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Neurologic Complications Following Epidural Placement – How to Differentiate and Manage?

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Stem Case and Key Questions Content

A 33 year-old G3P1 in labor requests epidural analgesia. History reveals no neurologic, musculoskeletal or hematologic disease; physical exam is notable for BMI of 40.

1. Is this patient a candidate for a regional technique? Does she have any contraindications to a lumbar epidural?

Epidural placement is attempted. On the first attempt, a dural puncture is noted.

2. How do you proceed? What are the options in managing an accidental dural puncture?
You decide to re-attempt at another level. This time, you correctly identify the epidural space, however upon threading the catheter, you notice the proximal end may be contaminated.

3. How do you proceed? What are the options in managing a possibly contaminated epidural catheter?

You remove the catheter and re-attempt placement a third time. On the third attempt, you successfully identify the epidural placement and thread a sterile catheter.

4. How do you dose the epidural catheter?

The patient gets comfortable shortly after 10 cc of bupivacaine 0.125%.

5. Would you use a continuous epidural infusion? Would you use a bolus demand dose?

The remaining labor course is uncomplicated and the patient delivers a healthy boy.

6. When would you remove the epidural catheter? Is there anything that can be done before removing the catheter to minimize the incidence of a postdural puncture headache?

The patient is doing well on postpartum day 1 (PPD) without any complaints. On PPD 2, you are called because this patient has developed back pain. She complains of pain at the level of T8, with radiation to the occiput and the sacrum, and intensification of pain with weight-bearing and

ambulation.

7. What is your differential diagnosis? What other signs/symptoms are you concerned about?

She denies associated neck stiffness, headache, photophobia, vision change, tinnitus or neurologic deficits.

8. What are your management options at this point?

You consult neurology and obtain head and spine imaging. Brain and spine MRI reveal trace blood ventral to the spinal cord at T12, a thoracic subdural hematoma with ventral cord displacement but no compression, and trace intracranial blood in the lateral ventricles.

9. Do you need to contact neurosurgery? What is the best management for this patient currently? What are the indications and time frame for surgical intervention?

You decide to manage this patient expectantly. On PPD 4, she develops hypertension, headache, nausea and photophobia. Preeclampsia workup is negative, and MRI is unchanged. The patient becomes febrile to 102°F with leukocytosis, but no motor or sensory deficits.

10. What is your current differential? What laboratory work-up is indicated? Why was preeclampsia work-up even considered in the postpartum period?

The patient begins to exhibit meningismus and bilateral abducens nerve palsies, and remains febrile despite empiric antibiotic treatment and negative cultures. You consult infectious disease specialists, and they recommend a lumbar puncture.

11. What are the indications for lumbar puncture? Does this patient have any contraindications to this procedure? Is it possible to manage this patient without a lumbar puncture?

The patient completes one week of antibiotics. Her cultures remain consistently negative, and her leukocytosis resolves. She defervesces on PPD 12, and is able to ambulate pain-free.

12. What is the likely etiology of her fever? Hypertension?

You run into the nurse who took care of the patient on labor and delivery during epidural placement. She asks you about the patient's complication and whether or not it could have been prevented.

13. Could this course have been prevented/avoided in this patient? If so, how?

Model Discussion Content

While epidural anesthesia and analgesia is a remarkable tool that can provide comfort for many patients undergoing surgical or obstetric procedures, it is also one that carries the potential for significant risk. Although the vast majority of patients undergo neuraxial techniques without any complications, those few out of hundreds of thousands that do suffer major neurologic sequelae,

can suffer greatly. For this reason, it is crucial to approach neuraxial techniques with the utmost care for safety and sterility.

The first step in performing a safe neuraxial anesthetic is to do a thorough history and physical examination. Patients with active coagulopathy as a result of disease or anti-thrombotic therapy, thrombocytopenia, or local or systemic infection are not candidates for this technique.^{1,2} Patients with central nervous system tumors, or tethered spinal cords, are similarly ineligible, as the potential risks of the technique would outweigh any benefit in these patients.³⁻⁵ Those with scoliosis or a history of spine surgery, while not necessarily ineligible for neuraxial anesthesia, present a challenge to the anesthesia provider. Lastly, patients refusing a neuraxial technique are certainly not candidates.

