Bacterial Meningitis in Parturients after Epidural Anesthesia

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It is common practice to use epidural catheters to facilitate analgesia for labor or for anesthesia and postoperative analgesia following cesarean section. Subarachnoid infection associated with such use is a rare event. The following case reports from two institutions that are geographically widely separated describe the occurrence of bacterial meningitis after the use of epidural catheters in two parturients.

CASE REPORT

Case 1. A healthy 23-year-old gravida 8, para 2 woman at term was admitted in early labor. Pregnancy had been uncomplicated and her membranes had ruptured shortly prior to admission. With cervical dilation of 5 cm, a lumbar epidural catheter was inserted via the fourth lumbar interspace. Sterile technique (povidone-iodine 5% skin preparation, sterile drape, sterile gloves), a steam autoclaved hospital-prepared block tray, and a disposable 18-G Tuohy needle were used. Following identification of the epidural space using a loss of resistance technique with preservative-free normal saline, an epidural catheter was inserted 3 cm beyond the tip of the needle. After a 3-mL test dose (0.25% bupivacaine containing epinephrine 1:200,000), an additional 6 mL of 0.25% plain bupivacaine was injected. Relief of labor pain was noted with the onset of analgesia from T₃ to L₄. Labor progressed rapidly with spontaneous delivery of a vigorous 3,060-g male infant. There were no cervical lacerations and there was no episiotomy. The epidural catheter was removed 50 min after insertion. The insertion site appeared normal.

Twenty-four hours after catheter removal, the patient noted a frontal nonpositional headache, a stiff neck, and generalized back pain. There was no back tenderness. These symptoms became more severe over the following 12 h and were accompanied by a fever of 40.2°C. The blood white cell count was 12.9 thousand/µL (10.7 neutrophils; 1.4 lymphocytes; 0.8 monocytes).

Neurology and infectious diseases consultations were obtained. The neurologist reported findings of a severe headache, marked nuchal rigidity, and muscle spasm in the posterior neck. A diagnostic lumbar puncture revealed CSF total protein of 356 mg/dL, glucose of 5 mg/dL, and 4721 WBC/µL (90% PMNS, 10% monocytes). Cultures of the CSF grew *streptococcus uberis*, a strain of *α*-hemolytic streptococcus. Urine, blood, and vaginal cultures obtained concomitantly grew the same organism. A chest x-ray and CT scan of the head were negative. Antibiotic therapy included ceftriaxone plus vancomycin for 4 days, then ampicillin (based on organism sensitivity) for an additional 6 days. Symptoms and fever resolved promptly and recovery was complete.

Case 2. A healthy 28-year-old gravida 6, para 4 woman with an uncomplicated pregnancy presented at term with membranes intact for elective repeat cesarean section. An epidural catheter was inserted via a midline approach using sterile technique at the second lumbar interspace, and advanced 4 cm into the epidural space. A commercial disposable epidural tray with an 18-G Tuohy needle was used. The epidural space was identified using a loss of resistance technique with preservative-free normal saline. After an uneventful 3-mL test dose using 2% lidocaine with epinephrine 1:200,000, a bilateral T₄ level to pinprick was established with 125 mg of bupivacaine (25 µL of 0.5% plain solution). A healthy 4,510 g male infant was delivered uneventfully. Epidural PCA via the same catheter was used for postoperative analgesia. After a loading dose with 0.9 mg of epidural hydromorphone (4 mL of 0.05% solution in preservative-free normal saline), the patient was allowed to self-administer 0.15 mg boluses of hydromorphone into the epidural space as frequently as every 30 min for incisional pain relief. Forty-eight hours after insertion, the epidural catheter was removed. At the time of removal, an erythematous indurated region, 4 cm in diameter was noted at the catheter entry site. The region was tender to palpation but there was no purulent material present. Thirty-six hours after catheter removal, the patient developed a fever of 38.5°C. The blood white cell count and differential were normal, and urine and blood cultures were negative. The erythema at the epidural entry site was resolving although some tenderness to palpation was noted in the left paraspinal muscles 10 cm lateral to the entry site.

On the evening prior to planned discharge (8 h after catheter removal), the patient complained of acute onset of a global, nonpositional headache that intensified with any movement. She also noted photophobia and hyperacusis. Neurologic consultation was obtained. Findings were severe headache, photophobia, marked nuchal rigidity, and cellulitis with tenderness at the insertion site of the previous epidural catheter. A diagnostic lumbar puncture revealed CSF total protein of 308 mg/dL, glucose of 27 mg/dL, and 3000 WBC/µL (73% PMNS; 22% lymphocytes; 3% macrophages; 2% monocytes). A smear of the CSF showed gram-positive diplococci within leukocytes. Culture of the CSF was positive for *streptococcus faecalis*. Urine and blood cultures obtained concomitantly showed no growth. A lumbar MRI and CT scan were reported as consistent with inflammation, blood, granulomatous tissue, or artifact in the ligamentum flavum and left paraspinal muscles at the L₃–₄ level. There was no evidence of an abscess. Initial antibiotic therapy included gentamicin, cefazidime, vancomycin, and penicillin G. Only vancomycin and penicillin G were used after the first day and were continued for a total of 10 days. Recovery was complete.

