In Vivo Sterilization of an Infected Long-term Epidural Catheter

MARC B. HAHN, D.O.,* JOSEPH A. BETTENCOURT, M.D.,† WILLIAM B. MCCREA, M.D.‡

Administration of opioids via a surgically implanted epidural catheter in patients with refractory cancer pain offers high-quality analgesia, while limiting the side effects often seen with large doses of opioids given orally or parenterally.1,2 Currently, there are several types of surgically placed epidural delivery systems being used for cancer pain management. These systems include both externalized catheters and implanted port access devices.

The primary concern associated with the repeated manipulation of any indwelling systems has been infection. It has been widely accepted that epidural catheters, like other indwelling devices, which become infected should be removed promptly and the appropriate parenteral antibiotic administered. Delay in the treatment of an epidural catheter–related infection may result in an expanding epidural abscess and ensuing neurologic sequelae.3

We believe that any large abscess formation, either draining pus at the injection site or expanding in the epidural space, is a surgical emergency, necessitating the immediate removal of the device and laminotomy if neurologic symptoms are present.4

However, as the following case report suggests, local skin infections (cellulitis) at the site of a subcutaneous infusion port, with subsequent infection or colonization of the port and catheter, may not necessarily predicate the removal of the system.

CASE REPORT

The patient was a 42-yr-old woman with stage III B serous cystadenocarcinoma of the ovary originally diagnosed 40 months prior to admission.

The patient had a subcutaneous H.D.C. Corporation Chemoport® mounted to an 18-G polyvinylchloride epidural catheter placed 4 months prior to admission. The epidural catheter was placed at the L2–L3 interspace and tunnelled to the port over the left ninth and tenth ribs at the anterior axillary line. The catheter tip was at the tenth thoracic vertebral body. The patient’s pain was initially controlled with daily bolus injections of morphine sulfate through the epidural port/catheter system. Eventually, the patient required continuous epidural infusion of morphine sulfate and then fentanyl citrate for better control of her analgesic requirements. The patient did well and was quite active, with minimal pain complaints. She required weekly changes of opioid cassettes, administration tubing, and Huber needles for the epidural infusion. Using sterile technique, the patient changed her dressing over the epidural administration site every other day.

On the day of admission, the patient complained of pain at the injection site. Examination revealed tenderness, erythema, and scant serous discharge at the infusion site. There were no signs of fluctuation or abscess formation at the subcutaneous port site or along the tunnelled catheter track. There also was no evidence of expanding epidural abscess (i.e., back pain or decreased analgesia), increased white blood cell count (8,000 per cubic millimeter, and she had not been receiving chemotherapy for more than 1 yr), or fever (37.5°C orally). Neurologic examination was normal.

An aspirate of the subcutaneous port through uninvolved skin acquired 1 ml of cloudy fluid. A Gram stain of the specimen revealed many white blood cells, with Gram-positive cocci in chains, pairs, and clusters. The epidural infusion was discontinued and an intravenous opioid infusion started for pain control. The patient was started on a 14-day regimen of vancomycin 1 g intravenously, twice daily. The patient wished to avoid any other surgical procedures, and therefore after consultation with the Infectious Disease Department and a review of the literature, we opted for in vivo sterilization of the implanted epidural delivery system. We assumed the infection was caused by Staphylococcus epidermidis; this was confirmed by positive culture from the original aspirate. Based upon that assumption, the epidural system (total dead space of 1.2 ml) was injected with 5 ml vancomycin (40 mg/ml) and left untouched for 2 days. The patient was frequently monitored for evidence of worsening condition or epidural abscess. The catheter was then irrigated with 5 ml normal saline to avoid spurious culture results and was left for 2 days before culturing.

Repeat culture at that time revealed a coagulase-negative Staphylococcus with many fewer colonies than was seen in the original culture. The vancomycin treatment was repeated, but the epidural system was then left in place for 7 days. After the second treatment, the catheter was once again irrigated with normal saline and culture obtained on the 2nd day. While awaiting these culture results, the patient was empirically treated a third time with the same vancomycin regimen through the epidural catheter.

