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Epidural Opioid Infusion: An Unusual Problem

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Intraspinal opioids have been a recognized treatment for postoperative analgesia since 1979.[1] Unintentional drug overdose with this form of therapy is rare. We report a case in which a patient-generated drug dose greatly exceeded the one prescribed, fortunately with no tragic consequences.

CASE REPORT

A 21-yr-old man with metastatic osteogenic sarcoma underwent thoracotomy for excision of a right upper lobe lung lesion. The patient had not received any preoperative medications. Surgery was accomplished uneventfully under a combination of general and epidural anesthesia. During the surgical procedure, the patient had received 1.2 mg epidural Dilaudid (Knoll, Whippany, NJ; concentration, 0.005%) and 100 μg fentanyl in an effort to alleviate postoperative pain. At the conclusion of surgery, he was transferred to the intensive care unit (ICU) and received a continuous epidural Dilaudid infusion (0.005%) at a rate of 4 ml/h (0.2 mg/h) using a Valley Lab pump (IV7200, Infusion Systems Division, Boulder, CO). He was transferred from the ICU on the first postoperative day with epidural Dilaudid infusing *via* the catheter at a rate of 0.2 mg/h.

At 2:00 P.M., before the nursing shift change, the volume remaining in the infusion bag was noted by the nurse to be 71 ml. At 4:30 P.M. while making a routine check, the nurse noted that the infusion rate had been reset to 54.2 ml/h (from 4 ml/h) and the infusion bag was empty. Thus, the patient had received an extra 61 ml (or 3.05 mg) Dilaudid over a relatively short period of time. The patient's vital signs were stable, with a respiratory rate of 18 breaths per min. He was somnolent but easily aroused. The infusion was decreased to 1 ml/h, and both the apnea and hemoglobin oxygen saturation (Sp_{O_2}) monitors were turned on. The Sp_{O_2} was 96%.

At 6:30 P.M., the nurse heard the Valley Lab pump alarm and found the patient trying to increase the rate. It was again readjusted to 1 ml/h. At 8:30 P.M., the machine again alarmed, and this time the nurse found that the patient had removed the cassette from the pump and was giving himself yet another bolus of Dilaudid. The patient was again counseled by the staff about the dangers inherent in self-medication. As the patient seemed to understand the danger of drug overdose, the infusion was continued at 1 ml/h. There were no further problems after this incident with either the patient or the pump for the remainder of the night. The infusion was kept running at 1 ml/h. Respiratory rate varied from 13–30 breaths per min. The Sp_{O_2} varied from 96–100%.

On morning rounds the next day, the patient complained only of sleeplessness because of frequent apnea monitor alarms. He explained the events of the previous day by saying that he was just trying to get air bubbles out of the cassette. He denied suicidal intent. The patient was very comfortable; the epidural catheter was discontinued; and oral analgesics were started.

DISCUSSION

Epidural opioids are being used with increasing frequency for postoperative analgesia, and some studies have demonstrated that they provide pain relief superior to parenteral regimens with minimal or negligible side effects.[2]

Side effects such as pruritis, nausea, and urinary retention are usually bothersome but not life-threatening. Respiratory depression, especially delayed depression, is the most serious side effect. In an effort to detect this potentially lethal complication, either an apnea monitor or a hemoglobin oxygen saturation monitor, or both, are frequently employed at Stanford Hospital. When patients are awake, movement causes these monitors to alarm frequently and falsely; thus, while these devices are kept at bedside, they are occasionally turned off.

The numerous apnea monitor alarms reported by the patient the next day could have been false, but since they would wake the patient from sleep, they were probably not the usual movement-related false alarms. The alarms may have been related to predictable transient apneas and hypoventilation seen after opioid administration. This would seem to imply respiratory depression. These alarms, however, may have reflected normal hypoventilation, periodic breathing, or apnea that have been reported to occur in healthy, sleeping subjects.[3] While there is a poor correlation between normal respiratory rates and adequacy of ventilation, normal indirect measurements of oxygenation (Sp_{O_2} without supplemental O_2) and this patient's unchanged mental status reassured us that significant respiratory depression probably did not occur. Multiple factors, including the hydrophilicity of morphine, relate to its eventual arrival at the brain stem and subsequent delayed respiratory depression.

The incidence of delayed respiratory depression with morphine is reported to be 0.09–3%.[3] Data are insufficient for epidural Dilaudid to comment on the incidence of respiratory depression it causes. However, since this drug is more potent than morphine and is less lipo-

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philic,‡ respiratory depression may be more common than with morphine. While other reports of epidural opioid overdose were due to avoidable medical personnel errors,[4,5],§ patient-generated overdoses are not. The unpredictability and potentially disastrous consequences of respiratory depression would suggest action to protect patients from overdosing themselves.

Patients are generally considered to be protected against the Valley Lab pump (IV7200) because it is a sophisticated, reliable, and accurate computerized device. It would be highly unlikely for a pump to spontaneously malfunction and cause an overdose of its infusate. It is not true, however, as demonstrated in this case, that the pumps are protected from the patients. The convenient but unsecured controls are easily adjusted by curious, self-destructive, drug-seeking, or confused patients.

To reduce this risk, a locking cover, as found on many patient-controlled analgesia pumps, might be desirable, effective, simple, and inexpensive. Until these pumps are made more secure, patients such as the one described above might not be suitable candidates for epidural infusions, and if pump controls are found to have been tampered with, perhaps infusions should be discontinued immediately.

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Superior Vena Cava Syndrome as a Complication of Change in Body Position during General Anesthesia

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Although superior vena cava syndrome (progressive obstruction or compression of the superior vena cava) manifests with distinctive and characteristic signs and symptoms, its causes are variable. The syndrome is frequently associated with mediastinal masses and chronic mediastinitis‡ but may also occur after insertion of central venous catheters.[1] We observed the development of superior vena cava syndrome after an inadvertent change in a patient's body position during surgery on the thoracic spine.

Case Report

A 64-yr-old, 84-kg man who was essentially healthy except for a history of controlled hypertension had neurologic symptoms of low-back pain, bilateral pain of the lower extremities, and bladder incontinence. Physical examination indicated diffuse bilateral motor weakness of the lower extremities. Magnetic resonance imaging revealed severe spondylosis and stenosis at T11–12 and L4–5 and large osteophytes. His chest radiograph results were normal. The patient was scheduled for removal of a T11 spur and a lumbar laminectomy; a left lateral extracavitary approach was planned.

Before induction of anesthesia, an arterial and a central venous catheter were inserted *via* a radial artery and the right internal jugular vein, respectively. Chest x-ray confirmed the position of the tip of the central venous catheter in the lower part of the superior vena cava. Two 16-G peripheral intravenous (iv) catheters also were inserted. Anesthesia was induced with thiopental, vecuronium, and sufentanil and was maintained with isoflurane, N_2O, and a sufentanil iv infusion. The patient was rolled onto the operating room table and positioned semiprone with the right side down. A bean bag (Olympic Vac-Pac™, Olympic Medical Co., Seattle, WA) provided support. Other supports for pressure points consisted of two foam chest rolls; pillows placed under the left arm, left leg, and right knee; and foam padding placed under the iliac crest. The bean bag was made rigid by suction deflation,

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