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Epidural Morphine for Postoperative Pain on Medical-surgical Wards—A Clinical Review

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Since the preliminary communication by Behar *et al.*,[1] epidural narcotics have become a popular method of alleviating postoperative pain. Epidural morphine sulfate (EMS) can provide analgesia superior to conventional methods in a variety of clinical settings.[2–7] The commonly reported side effects of EMS include pruritus, urinary retention, nausea, and respiratory depression, both early and delayed.[8] Some clinicians believe that the risk of respiratory depression is sufficient to warrant administration of EMS only in a recovery room or intensive care unit, where constant observation of the patient is possible.[9,10]

Many clinical investigations involve only single postoperative injections of morphine.[2,5,11,12] Since 1984, we have used epidural morphine, injected over several days, on medical-surgical wards. Because our experience and methods are different from many other centers, we have reviewed our use of EMS in regard to the administration, dosage, patient management, and side effects.

METHODS AND MATERIALS

Administration of epidural narcotics. All epidural catheters were inserted and injected by physicians from our anesthesia department. Written consent for epidural catheter placement was obtained preoperatively. Catheters were inserted in the immediate postoperative period in the recovery room or intensive care unit. An 18-gauge Tuohy needle contained in a standard disposable epidural kit was used in all cases. Patients were placed in lateral decubitus position, and a loss of resistance technique was used. The initial dose of epidural morphine was given in the recovery room or intensive care unit, and preservative-free morphine sulfate (Duramorph®) was used. An initial dose of 5 mg was chosen for most patients; elderly or debilitated patients were given a reduced initial dose of 2–3 mg. If adequate pain relief was not obtained with the initial dose, repeat injections were given as needed. After the patient was transferred to the medical-surgical unit, catheters were injected by physicians making rounds twice daily (or more often, if necessary). After transfer, the dose of epidural morphine was based on total recovery room or intensive care unit dose and the response to subsequent injections. Standard printed observation orders (table 1) were used after all injections, and the nurse responsible for the patient was informed of each injection. Physicians were available in-house at all times to make injections and manage any problems related to EMS. Side effects were treated with narcotic antagonists. Naloxone 0.1–0.4 mg iv was used to treat pruritis, nausea, vomiting, or urinary retention. A naloxone infusion of 5–10 $\mu g \cdot kg^{-1} \cdot h^{-1}$ was considered if repeat doses of naloxone were necessary. Alternatively, nalbuphine 0.05–0.1 mg/kg iv was used to treat side effects.

Chart review. Charts of all patients who received epidural morphine during January through March, 1986, were reviewed retrospectively. Obstetric cases and chronic pain management cases were excluded. Charts were reviewed for descriptive data and the specifics pertaining to insertion, duration, dosage, and side effects of the epidural catheter.

The side effects reviewed were pruritis, nausea, urinary retention, and respiratory depression, with the following conditions being met: 1) a temporal relationship to epidural morphine injection; 2) no other reasonable explanation for the side effect, *e.g.*, itching from an allergic drug reaction or adhesive tape; 3) reversal of the side effect with treatment by a narcotic antagonist or withdrawal of EMS injections; and 4) respiratory depression defined as a respiratory rate of less than ten breaths per minute.

The data pertaining to dosage of EMS were obtained as follows: 1) number of injections and hours catheter *in situ* were read directly from the records (the mean and standard deviation were computed for the entire study population from these results), 2) injection interval and mean dose were computed first as a mean for each patient (from those results, the mean and standard deviation for the entire study population were computed).

RESULTS

The study group included 125 patients, 81 men, and 55 women. The average age was 55.5 yr, with a range

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TABLE 1. Duramorph Observation Orders

Date:
Time:
1. _____ mg Duramorph *via* epidural at _____ am/pm
2. Resp. rate q 30 min for 2 hr
   then q 1 hr for 10 hr
   then q 2 hr for 12 hr
   OR
   Resp. rate q _____ for _____ hr
3. Head of bed up 30–45° as tolerated.
4. Only anesthesia will write for additional pain or sedation medication within 12 h of Epidural Morphine Injection.
5. Ambu Bag and oxygen equipment available at nurses' station.
6. If respiratory rate is less than 10/min give Narcan® (naloxone) 0.2 mg intravenously and page anesthesia resident on call.
7. Page anesthesia resident on call for recurrence of pain, or if having severe nausea or vomiting, urinary retention, or itching which requires therapy.
8. Other orders:
9. _____ mg used _____ mg wasted
   _____ M.D.

of 24–85 yr. The ASA status ranges from ASAI to ASAV, though 82% of patients were ASAII or ASAIII. Sixty-five percent of patients had abdominal surgery. The other patients had renal, thoracic, lower extremity, pelvic, rectal, or urologic surgery. Catheters were inserted from the T12-L1 interspace to the L4-5 interspace, though 82% of the catheters were inserted at L2-3 or L3-4. Catheter insertion distance ranged from 3–6 cm cephalad.