Once the patient is deemed eligible for epidural placement, a safe and sterile neuraxial technique is imperative. While the risk for bleeding in the epidural space is less in a patient with normal coagulation and platelets as compared to an anticoagulated patient, it is not negligible, particularly in the case of a traumatic technique. Additionally, the risk of dural puncture and subsequent post-dural puncture headache (PDPH) is relatively significant. In one meta-analysis, patients had a 1.5% chance of accidental dural puncture and 50% of those later developed a PDPH.⁶

In the event of an accidental dural puncture, there are typically two management options: 1) threading of the epidural catheter into the intrathecal space and using it as a spinal catheter, and 2) removing the epidural needle and re-attempting placement at a different interspace. Both methods offer advantages and disadvantages. Threading a spinal catheter may decrease the risk of PDPH,^{7,8} but subjects the patient to the risks of a high or total spinal. Re-attempting epidural placement avoids the need for a spinal catheter, but presents another opportunity for dural puncture.

Aside from the risks of hematoma and dural puncture, infection is another serious risk. To minimize epidural infections, the operator must don a hat, mask, and sterile gloves, and disinfect the patient's back with chlorhexidine or betadine, allowing the solution to dry sufficiently before attempting placement. Similarly, if the catheter, or any other part of the epidural kit, is noted to become contaminated at any point during the procedure, it is best to remove the catheter, obtain a fresh kit, and re-attempt the procedure.

Despite the utmost care to ensure a safe and sterile technique, patients may occasionally still present with complaints after epidural placement. If a patient presents with headache or neck pain one to two days after epidural placement, particularly if her symptoms are positional, PDPH is likely. Vision changes and tinnitus can also be signs of PDPH, and typically indicate the need for epidural blood patching. Neck stiffness can be due to meningismus as a result of meningeal irritation, and if accompanied by fever or mental status changes may indicate infectious meningitis. Aseptic meningitis, also known as chemical meningitis, may present in a similar way.¹¹

Back pain can be concerning if it is associated with decreased sensation or motor weakness, as these can be signs of an epidural hematoma,¹² but most often back pain without associated weakness is due to muscle strain. However, given the consequences associated with epidural hematoma, it is important to have a low threshold of suspicion and to order appropriate imaging,

such as MRI, immediately. If MRI reveals epidural or subdural blood with spinal cord compression, immediate neurosurgical intervention is mandatory. Surgical intervention within 8 hours of symptom onset is typically the goal, however patients can make a meaningful recovery if surgery occurs within 10-12 hours.^{13,14} Beyond 12 hours, however, permanent neurologic injury is likely. If no cord compression is evident, the patient can be medically managed. Medical management of epidural, subdural, or subarachnoid hemorrhage includes pain control with intravenous opioids. Blood pressure management is necessary in the case of subarachnoid bleed. In parturients, the possibility of pre-eclampsia, even postpartum, can present with hypertension, thus creating a confusing clinical picture in the case of a concomitant subarachnoid hemorrhage. For this reason, pre-eclampsia labs, including a complete blood count (CBC) and liver function tests, must be investigated.

It is important to note that subarachnoid hemorrhage can present with fever, as well as hypertension.¹² In such a situation, it can be unclear if the fever is due to infection or aseptic irritation. Given the uncertainty, blood cultures should be drawn and empiric antibiotics initiated. A lumbar puncture could be considered if there is concern for cerebrospinal fluid (CSF) contamination. However, in the case of a concomitant epidural hematoma and/or systemic infection, lumbar puncture is best avoided given the risk of bacterial seeding of the CSF. When administered carefully, neuraxial techniques can provide safe and effective analgesia. Thorough patient assessment is mandatory in order to select appropriate candidates. For the most part, atraumatic and sterile techniques result in patient comfort without major complications. However, more common complications, such as PDPH, may still occur in up to 1.5% of patients. Fortunately, PDPH usually has a benign course, which may occasionally require a blood patch. When more serious complications arise, such as neuraxial hematoma or infection, a successful outcome is highly dependent on a low index of suspicion, early imaging for diagnosis, and continual assessment of risks and benefits in determining the best course of management.

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