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Case Report

Aseptic Meningitis After Spinal Anesthesia

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Abstract

Meningitis is a rare but serious complication of neuraxial anesthesia. Our team reports a case of a 32-year-old who developed aseptic meningitis following a spinal anesthetic for Caesarean delivery. She presented with fever, headache, and neck pain, suggesting meningitis. However, the workup was negative for any causative organism. Aseptic meningitis is a diagnosis of exclusion, secondary to chemical irritation of the meninges or drug hypersensitivity. Differentiation between bacterial and aseptic meningitis is important due the prompt need for antibiotic therapy and further life-threatening complications.

Keywords: Spinal; Epidural; Anesthesia; Meningitis; Neuraxial; Obstetric; Caesarean section; Headache; Bacterial

Introduction

Neuraxial anesthesia techniques are among the most widely used techniques in the perioperative management of a wide variety of patient populations undergoing invasive procedures. Neuraxial anesthesia in the obstetric population involves injecting local anesthetic agents and opioid analgesics into the lumbar epidural/subarachnoid space for motor and sensory blockade of the lower thoracic, lumbar, and sacral nerve roots during obstetric surgeries and all stages of fetal delivery [1]. Due to the invasive nature of the procedure, the clinician must be mindful that there are numerous, but rare, serious complications that can occur.

Absolute contraindications to neuraxial anesthesia include patient refusal, sepsis, localized skin infection/active viral lesions at the site of puncture, thrombocytopenia, therapeutic anticoagulation, pre-existing CNS disorders, preload dependent states, and increased intracranial pressure [2]. Common complications include LAST (local anesthetic systemic toxicity), TNS (transient neurological symptoms), the formation of hematoma, epidural abscess, post-dural puncture headache, and meningitis [3,4]. The prevalence of meningitis after spinal anesthesia is a rare but severe complication with different etiologies. Because of the potential risk of bacterial introduction into the intrathecal space secondary to extrinsic contamination, both the American Society of Regional Anesthesia and Pain Medicine and the Healthcare Infection Control Practices Advisory Committee (HICPAC) in June 2006 and 2007, respectively [5] recommended the mandatory use of surgical masks during these procedures. Despite safe practices, differing etiologies are proposed for meningitis following a lumbar puncture apart from the bacterial/viral infection that may also include a specific subset of meningitis termed "aseptic meningitis." Aseptic meningitis can occur secondary to either disinfectant induced chemical irritation of the meninges or a hypersensitivity reaction to local anesthetic usage. Nonetheless, the differentiation between bacterial and aseptic/chemical meningitis in the clinical setting is critical. The latter is characterized by normal CSF glucose and negative bacterial cultures and remains a diagnosis of exclusion.

Case Presentation

We are presenting a case report of a 32-year-old primigravida who was admitted at 37 weeks of gestation for spontaneous rupture of membranes (SROM). Preoperative anesthesia evaluation had shown a past medical history of asthma, herpes labialis, liver

nodules, migraine headaches in the second and third trimester, depression, and anxiety. The patient had no known drug allergies. The physical exam showed a BMI of 29.42 kg/m2, Mallampati score II, thyromental distance > 5 cm, and unremarkable neurologic, cardiac, and pulmonary physical exam findings. The patient requested delivery by primary cesarean section and was consented for spinal anesthesia. The patient was positioned in a sitting position. Sterile gloves and a surgical face mask were donned prior to and during the entire procedure. The back was sterilely cleaned with povidone-iodine solution, allowed to dry for 3 minutes, and a sterile drape was applied over the back. At the L3-4 level, we used a 25-gauge pencil-point spinal needle to inject a mixture of 12 mg of 0.75% bupivacaine with 8.25% dextrose, 150 mcg of preservative-free morphine, and 15 mcg of fentanyl into the subarachnoid space. No complications or difficulty with the neuraxial procedure were noted. The patient underwent an uncomplicated cesarean delivery with an estimated blood loss of 700 ml. The infant was delivered with Apgar scores of 8 and 9 at 1 and 5 minutes, respectively. No other complications were noted during the intra-operative course.

On postoperative day (POD) 1, the patient started complaining of a non-radiating frontal headache with a severity of 10/10. The headache did not improve or worsen with the change of position, and was described as penetrating, pressure, and sharp in nature. The patient denied fever, back pain, nausea, vomiting, or photophobia. No alleviating or aggravating factors were noted. The anesthesia team evaluated the patient giving initial recommendations for bed rest, hydration, and butalbital-acetaminophen-caffeine (Esgic) administration. Later during the day, the pain started radiating behind the patients' eyes. The obstetrics team consulted neurology, and a CT scan of the head without contrast showed no acute intracranial hemorrhages or mass effect. The neurology team's preliminary diagnosis was status migrainosus secondary to hormonal changes, for which that patient was started on sumatriptan. On POD 3, the patient reported improvement in her headache, stating a pain score of 2/10 down from 10/10. The patient was discharged from the hospital with instructions to continue sumatriptan, Esgic, and hydrocodone-acetaminophen as needed for 7 days and to follow up in the outpatient neurology clinic.

