The Role of Epidural Morphine in the Postcesarean Patient: Efficacy and Effects on Bonding

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This study was designed to determine in postcesarean patients whether in addition to superior analgesic effects, epidural morphine administration results in secondary benefits in maternal well-being and maternal-infant interaction. Following elective cesarean section with bupivacaine epidural anesthesia, 40 healthy mothers received 5 mg preservative-free morphine sulfate in 10 mL of saline, either by the epidural (Group 1, n = 20) or the intravenous (Group 2, n = 20) route, in a randomized, double-blind fashion. Each received a simultaneous injection of saline by the alternate route. Analgesia in Group 1 lasted significantly longer (16.1 ± 8.8 vs. 4.4 ± 2.4 h, mean ± SD; P < 0.001), and morphine requirements in the first 24 h were significantly less (12.5 ± 20 mg vs. 36 ± 21 mg, P < 0.001) than in Group 2. Seventy-four percent of patients who received epidural morphine reported excellent analgesia, compared with only 32% of those who received intravenous morphine (P < 0.05). Although Group 1 mothers ambulated 6 h earlier than those in Group 2 (P < 0.02), there was no difference between the groups in time of first voiding, number of hours mothers slept, or duration of hospital stay. Mothers in both groups interacted with their infants equally well and for the same duration of time. Icting occurred in 58% of Group 1 patients and only 16% of Group 2 patients (P < 0.01); the incidences of nausea, vomiting, and urinary retention were not statistically different between the groups. No respiratory depression was observed. Benefits of epidural morphine in this patient population appear limited to the provision of improved analgesia and earlier mobility. (Key words: Analgesia: postoperative. Analgesics: morphine, epidural. Anesthesia: obstetrics. Anesthetic techniques: epidural. Pain: postoperative."

In 1976, Yaksh and Rudy4 demonstrated in rats that small doses of narcotics administered intrathecally produced intense and prolonged pain relief, without other objective signs of anesthesia. Since then, many studies have described the successful use of intrathecal and epidural opiates for the treatment of chronic and postoperative pain in humans; these have been reviewed recently by Yaksh.5 The patient who has received epidural anesthesia for her cesarean section should be an excellent candidate for this treatment. As well as providing excellent pain relief, an additional benefit might be an improvement of the maternal ability to care for and interact with her baby. This study was designed 1) to confirm the analgesic efficacy and safety of epidural morphine in a controlled, double-blind trial, and 2) to establish whether specific advantages accrue from its use with respect to maternal caretaking and interactive behavior in the early postpartum period.

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Methods

Informed consent was obtained from 40 healthy, term parturients who had requested epidural anesthesia for elective cesarean section. Surgical anesthesia was provided with 0.75% bupivacaine. If supplemental analgesia was required intraoperatively, fentanyl, up to a maximum dose of 100 µg, was administered after delivery. In view of this agent's short duration of action, it was not expected to interfere with the protocol. No long-acting narcotics were employed. One hour following the end of operation, or when the patient first complained of pain (whichever occurred sooner), each patient received both an epidural and an intravenous injection. Ampules of the study drugs were coded, randomized, and administered using a double-blind system. Patients in Group 1 (n = 20) received a 10-mL epidural injection of preservative-free morphine sulfate, 5 mg in saline, and a 10-mL intravenous injection of saline; those in Group 2 (n = 20) received a 10-mL intravenous injection of morphine sulfate, 5 mg in saline, and a 10-mL epidural injection of saline. Subsequently, pain in all patients was treated with intravenous or intramuscular morphine, as necessary.

Clinical Efficacy

Mothers were monitored for the first 24 h by a trained nurse observer, who had no other responsibilities. Pain was assessed by the patient, initially at 15 min, and later at 1-h intervals, using a linear analog scale.5 Also, the degree of pain relief was assigned a score by both patient and observer, where 0 represented no relief, and 4 indicated complete pain relief. The time until additional narcotics were requested, and the total narcotic dosage in the first 24 h were noted. At the end of the study, mothers and observers evaluated the overall quality of pain relief (i.e., poor, fair, good, or excellent) and gave their opinion as to the ease of caring for the newborn. The incidence of maternal adverse effects, vital signs, time of first ambulation, duration of time spent sleeping, and time of first voiding were recorded.

