Seizures Following Meperidine Use

Case Study

M.T. is a 28-year-old male with sickle cell anemia who was admitted to the emergency department in sickle cell crisis. His pain affected his lower back, knees, and ankles while “moving from place to place,” aching, and throbbing. M.T. reported his pain, whether resting or moving, as a 10 on a scale from 0–10, with 10 being the maximum level of pain. According to M.T., IV push (IVP) meperidine (Demerol) is the only medication that helps control his pain during a crisis. He listed allergies to morphine, codeine, and prochlorperazine. His past medical history includes five sickle cell crises in the past 12 months. He has no history of seizures or strokes. He takes 1 g of hydroxyurea orally every day to help prevent crises.

His hemoglobin on admission was 8 g/dl, his reticulocytes were 5%, his white blood cell count was 4,000/mm³, and his serum creatinine level was 1.9 mg/dl. His pulse oximetry on room air was 92%, and his chest x-ray was negative. The emergency room physician wrote the following orders and transferred M.T. to the inpatient unit:

• IV of 5% dextrose and 0.45% normal saline at 150 ml/hour
• Meperidine 125 mg IVP every two hours as needed
• Promethazine 12.5 mg IVP every six hours as needed for nausea.

M.T. received meperidine every two hours and reported his pain intensity as ranging from 4–9 on the 0–10 scale. Six hours after admission, he was found having a seizure. His seizure was managed with phenytoin (Dilantin®), Parke-Davis, Morris Plains, NY). The meperidine was stopped, and M.T. was started on hydromorphone 4 mg IVP every two hours around the clock with 2 mg IVP every hour for breakthrough pain. His serum meperidine level was 400 ng/ml, and his serum normeperidine level was 450 mg/ml. M.T. was diagnosed with normeperidine toxicity as a result of receiving 800 mg of meperidine over 12 hours.

Clinical Problem Solving

Responding to this clinical challenge are Chris Pasero, MS, RN, and Margo McCaffery, MS, RN, FAAN. Pasero is a pain management educator and consultant in Rocklin, CA, and McCaffery is a consultant in the nursing care of patients with pain in Los Angeles, CA.

This patient experienced seizures as a consequence of the inappropriate prescribing of meperidine. Why was meperidine a poor choice for this patient, and how should this patient’s pain have been managed?

Meperidine no longer is recommended as a first-line opioid analgesic for the treatment of any pain because its active metabolite, normeperidine, can cause central nervous system toxicity and seizures (Acute Pain Management Guideline Panel, 1992; American Pain Society [APS], 1999; Jacox et al., 1994). This drug is a particularly poor choice for patients with sickle cell disease because they often require doses much higher than the recommended total daily dose of 600 mg and longer than the recommended limit of 48 hours. Furthermore, most patients with sickle cell disease have renal dysfunction and cannot easily eliminate normeperidine. Many also have a low seizure threshold, putting them at an even higher risk for normeperidine seizures (APS).

Promethazine is another poor choice for patients with pain because it does not relieve pain or potentiate opioid analgesia (APS, 1999). In addition, the drug is a poor antiemetic (Ernst, Weiss, Park, Takakuwa, & Diercks, 2000). It also lowers the seizure threshold, making it a dangerous choice in patients with sickle cell disease.

IV hydromorphone is a better alternative for M.T. because the drug has no clinically relevant metabolites. A dose of 2.5 mg hydromorphone is roughly equal to 125 mg of meperidine and can be administered by IVP over 5–10 minutes (Pasero, Portenoy, & McCaffery, 1999). It is often necessary to repeat the bolus dose in patients who are experiencing severe pain. After M.T. achieves a level of comfort, a patient-controlled infusion of hydromorphone can be started to allow him to manage his ongoing pain. A nonsteroidal anti-inflammatory drug, such as ibuprofen or rofecoxib, can be given in scheduled doses around the clock to provide additional analgesia. A dose of ondansetron or dolasetron at the time of the initial bolus dose of hydromorphone can help to prevent nausea (Korttila et al., 1997; Zarate et al., 2000).

Because M.T. believes that only meperidine can relieve his pain, switching to another opioid may cause anxiety. Ideally, the need to avoid meperidine and use another morphine-like opioid should be discussed when the patient is not in crisis (e.g., after a crisis is resolved, during a clinic visit). When the change is made, the clinician must titrate the new analgesic aggressively to convince the patient that it will be effective (Brookoff & Polomano, 1992).

What institutional safeguards can be put in place to prevent the inappropriate use and prescribing of meperidine?

The use of meperidine should be limited to patients who are otherwise healthy and allergic to or intolerant of first-line opioid analgesics, such as morphine, hydromorphone, and fentanyl (Acute Pain Management Guideline Panel, 1992). The dose of meperidine should be limited to 600 mg in a 24-hour period and administered for no more than 48 hours (APS, 1999). In patients who are at risk for normeperidine accumulation, nurses should