On POD 4, the patient returned to the hospital with a persistent headache in addition to a fever of 102 °F at home and "fever blisters" on her lips. Her headache at the time was described as temporal and located behind her eyes, non-positional, aggravated by movement, associated with nausea and photophobia, and with radiation down her neck, back, and bilateral legs causing difficulty with ambulation. The anesthesia and neurology teams evaluated the patient at this time and determined that the patient's headache symptoms were unlikely to be a post dural punctural headache (PDPH). Based on the clinical manifestations, the onset of fever, nuchal rigidity, and an elevated white blood cell count at 20x103/mm3, the patient was diagnosed with meningitis. Empiric piperacillin-tazobactam and valacyclovir were started. A CT scan of the head with contrast showed no acute intracranial abnormalities. On POD 5, MRI of the brain revealed diffusion restriction within the lateral ventricles, suggesting possible early changes of meningitis or blood from recent neuraxial anesthesia. A lumbar puncture was performed by interventional radiology (Figure 1).

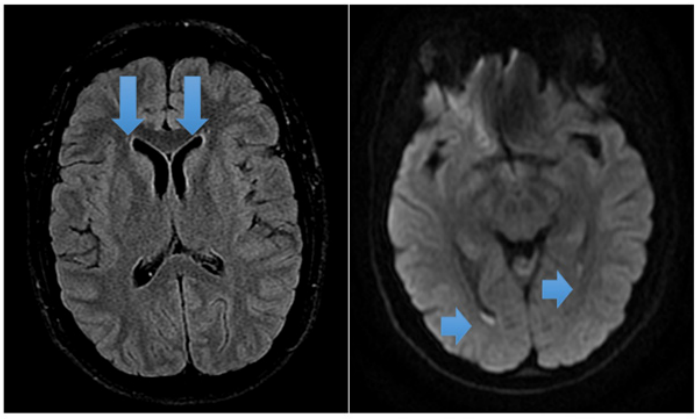

Figure1: MRI brain performed on POD 4 within the dependent portion of the lateral ventricles, possibly representing early changes of ventriculitis/meningitis
A) Axial Diffusion Weighted MRI (DWI) at the level of the lateral ventricles occipital horns demonstrates high signal in the dependent part of the occipital horns (B) T2 FLAIR MRI at the level of foramen of Monroe demonstrates high T2 signal at the anterior horn's ependymal surfaces.

The cerebrospinal fluid (CSF) analysis revealed decreased glucose at 23 mg/dL, increased protein levels at 197 mg/dL, and elevated WBC count at 386//mm^3, suggestive of bacterial meningitis. The CSF, blood, and urine cultures were negative for bacterial organisms, viruses, or fungi. On POD 6, the infectious diseases service was consulted and recommended changing antibiotics to vancomycin and cefepime. On POD 7, the patient reported no improvement in her headache and neck pain, but the

fever has resolved. On POD 8, amphotericin B was added for empiric coverage of fungal organisms. A peripherally inserted central catheter was placed for long term antibiotic administration. On POD 9, a repeat MRI brain was obtained, which showed no significant change from the previous MRI. Additionally, the leukocytosis was resolved with a WBC count of 10x103/mm3.

On POD 10, despite broad-spectrum antibiotics, antifungal, and antiviral medications, the patient's headache and neck stiffness persisted. Her headache was being treated with morphine, Esgic, and ketorolac. A repeat lumbar puncture was performed by interventional radiology, and the second CSF analysis showed a similar elevation in protein (114 mg/dL), a decrease in glucose (38 mg/dL), and an increased WBC count (174/mm3) with negative CSF culture growths for bacteria, viral, or fungal organisms. On POD 11 and 12, the neurology team added gabapentin, cyclobenzaprine, and topiramate to her regimen with the patient reporting some improvement in her headache and neck pain. With improvement in her symptom, the patient was discharged from the hospital on POD 13 with a PICC line to continue antibiotics as an outpatient for 14 days. The patient followed up with her obstetrician on POD 16; she reported significant improvement of her headache with no residual neurologic deficits.

