Acute Postoperative Pain Management and Malfunctioning Epidural Catheter

Case Study

J.S., a 30-year-old male, was diagnosed with leiomyosarcoma of the small bowel with extension into the retroperitoneal space one month before admission. Abdominal x-rays and an ultrasound confirmed the presence of a 17 cm x 10 cm mass protruding from the edge of the jejunum and extending to the approximately 8–10 cm posteriorly up to the median raphe of the right kidney.

General anesthesia was required for the lengthy (i.e., four hours) radical resection of this large tumor, with epidural analgesia planned for postoperative pain management. In the postoperative holding area the morning of surgery, an epidural catheter was inserted at J.S.’s thoracic spinal level T-8. Accurate catheter placement was confirmed by administration of 5 ml of 2% lidocaine with epinephrine 5 mcg/ml and a subsequent mild sensory block from T-12 to T-6. General endotracheal anesthesia was induced and maintained with propofol and isoflurane in intraoperatively. To effect analgesia, a 3 mcg/kg bolus of fentanyl was administered prior to surgical incision, followed by a constant IV infusion of 2 mcg/kg per hour.

During the final hour of surgery, the epidural catheter was activated with a bolus of 5 ml of 0.0625% bupivacaine with 40 mcg/kg of preservative-free morphine per ml, followed by a continuous epidural infusion of 8 ml per hour. Following extubation, J.S. was transported to the postanesthesia care unit. He had a nasogastric tube, a Foley catheter, several surgical drains, and an epidural infusion. Upon awakening, he rated his pain (using a numeric rating scale of 0, which equals no pain, to 10, which equals worst pain) as 1–2, his vital signs and urine output were within normal limits, and he appeared comfortable.

Based on this initial postoperative pain assessment, the fentanyl infusion was discontinued, the epidural infusion was maintained at a rate of 8 ml per hour, and the patient was transferred to the oncology postoperative floor relatively comfortably, drowsy, and with normal vital signs. The pain service, responsible for the epidural catheter management, left the following orders for nursing care.

1. Give no narcotics or other central nervous system depressants except as ordered by the pain service.
2. Maintain the epidural infusion (0.0625% bupivacaine plus 40 mcg/ml morphine) at 8 ml per hour.
3. Inspect the catheter every shift. If blood or clear fluid is leaking, call the pain service.
4. Monitor the respiratory rate and sedation scale (1 = fully awake; 2 = drowsy, easily aroused; 3 = somnolent, difficult to arouse) every hour for 12 hours, then every four hours from the time of any bolus or change in the epidural infusion. Do a pain assessment (i.e., 0–10 scale) every four hours with vital signs.
5. Keep one ampule naloxone at the bedside, and maintain patent IV at all times during the epidural infusion.
6. Treat side effects as follows.
   a. If the respiratory rate is less than eight per minute and the patient is difficult to arouse, give naloxone 0.1 mg by IV push and repeat as needed until responsive; page the pain service to check the patient.
   b. If the patient is nauseated, administer ondansetron 4 mg via IV.
   c. For pruritis, administer diphenhydramine 25 mg via IV every eight hours.
   d. For urinary retention, give bethanecol 2.5 mg subcutaneously. Repeat once in 15 minutes as needed. If no voiding occurs after three to four hours, perform in-and-out catheterization.
7. Ensure the epidural catheter is taped securely before the patient turns in bed, sits up, or ambulates.
8. Maintain these orders in effect for the duration of epidural infusion.

The orders were signed by the physician on call for the pain service.

J.S. appeared to have adequate analgesia and normal vital signs until 11:30 pm, at which time the nurse responded to his frantic calls to find him literally crying with severe pain he rated as 10 and with extreme tachycardia and hypertension. The nurse first paged the physician on call for the pain service and then inspected the epidural catheter and site of insertion, which initially appeared normal. During administration of the bolus of medication ordered by the pain service, the nurse noted extravasation of fluid around the point of catheter entry into the skin, indicating dislodgement of the catheter. She quickly prepared an IV dose of hydromorphone, and on arrival of the pain service physician, began administering 0.5 mg doses via IV every five minutes until J.S.’s pain scores, pulse rate, and blood pressure began to return to baseline. When adequate analgesia had been obtained, the patient was supported in a sitting position and the epidural catheter was reinserted at the T-9 level, along with a bolus of 5 ml of the maintenance infusion solution, which was restarted at 8 ml per hour. Throughout 10 minutes, J.S. was extremely drowsy, he was difficult to arouse, and his respiratory rate dropped to six per minute. A pulse oximeter was applied, and his O2 saturation was 80%. Oxygen was started per nasal cannula, and naloxone 0.2 mg was administered via IV. A fluid bolus of 500 ml normal saline was given to compensate for a drop in blood pressure to 80/40. Fifteen minutes later, the patient was drowsy but arousable, with a blood pressure of 100/60, respirations of 10 per minute, and a pain score of 0–1. The remainder of the postoperative course was problem free.

He was placed on IV opioid patient-controlled analgesia as a “bridge” to oral pain medication before discontinuing the epidural infusion on postoperative day four. He was discharged.

Clinical Problem Solving

Responding to this clinical challenge are Charles Griffis, CRNA, MS, and Shelly Gierat, CRNA, MS. Both are nurse anesthetists in the Department of Anesthesiology at the University of California, Los Angeles, Medical Center.

What are the benefits associated with epidural analgesia?