DISCUSSION

Infections are rare complications of epidural anesthesia. They may develop at any point along the path of...
the epidural needle or catheter from the skin to the subarachnoid space. Infections may be transmitted by syringes, needles, catheters, drugs, and hospital-prepared epidural trays, or may arise from patients with a septic process involving the skin, deeper tissues, or blood.\textsuperscript{2,3} Contaminating organisms may originate from the hands of anesthesiology personnel.\textsuperscript{4} The most common site of infection is the skin and subcutaneous tissue in the form of cellulitis, especially in patients receiving long-term therapy for chronic pain with indwelling catheters. The most serious but least common infections involve the epidural and subarachnoid spaces.\textsuperscript{1}

Epidural space infections usually manifest as an epidural abscess. These result predominantly from the blood-born spread of organisms from the skin, spine, retroperitoneum, paravertebral area, intercostal space, or pelvis.\textsuperscript{5} Introduction of an infectious organism during epidural anesthesia has been rare, as noted by Baker et al. in a review of the experience of the Massachusetts General Hospital from 1947 to 1974.\textsuperscript{6} Another review of the subject by Danner and Hartman disclosed 166 cases of epidural abscess reported in five series.\textsuperscript{7} It was noted that the clinical course of an epidural abscess has four phases: 1) spinal ache; 2) nerve root pain; 3) weakness including bowel and bladder dysfunction; and 4) paralysis. The initial three phases progressed at rates varying from several hours to many weeks. The cases in which the progression occurred in less than 16 days tended to have more marked clinical evidence of sepsis, including higher fevers and white blood cell counts. Bacteriologic cultures of the abscess were positive in 97 of 107 cases where they were obtained. CSF cultures were positive in 15 of 88 cases, and blood cultures were positive in 36 of 60 cases. Treatment consisted of prolonged iv antibiotic therapy and immediate surgery in the presence of neurologic signs. Outcome appeared to depend on the severity and duration of neurologic impairment before treatment.

Few cases of subarachnoid infection complicating epidural anesthesia have been reported. Usubiaga and Bromage reviewed, in separate publications, five such cases; two involved a continuous caudal technique, two involved a single injection lumbar technique, and one involved a single-injection thoracic technique.\textsuperscript{5,8} Three cases presented as meningitis with CSF white cell counts compatible with infection but with negative CSF cultures. The other two cases presented as arachnoiditis with no mention of CSF cultures. Braham and Saia reported a single case of arachnoiditis that may have been caused by chemical irritants containing an epidural anesthetic solution injected for cesarean section.\textsuperscript{9} Bromage noted that arachnoiditis may result from infection originating elsewhere in the body.\textsuperscript{8} These six cases occurred in the early era of epidural anesthesia and analgesia. In more recent literature, the only reports of subarachnoid infections associated with epidural catheters are related to the treatment of pain in cancer patients whose immune responses have been impaired.\textsuperscript{10}

Bacterial meningitis in pregnancy without use of spinal or epidural anesthesia may be either primary or secondary. Primary bacterial meningitis during pregnancy is most frequently caused by S. pneumoniae and N. meningitidis, and infrequently by H. influenzae. Secondary bacterial meningitis is most commonly associated with infective endocarditis and has an incidence of 1:8,000 deliveries.\textsuperscript{11} It is associated with increased maternal and fetal mortality.

In contrast to previous cases cited, the two cases reported here involved documented subarachnoid bacterial infections occurring 12 h and 3 days after removal of epidural catheters. Diagnoses were based on clinical findings, CSF chemistry, cell counts, and positive CSF cultures. Both patients displayed classic signs and symptoms of meningitis including meningismus, headache, and fever. In both cases, diagnosis was prompt, and treatment began within several hours after the patients displayed signs of subarachnoid infection. Recovery was complete in both cases.

Organic iodine compounds were used in both cases and are recommended as antiseptic agents for skin preparation prior to performing epidural blockade.\textsuperscript{3,4} Bacterial filters were not used on the epidural catheters in either case. It has been shown that in parturients, no reduction in bacterial contamination occurs with their use.\textsuperscript{2} Local anesthetics themselves have been shown to have antimicrobial activity.\textsuperscript{1,12}

In the first case reported, sterile technique was used for epidural catheter insertion. The catheter was left in place only 50 min and there were no physical findings suggestive of infection near the site of catheter insertion. The organism cultured from CSF was also present in vaginal secretions, urine, and blood. Based on these facts, the infectious diseases consultant gave the opinion that the meningitis was most probably caused by blood-born spread of the infecting organism from the vagina.

In the second case, sterile technique was also used. The epidural catheter was left in place for 3 days to facilitate postoperative analgesia. Superficial inflammation at the epidural catheter insertion site was noted but had nearly resolved prior to the onset of signs and symptoms of meningitis. In this case, blood and urine cultures were negative at the time of a positive CSF culture. A lumbar MRI and CT scan showed nonspecific changes at the level of the epidural catheter insertion site. The infectious diseases consultant thought the most likely source of the organism causing the meningitis was the area of cellulitis at the site of the epidural catheter insertion. However, the possibility of causes unrelated to the epidural catheter could not be
excluded. No other cases of meningitis in obstetric patients receiving epidural catheters are known to have occurred at either institution.

In summary, we report two cases of bacterial meningitis occurring in patients who had recently received epidural anesthesia. In one case the cause of the meningitis was in all likelihood the blood-borne spread from the vagina. The cause of the second case is less certain, although cellulitis from the site of the epidural catheter is the best possibility.

REFERENCES