesia with a majority believing that discomfort impacted their ability to provide informed consent.[30] Of interest, even in ideal situations, regional anesthesiologists rarely disclose severe risks associated with epidural analgesia (risk of paralysis disclosed by 43% of anesthesiologists, risk of death described by 29% of anesthesiologists).[31]

Potential Strategies to Improve Informed Consent Process

In terms of the postoperative patient the most important question at hand is whether they have the appropriate capacity to understand information, including the risks and benefits of a regional anesthetic technique, and be able to consent to the procedure. And if so, should we perform techniques that may have less perceived risk but perhaps decreased benefit to the patient (i.e. perform a TAP block instead of an epidural in patients where there are concerns regarding medical capacity)? There are many strategies that can be employed to address the problems encountered when consenting postoperative patients for unplanned regional anesthesia:

1 Refuse to provide regional anesthesia to patients not appropriately consented preoperatively.

2.Allow postoperative patients demonstrating appropriate medical capacity to make the decision to undergo regional anesthesia.

3.Allow a surrogate decision maker (family member) to assist in the consent process of postoperative patient.

4.Require all surgical patients to review/sign an anesthesia consent form that discusses serious risks of possible unplanned postoperative regional anesthesia interventions.

5.Be more comprehensive in the anesthesia consent process. Discuss possible interventions should surgery be more painful than expected, laparoscopic case convert to open, etc.

Whatever approach is chosen, proper patient selection and good preoperative rapport will likely decrease the risk of patient dissatisfaction and medico-legal complications.

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