The dosage characteristics are shown in figures 1–4, which demonstrate the number of injections of EMS per patient, the mean injection interval, the mean dose of EMS, and the duration of catheter placement. These data describe a total of 1,100 EMS injections. In 119 of 125 patients (95.2%), initial injections were made in the recovery room, with all subsequent injections made on the medical-surgical ward. The other six patients had catheter insertion and at least one injection in the intensive care unit. Of the 125 patients, three required

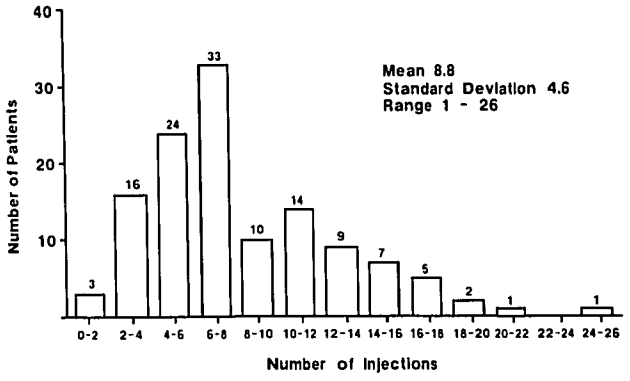

FIG. 1. Number of injections of EMS per patient (histogram).

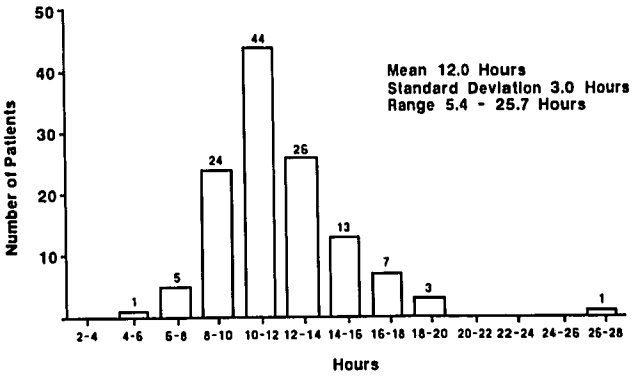

FIG. 2. Injection interval of EMS (histogram).

premature removal of epidural catheters. One patient had inadequate analgesia, one patient complained of left leg numbness with injection, and one patient felt that her vision was made worse by EMS injections. In addition, two catheters were accidentally dislodged by patient movement and traction on the catheter.

The incidence of side effects is shown in table 2. The incidence of urinary retention was calculated with a denominator of 35, the number of patients who did not have the intraoperative placement of a Foley catheter. There were no documented episodes of respiratory depression requiring naloxone treatment.

DISCUSSION

Although use of epidural narcotics has been described, the specifics of dosage, dosage intervals, and management of patients when catheters are used for multiple injections are not well defined. We have retrospectively reviewed our experience with 125 patients receiving 1,100 injections.

Of note, 95.2% of patients were managed on the medical-surgical wards—a clinical practice that some experts on epidural narcotics have advised against because of the risk of respiratory depression.[9,10]

The recommended dose of epidural morphine is 2–10 mg.[2–4,6,10–12] Our data substantiate our clinical impression that the majority of patients require a dose of 5 mg, though doses in our review ranged from 2–10 mg. The mean injection interval of 12.0 h is a function of our epidural rounds and the duration of pain relief with EMS.[8] We have found that, by injecting catheters twice daily, gaps in patient analgesia are avoided. The duration of catheter placement and number of injections varied widely, a function of the diversity of surgical procedures and heterogeneous postoperative courses.

We feel that our incidence of side effects is acceptable. Choosing pruritis as an example, the literature

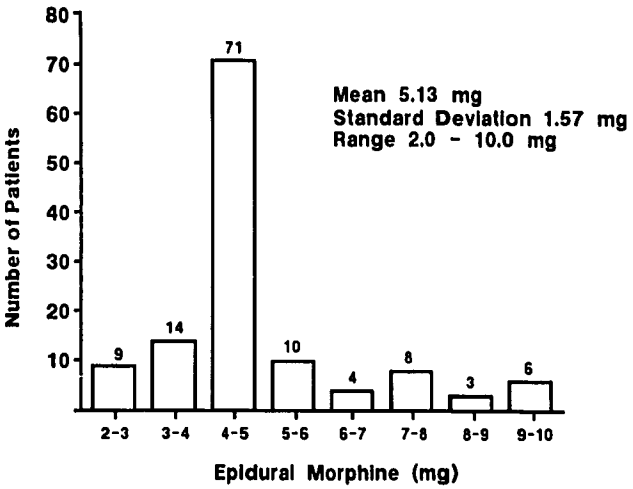

FIG. 3. Mean dose of epidural morphine (histogram).