Behavioral Aspects

As maternal-infant interaction can be hindered by preexisting conditions in either individual, an attempt was made to determine whether such factors were present. Maternal attitudes to the forthcoming delivery were
assessed before cesarean section by means of a questionnaire. The mother’s initial response to delivery was videotaped (with sound track) to identify adverse responses to the infant (e.g., comments that the baby was the wrong sex or looked dirty, or unwillingness to touch or hold it). The infant was evaluated by recording Apgar scores at 1 and 5 minutes and with a neurobehavioral examination, the Neurologic and Adaptive Capacity Score, at 2–6 h of age. The latter examination, although new, closely resembles well-established neonatal neurobehavioral tests and should similarly identify infants depressed from anesthetic or other causes. It was thought that if all maternal and neonatal assessments predicted satisfactory maternal-infant interaction, then differences between the groups might relate to the quality of postoperative analgesia. The mother was allowed to have the baby “rooming in” whenever she wished and the length of time that the mother and infant were interacting was recorded by the nurse, who remained in the room throughout the study period. On at least one occasion during the first 24 h after delivery, a videotape recording of approximately 30-min duration was made of the mother holding and feeding the infant. After completion of the study these tapes were analyzed by a psychologist, who was unaware of the treatment the mother had received or the quality of her analgesia. Methods used in behavioral evaluation were similar to those described previously. In brief, observations concentrated on maternal-infant eye and body contact, maternal effect in response to the baby (smiling, neutral, or sad expression), vocalization (proud or complimentary remarks, rejection or criticism), and the mother’s appropriateness and competence during feeding and in comforting the baby if it cried. Although each behavioral characteristic was scored individually, not all parameters could be assessed adequately in all patients. A composite score therefore was derived for each patient, which reflected the overall quality and appropriateness of maternal-infant interaction. On this scale, 0 represents a very negative maternal response, 4 a neutral response, and 7 a highly positive response.

Data were analyzed using Student’s t test, the Wilcoxon rank sum test, and chi-square analyses, as appropriate. A P value < 0.05 was considered significant.

Results

The groups were similar with respect to maternal age (29 years), weight (82 kg), parity, number of previous cesarean sections, and the duration of operation.

Analgesic Efficacy

All except two patients were completely pain-free, or had only mild pain, one hour after operation when they received their study medication. These two subjects, one from each group, had severe pain at the end of operation and required immediate medication. Since they were not comparable with the rest of the population, they were excluded from subsequent consideration.

The duration of analgesia, as indicated by the percentage of patients who had not requested additional narcotics at the end of each hour, is shown in figure 1.

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**Fig. 1.** Percentage of patients at hourly intervals who have not requested additional narcotics.

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Epidural morphine (n=19)  
Intravenous morphine (n=19)
The mean time until supplemental narcotic administration was 16.1 ± 8.8 (SD) h in Group 1, compared with 4.4 ± 2.4 h in Group 2 (P < 0.02). Also, morphine requirements in the first 24 h were significantly (P < 0.001) less in Group 1 than in Group 2 (12.5 mg ± 20 mg vs. 36 ± 2 mg). Seventy-four percent of women in Group 1 rated their overall analgesia as excellent, compared with only 32% in Group 2 (P < 0.05). Data obtained from analog pain scales and patient and observer assessments of pain relief similarly demonstrated superior analgesia following epidural morphine.

Although Group 1 patients ambulated almost 6 h sooner than did those in Group 2, there were not other significant differences between the groups (table 1). A higher percentage of women in Group 1 than in Group 2 felt better than they had expected (69% vs. 47%) and found their babies easier to care for than expected (79% vs. 58%). However, these differences failed to reach statistical significance. The duration of hospital stay was 5.5 days in both groups.

ADVERSE EFFECTS

The incidence of side effects is shown in table 2. Nausea and itching, usually of the face and trunk, were more common after epidural morphine. These symptoms were treated by diphenhydramine or promethazine in 10 patients, and diphenhydramine and naloxone in one patient. Fifteen minutes following naloxone administration (7 h postoperatively), analgesia diminished somewhat and an intramuscular dose of 10 mg morphine was given. Analgesia subsequently improved to its previous level and no further narcotic was required for the remainder of the first 24 h. There was no significant difference in the time of spontaneous voiding (table 1); however, in our institution it is common practice to electively leave the bladder catheterized for the first 12 h, which would tend to obscure this sign. One patient in Group 1 had urinary retention and required recatheterization. The mean minimal respiratory rate during the study period was 15 min⁻¹ in both groups and this rate occurred 9.6 h (intravenous morphine) and 10 h (epidural morphine) following the initial injection. No patient had a respiratory rate of less than 10 min⁻¹ at any time. Hemodynamic disturbances did not occur.

MATERNAL-INFANT INTERACTION

All newborns had Apgar scores above 7 at 5 min and neurobehavioral examinations revealed a similar distribution of scores in both groups. There was no difference between the groups in the cumulative time during which mothers interacted with their babies (table 1). Scores assessing the quality of maternal-infant interaction are shown in table 3. Two mothers in Group 2 received low scores of 3 and 4, respectively; however, both had excellent pain relief. In one case the baby was detained in the Intensive Care Nursery for 12–18 h and was only released to the mother for short feeding periods. One mother in each group was identified prenatally as having negative attitudes towards the birth of her child; however, both scored 5, indicating adequate, if not outstanding attachment behavior. Most mothers in Group 1 who scored 6 or 7 experienced excellent analgesia, while many of those in Group 2 with similarly high “bonding” scores had only poor, or fair pain relief. Thus, the quality of analgesia did not influence the quality of maternal-infant interaction.
Discussion

Our findings of superior quality and duration of analgesia following epidural, as compared with intravenous or intramuscular postcesarean administration of morphine, agree with those of other workers. The efficacy of epidural morphine appears to be dose-related, and unsatisfactory analgesia has occurred when a dose of only 2 mg was employed. Also, the timing of the injection is important. If the patient is already in severe pain when epidural morphine is given, its variable latency period (10–60 min) often necessitates the early administration of additional intravenous narcotic.