The last culture revealed no growth at 96 h, and the patient demonstrated no sequelae from this treatment. Throughout the entire 2 weeks of therapy, the patient remained afebrile and showed complete resolution of the erythema and tenderness at the injection site. After this last negative culture, the continuous epidural opioid infusion was re instituted, resulting in excellent analgesia.

The patient’s epidural port was aspirated and the aspirate was resubmitted on a weekly basis, following the resumption of epidural opioid

* Chief, Pain Management Clinic; Assistant Professor of Anesthesiology.
† Director, Neuroanesthesia Section; Clinical Instructor of Anesthesiology.
‡ Senior Resident, Anesthesiology.

Received from the Departments of Anesthesiology, Walter Reed Army Medical Center, Washington, District of Columbia and F. Edward Hébert School of Medicine, Uniformed Services University, Bethesda, Maryland. Accepted for publication December 11, 1991.

The opinions and assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of the Army.

Address reprint requests to Dr. Hahn: Department of Anesthesiology, Walter Reed Army Medical Center, Washington, District of Columbia 20307.

Key words: Anesthetic techniques, epidural: infection. Antibiotics: vancomycin.
infusion. For 4 weeks after therapy the patient reported excellent pain relief, and all cultures remained negative. In the 5th week, the patient returned to our clinic with new complaints of pain and redness over the injection site and a decreasing level of analgesia. Upon examination, the infusion site was once again tender and erythematous. Epidural catheter aspirate was obtained and revealed white blood cells along with Gram-positive cocci in pairs, chains, and clusters. Because of a repeat infection, we elected to remove the catheter surgically and administer intravenous antibiotics. Subsequently, the patient’s pain was adequately controlled with intravenously administered opioids through a vascular access catheter.

**DISCUSSION**

We believe that these two catheter-related infections were unrelated. Bacterial culture reports of markedly different antimicrobial sensitivities suggested that the two infections were due to entirely different strains of *Staphylococcus epidermidis*. This is substantiated by the report that both organisms were similarly very sensitive to vancomycin. This would imply a new infection, rather than inadequate treatment of the first infection or acquired resistance by the *Staphylococcus epidermidis* to the antibiotic.

In *vivo* sterilization of vascular access catheters, using antibiotic infusion, has become an accepted technique for treating catheter bacterial infections or colonization.§ Although parenteral antibiotic would adequately treat the infection in the surrounding tissues, it would not sterilize the lumen of the catheter delivery system. Therefore, antibiotic administration through the implanted delivery system is selected during *in vivo* sterilization.

The primary concern with epidural catheter *in vivo* sterilization is the effects of the antibiotic on the epidural space, nerve roots, and spinal cord (inadvertent subarachnoid injection), and a systemic effect (inadvertent intravenous injection).

We chose the antibiotic vancomycin, initially empirically, because the vast majority of catheter-related infections are caused by skin flora. The minimum therapeutic concentration of vancomycin in the serum and tissue is 10–20 μg/ml. Vancomycin is freely soluble in water and diffuses readily in body tissues. Therefore, we believed that this small concentration of vancomycin in the epidural space would be absorbed rapidly through the epidural venous plexus, without sequelae to the space. Vancomycin has also been used intrathecally to treat resistant bacterial meningitis without neurologic sequelae. Based upon this information, we judged that this dose given epidurally would not pose a threat, even if inadvertently injected subarachnoid. Perhaps a more appropriate dosing regimen would represent intervals used for intravenous therapy (i.e., daily or twice daily for 10–14 days).

Small doses of vancomycin, injected into an early infection or colonization of a surgically placed epidural catheter system, initially appears to be bacteriocidal to sensitive organisms and poses no threat to the patient. Although additional studies need to be conducted, in patients with early infections or colonizations of their chronic epidural systems, instillation of vancomycin initially appears efficacious in the eradication of sensitive organisms. This form of treatment may avoid surgical procedures and prolong the functioning of an implanted epidural catheter system in the premoribund patient.

**REFERENCES**