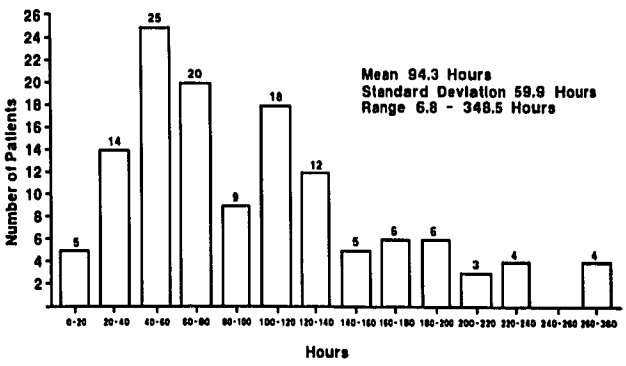

FIG. 4. Duration of catheter placement (histogram).

reports an incidence of 1–78%,[3,6,7,11,13,14] while our incidence was 16.8%. Nausea is the most difficult side effect to evaluate, as postoperative nausea may be associated with many abdominal procedures.

No patients in our review had clinically evident respiratory depression, which we have defined as the occurrence of a respiratory rate of less than ten per minute. We believe this is the result of several safeguards. First, only anesthesiologists write orders for sedatives or analgesics while the epidural catheter is in use, although it is not our usual practice to order systemic narcotics for patients receiving EMS. We have found that an adequate dose of EMS provides analgesia, and we feel that the simultaneous administration of systemic narcotics increases the risk of respiratory depression. For patients requiring sedation, we often use small doses of intravenous Benadryl® (diphenhydramine). Second, overmedication with EMS is avoided. Our clinical end-point is reasonable postoperative pain relief and not total analgesia during all activities. Third, extensive efforts have been made to educate our nursing staff about EMS and its complications. Finally, we feel that, should respiratory depression occur, it would be detected by the nurse caring for the patient and monitoring respiratory rate according to our protocol. Though the literature reports instances of serious respiratory depression,[15,16] this problem was not in evidence in our review.

This study is a retrospective review, and has several important limitations. First, objective evidence of patient satisfaction and adequate analgesia is not obtainable in a review of this kind, and, although our clinical impression is good analgesia, this cannot be documented in our study. Second, some aspects of patient care are not detected in our review. For instance, pruritis not requiring treatment might not be documented, and, thus, never quantitated in our review. Finally, in the case of respiratory depression, our study could only document episodes of respiratory depression clinically recognized. We did not find any such cases in our review, using a respiratory rate of less than ten as our criteria for respiratory depression. However, more subtle episodes of respiratory depression may have occurred and gone undetected. It is documented that epidural morphine may cause an elevated Pa_{CO_2} and a decrease in the ventilatory response to a CO_2 challenge.[2,17] Thus, episodes of subclinical respiratory depression may have occurred in our patient population.

In conclusion, we have retrospectively reviewed our experience with 125 postoperative epidural catheters used for 1,100 EMS injections. We have described our management protocol and the clinically pertinent characteristics of those patients with regard to the dosage, administration, and side effects of EMS. Of significance, 95.2% of patients were managed in private or semi-private rooms. There were no clinically evident episodes of respiratory depression. Our EMS program requires significant manpower, in that an anesthesia resident is in-house at all times, available for epidural injections and the management of related problems. Our program enjoys strong support from our surgical colleagues, and EMS has become our standard of care for postoperative pain control in patients undergoing appropriate surgical procedures with no contraindication to epidural

TABLE 2. Side Effects (n = 125)

	Number of Patients	Percent of Patients
Pruritis	21	16.8
Nausea	11	8.8
Urinary retention*	6	17.1
Respiratory depression	0	0

* Incidence calculated based on patients without a Foley catheter.

catheter placement and narcotic administration. While we do not advocate our methods to all institutions, EMS in the correct clinical setting may be an acceptable modality of pain relief for surgical patients in private or semi-private rooms.

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Thiopental Requirements for Induction of Anesthesia in Children

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There is a wide patient-to-patient variation in the thiopental dose required to induce anesthesia. Lower doses are needed in the aged than in younger adults.[1–3] There is some uncertainty concerning the doses required in children, however. Some authors have reported that children need more thiopental in relation to bodyweight than adults,[4,5] while others have observed no difference.[1,3] One possible explanation for the divergent findings may be that small children need higher doses of thiopental, whereas older children do not, *i.e.*, the situation may be similar to what has previously been reported for the minimum alveolar anesthetic concentration (MAC) for volatile anesthetics.[6,7] To investigate this, we measured the thiopental dose needed to induce anesthesia in children of different ages.

Methods

One hundred unpremedicated children, ASA 1 and 2, scheduled for elective surgery, were divided into six groups according to age: 1–6 months; 6–12 months; 1–4 yr; 4–7 yr; 7–12 yr; and 12–16 yr. Some demographic data are shown in table 1. Surface area was calculated in all patients.[8] All patients were NPO for at least 4 h preoperatively. The study was approved by our local committee on human research.

Children more than 3 months of age were pretreated with a local anesthetic cream to alleviate pain during venous cannulation.[9] Nine of the 19 patients less than 3 months of age had their veins cannulated on the ward before transportation to the operating suite. The catheter (22- or 24-gauge) was inserted in a hand vein or in an antecubital vein. Children more than 6 months of age were accompanied by a parent during induction.

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