In spite of the excellent analgesia afforded by this technique, the germane issue when considering its routine use must be whether the benefits outweigh the potential risks. In patients who have had abdominal or thoracic surgery, there is often an impressive improvement in FEV₁ and peak expiratory flow following epidural opiate therapy, as compared with conventional narcotic therapy or local analgesia. Epidural narcotics may be indicated in these patients, as well as in others in whom postoperative respiratory function is a particular concern. In contrast, the cesarean delivery patient is usually free from concurrent disease and the commonly used low transverse incision is relatively less painful, with less effect on respiratory function.

What then are the benefits to the new mother of epidural opiate therapy as compared with conventional narcotic analgesia? Yaksh has stated that, “The ability to control pain in the postpartum mother without motor block or the behavioral depression or sedation associated with parenterally administered analgesics is of obvious psychological consequence, particularly following a difficult delivery or cesarean section.” Furthermore, Klaus and Kennell, among others, have claimed that early and prolonged maternal-infant contact on the first day of life is crucial for satisfactory attachment of the mother to her baby, a process often referred to as “bonding.” Does epidural morphine, by causing less sedation and better analgesia, facilitate maternal-infant bonding?

In this study we found no difference in the time that mothers slept during the first postpartum day. Additionally, we were unable to detect any differences between the groups with respect to the quality or quantity of early interactive behavior; almost all mothers demonstrated strong attachment to their infants. While it is possible that the continual presence of the nurse contributed to wakefulness in both groups, and that our methods for evaluating behavior were not sensitive enough, we do not believe that these factors obscured a clinically significant difference between the groups. It is likely that factors such as socioeconomic status, sex of the child, and family support have more effect on maternal-infant interaction and later caretaking ability than temporary influences such as postcesarean analgesia.

Another advantageous effect of epidural morphine therapy in the new mother is the decreased neonatal exposure to narcotics secreted in maternal milk. It was our intention to measure milk morphine concentrations, but mothers consistently were unable to provide us with samples in the first 36 hours following delivery, as lactation was not yet established. Thus, differences in neonatal drug levels resulting from the treatments we studied would probably be of minimal importance, because of the small volume of milk imbibed by the baby during this period.

Disadvantages of epidural opiates relate to minor side effects such as itching, nausea, vomiting, and urinary retention and, more importantly, the rare occurrence of severe respiratory depression. In this, as in other clinical studies, pruritis was the most frequent side effect, despite the use of preservative-free morphine. Nausea and vomiting, and urinary retention have been reported with widely varying frequencies. The latter complication which occurs most often in males would not be a problem in the cesarean patient if, as in this study, the bladder is electively left catheterized. In contrast to clinical studies, experiments in volunteers with doses in excess of 5 mg have consistently revealed severe side effects in a high percentage of subjects. Pruritis, nausea, and vomiting appear consecutively, corresponding to an ascending dermatomal level of hypalgesia; this suggests that they result from widespread rostral distribution of morphine via the cerebrospinal fluid. Naloxone, in systemically administered clinical doses, is said to reverse these side effects without reversing analgesia, presumably because its concentration in the spinal cord is inadequate to antagonize the high opiate levels found there.

The risk of respiratory depression is extremely difficult to evaluate. A significant number of isolated cases of life-threatening respiratory depression have been described following the use of both intrathecal and, less commonly, epidural opiate therapy. Advanced age, narcotic premedication, reinsertion of narcotic (by the epidural, intravenous, or intramuscular route), and assumption of the supine position were contributory factors. Respiratory difficulties occurred hours after initial opiate administration and most likely resulted from spread of narcotic from the spinal cord to the respiratory neurons near the surface of the fourth ventricle.

While severe respiratory depression is rare, experiments in patients and volunteers have demonstrated abnormalities in respiratory function. Doblar et al.
demonstrated depression of ventilatory and airway occlusion pressure responses to CO\textsubscript{2} following 10 mg of epidural morphine, the latter abnormalities persisting for at least 6 h. Knill and associates\textsuperscript{30} reported a progressive increase in P\textsubscript{CO\textsubscript{2}}, and progressive decreases in respiratory rate, tidal volume, and ventilatory response to CO\textsubscript{2}, following the administration of epidural morphine, either 3.5 or 7.0 mg to volunteers. It is important to note that depression was maximal at the time that analgesia was beginning to wane; clinically this is when most patients would receive additional narcotics. Thus, to safeguard against respiratory depression, the patient must be reliably monitored for 24 h after epidural operative administration. Since additional nursing care and perhaps monitoring equipment would be necessary, each anesthesiologist in the context of his or her institutional needs and resources must decide whether this is feasible for the routine cesarean section patient.

In summary, epidural morphine gave excellent pain relief in postcesarean patients with no major complications and few minor side effects. However, as the sample size of the study groups was small, no firm conclusions relating to the incidence of adverse effects can be drawn. From a humanitarian viewpoint, epidural morphine could be considered the ideal postoperative analgesic, although we failed to demonstrate the secondary behavioral benefits that have been claimed for this patient population.

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