Discussion

In our case, the patient was a 32-year-old primigravida with a pertinent past medical history of herpes labialis and migraine headaches who underwent spinal neuraxial anesthesia. Routine stringent aseptic techniques are followed to protect against nosocomial bacterial infection; sterile disposable syringes, needles, and local anesthetics obtained from an unopened, undamaged spinal kit are placed onto the sterile field and the procedure is performed with sterile gloves, face mask, and hat.

On post-op day 1, the patient started complaining of an initial non-radiating non-positional frontal headache with no aggravating or alleviating factors, without any signs of systemic symptoms or focal neurological deficits to suggest bacterial etiology. Furthermore, CT imaging was negative for any signs of acute intracranial abnormalities. The post-dural puncture headache was considered in the differential diagnosis and was initially treated with conservative measures. Although the patient developed an acute onset headache, she denied any change in the severity of the headache with changes in position. Furthermore, the needle gauge seems to be the most important precipitating factor for PDPH; Turnbull DK, et al. [7], reasoned that with the introduction of fine-gauge pencil-point needles in 1951, the incidence of PDPH has significantly decreased.

Additionally, status migrainosus was considered given the patient's past medical history of migraines, it's critical to recognize the increased incidence of postpartum headaches (PPH) in this patient population. Several studies, such as Goldszmidt E, et al. [8] and Stein G, et al. [12] have found that primary PPH (i.e., tension and migrainous) in the first few days after delivery is more common in those with a previous history of headaches; estrogen has been elucidated as a common factor, as the postpartum migraine may be related to falling estrogen levels [9]. On POD 4, the onset of new constitutional symptoms suggested meningeal irritation. The patient was acutely febrile and had a headache associated with photophobia radiating down her neck, back, and bilateral legs causing difficulty with ambulation. In addition, she had orolabial blisters; in light of these dermatological findings, this suggested reactivation of HSV-1. The patient was diagnosed with meningitis following her clinical presentation, leukocytosis, and brain imaging; she was started on empiric antibiotics for bacterial meningitis and valacyclovir prophylaxis. Regarding the use of neuraxial anesthesia for cesarean section in patients with a history of HSV-1 infection, there have been concerns regarding its safety. This is partly due to the possible risk of the central nervous system dissemination following reactivation of the latent virus (from the trigeminal ganglia), especially in viremia cases, and is caused by intrathecal morphine use demonstrated in a study by Davies PW, et al. [11] and pregnancy-associated depression of cell-mediated immunity [10].

Aseptic meningitis remains a diagnosis of exclusion. Several case reports on aseptic meningitis attribute it to potentially several causes, including contamination from detergent used to sterilize the spinal needle, hypersensitivity reaction to spinal medication, direct chemical irritation of the meninges, and systemic immunologic hypersensitivity to drugs such as non-steroidal anti-inflammatories (NSAIDS), intravenous immunoglobulins, and antibiotics [13,14,16]. With regards to the neuraxial technique, previous case reports have suggested bupivacaine-induced aseptic meningitis. The mechanism for drug induced meningitis after bupivacaine is not well defined similar to other drugs that are implicated, however the fact that there are several reports suggests that chemical meningitis is a rare potential side effect of the medication itself. Bupivacaine, like other local anesthetics, have several transient neurologic symptoms such as tinnitus, dizziness, and altered vision [13,14,17].

A review article from Baer ET, et al. [15], analyzed several possible causes for bacterial post-dural puncture meningitis. A reported 179 cases of post-dural puncture meningitis, with 114 having an organism have been identified. Of these 114 cases, 76% were caused by mouth commensal organisms, 23% were caused by organisms found on the skin, and 1% with endogenous origin. This possibly suggests droplets from medical personnel as a source of contamination. Additionally, there currently are no guidelines regarding the necessity for maximal sterile barrier precautions (face mask, cap, sterile gloves and gown, large sterile drape) during neuraxial placement. A central venous line placement showed several studies that reduced the rate of infection when maximal sterile technique is followed, but similar infection control studies for neuraxial placement have not been performed [15].

Overall, meningitis after neuraxial block is a rare but serious condition. CSF culture is critical to determining the source and

guide antimicrobial therapy. In most cases, the risk of not treating a bacterial meningitis would have devastating consequences, thus the need for empiric antibiotics administration while the workup is performed is essential. In our case, we suspect bupivacaine induced chemical meningitis, however the patient's history of migraines and herpes simplex virus infection may have contributing factors as well. The post-dural puncture headache has a broad differential, and it is important to consider meningitis as an early possibility.

Acknowledgement

None.

Conflict of Interest

The authors declare no financial conflicts of interest exist.

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