S. Gierat: Pain management using epidural analgesia is appropriate for abdominal or thoracic surgical procedures because it produces a neuraxial sensory block of the trunk. With the ability of this technique to spare motor function...
function while blocking sensory function of specific dermatomes, patients can ambulate early and cough effectively with minimal pain, which is extremely important to patients such as J.S., who are undergoing major abdominal surgery. Studies have shown that with epidural analgesia, pulmonary function is restored earlier in the postoperative period than when patient-controlled IV opioid analgesia is used. Also, early ambulation can prevent thromboembolic complications.

C. Griffis: Researchers have theorized that effective treatment of postoperative pain in surgically treated patients with cancer with methods such as epidural analgesia can positively affect the postoperative prognosis regarding cancer recurrence (Cepeda, 1996; Page & Ben-Eliyahu, 1997). Pain in patients with cancer can be conceptualized as a pathogen in that it stimulates the stress response and is characterized by the release of epinephrine, norepinephrine, and cortisol, all of which negatively affect immune cell function and immunosurveillance and offer residual tumor cells a chance to escape detection and grow into metastatic lesions (Page & Ben-Eliyahu). Effective epidural analgesia can very effectively block the pain-driven component of the stress response and may allow for enhanced immune function.

What are commonly encountered problems with postoperative epidural analgesia infusions?

S. Gierat: J.S.’s case study details one of the serious potential problems with this analgesia technique—an episode of severe pain associated with epidural catheter dislodgement. As seen in the pain service orders for J.S., usually no IV analgesic drugs are ordered for patients with opioid-containing epidural infusions because concurrent administration of opioids may result in serious respiratory depression. Catheter dislodgement from the epidural space must be recognized promptly, and the onset of worsening pain should prompt oncology nurses to look for extravasation of fluid around the catheter insertion point or the entire catheter having been pulled out. In these cases, the catheter must be reinserted. IV analgesics are used in the interim to control pain. As also was seen in J.S.’s case, patients can develop hypotension and respiratory depression following IV hydromorphone combined with epidural catheter reinsertion and subsequent bolus administration of the combined local anesthetic and opioid-containing epidural solution. However, the healthcare team treated J.S.’s pain episode aggressively because pain in postoperative patients with cancer should be treated as quickly and effectively as possible to decrease activation of the stress response with possible deleterious immune system consequences.

C. Griffis: Another potential problem to be considered is that when resting supine in bed, patients may have adequate analgesia with the initial infusion rate; however, oncology nurse specialists should be prepared to obtain orders to adjust the epidural infusion rate when ambulation first begins because patients may feel more pain with movement. Administration of a bolus of the combined local anesthetic or opioid infusion should occur with patients sitting or supine because transient hypotension and mild motor block of the lower extremities may occur. This hypotension will not be seen when the epidural solution contains only an opiate (e.g., morphine), but other side effects may be problematic, such as pruritis, nausea, and urinary retention. Pruritis can be quite severe and should be managed aggressively with antihistamines such as diphenhydramine via IV; intractable pruritis may necessitate removal of the opioid from the epidural infusion. Nausea is, likewise, a manageable problem in some patients but can be severe, requiring multiple medications and epidural opioid discontinuation in others. Urinary retention usually can be treated effectively by administering bethanechol, a cholinergic agent that acts to stimulate micturition by increasing the tone of the detrusor muscle.

Clinical Highlights: Epidural Analgesia—Description and Common Applications

Description: Epidural analgesia is a technique of providing postoperative analgesia for thoracic and abdominal surgical sites and usually is started pre- or intraoperatively (Stevens, 1996). Patients usually sit or lie on their side in the preoperative area or operating room, and the anesthesiologist or nurse anesthetist, using local anesthesia and strict aseptic technique, inserts an epidural needle (called a Tuohy needle, gauge sizes 17–20) into the skin of the back and down to the epidural space at the approximate midpoint of the desired dermatomal analgesia spread (Brown, 2000). When the needle is in place, a long, thin, hollow catheter (18–20 gauge) attached to a sterile filter is threaded through it into the epidural space, which will allow administration of the prescribed analgesia medications. Often, a combination of dilute local anesthetic (to block axonal pain conduction but avoid motor block) and opioids (to effect analgesia by acting on mu opioid receptors in the spinal cord) as a continuous infusion is prescribed following an initial bolus of solution (Grass, 1998).

Side effects: When a bolus of epidural local anesthetic solution is administered, hypotension may result from local anesthetic sympathetically induced block of lower extremity weakness from motor nerve block; therefore, patients should remain supine and ambulate only after receiving an IV fluid bolus or observation of acute local anesthetic effect. Respiratory depression from epidural opioids can occur and will be exacerbated if IV narcotics, which should be avoided or given in reduced doses with careful monitoring of respiratory rate, are administered concurrently. Naloxone should be available to immediately treat severe respiratory depression. Opioid-associated nausea and pruritis can be treated with antihistamines and anticholinergics. Urinary retention is managed with medication and urinary catheterization.

Nursing care: Oncology nurse specialists can help to facilitate epidural catheter insertion or, if needed, reinsertion in the perioperative period by helping patients assume the desired position and reassuring and explaining the purpose of the procedure. Nurses should ensure that the epidural catheter and associated infusion pump, bag, and tubing are clearly and unambiguously identified to avoid inadvertent administration of medications intended for the vascular system into the epidural space. The epidural catheter must be taped carefully in place, beginning with a loop at the skin surface covered with a sterile gauze pad and clear plastic occlusive dressing and progressing in a straight line up the back under a continuous strip of wide tape. The catheter and infusion tubing must have sufficient length to accommodate patient movement and must be kept free of bed structures to avoid dislodging it (Grass, 1998). Oncology nurses must have sufficient knowledge of the technique of epidural analgesia and the pharmacology and physiology of epidural local anesthetics and opioids to be able to anticipate, diagnose, and solve commonly encountered problems.

References
