Bupivacaine, 0.125 Per Cent, in Obstetric Epidural Analgesia: Experience in Three Thousand Cases

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Bupivacaine, 0.125 per cent, with epinephrine, 1:800,000, was administered to 3,000 women in labor. Administration was in the lumbar epidural space for the purpose of achieving satisfactory analgesia with minimal or no motor paralysis. The usual initial dose of 12.5 mg (mean 15 ± 2 SD) resulted in good sensory analgesia in 85 per cent of the patients and lasted for about an hour (mean 56 ± 16 min). The mean total dose used for labor and delivery was 55 ± 20 mg and the mean dose per hour 23 ± 13 mg. Satisfactory analgesia for labor and delivery was obtained in 92 per cent of the patients, and in 66 per cent there was no discernible motor blockade. In the 3,000 patients, there was no adverse reaction to bupivacaine or epinephrine. No patient had a total spinal block or neurologic sequelae, and no neonatal depression could be attributed to the anesthetic. (Key words: Anesthesia, obstetric. Anesthetic techniques, epidural; peridural; lumbar. Anesthetics, local: bupivacaine.)

CONTINUOUS LUMBAR ANALGESIA is commonly used for relief of pain during labor and delivery. The objections to the use of continuous epidural analgesia and its commencement during early labor include: slowing or arrest of labor, necessitating the use of oxytocin; motor paralysis of the pelvic and abdominal muscles, resulting in lack of internal rotation and insufficient bearing-down force; absence of Ferguson reflexes,1,2 with further delay of the second stage and an increase in the need for mechanically assisted deliveries; increased risk of hypotension; accumulation of local anesthetic in maternal and fetal blood; unpleasant subjective awareness of numbness and paralysis by the mother; increased time commitment by the anesthesiologist, and the need for more prolonged intensive monitoring. We have been able to minimize most of these drawbacks by inducing a differential epidural nerve blockade (i.e., selective sensory analgesia with minimal motor paralysis) using a low concentration of bupivacaine, 0.125 per cent, with epinephrine, 1:800,000.

Materials and Methods

The effectiveness and the duration of analgesia, the dose of local anesthetic used, the degree of motor blockage, and the duration of the second stage of labor were analyzed in 3,000 sequential, unselected parturients for whom continuous lumbar epidural analgesia with bupivacaine, 0.125 per cent, with epinephrine, 1:800,000, was used. Bupivacaine, 0.125 per cent, with epinephrine, 1:800,000, was prepared by diluting 5 ml of bupivacaine, 0.5 per cent, with epinephrine, 1:200,000, with 15 ml of sterile physiologic saline solution without preservative.3–5

After the thirtieth week of gestation, all parturients were advised by the obstetrician to see a skilled physical therapist for bearing-down instructions and appropriate training.

Shortly after the patient entered the hospital, and if possible before she was in severe pain, a soft nylon catheter (Portex® 100/380/300) was inserted through a 16-gauge Tuohy needle into the epidural space between L3 and L4 and advanced 3–4 cm cephalad. If no blood or CSF was aspirated, a 5-ml test dose of bupivacaine was given. Three minutes after this dose, sensory changes were tested by pinprick and motor blockade was evaluated. If no response was elicited, epidural analgesia was instituted when the parturients asked for relief of pain. Frequently the cervix was only minimally dilated (less than 2 cm). The routine initial dose was 10 ml. Twenty minutes after this initial dose, the level of skin analgesia was noted. If analgesia was inadequate, an additional 10 ml was administered. Supplemental doses were given as soon as uterine contractions were perceived again, ideally before pain returned. If an additional dose was needed for delivery of the infant, the patient was placed in the sitting position. Depending on the sensory level already reached, 8 to 16 ml were administered slowly over a two-minute period.

Quality of analgesia was assessed by the following scoring system: excellent: relief of pain was complete from the first or the second injection until the end of the delivery; good: the mother was satisfied, but some pain was experienced for a short period during the delivery process; incomplete: the patient had significant relief of pain but experienced some pain during most

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of labor or delivery; failure: pain was experienced during both labor and delivery.

Motor blockade was assessed immediately after the delivery using the criteria of Bromage: unimpaired knee and ankle movements 0 per cent; partial impairment of knee flexion, 33 per cent; foot movements but no knee power, 66 per cent; complete inability to move the leg or foot, 100 per cent. Even when only one leg was involved, the patient was classified as if both legs were affected. Total duration of analgesia was calculated as the time from onset of analgesia to the end of the second stage. The incidence of mechanically assisted versus spontaneous delivery was recorded. Apgar scores at 1 and 5 min were recorded. In 347 unselected patients blood from the umbilical artery, and vein was sampled anaerobically and analyzed within 5 min for pH, P\textsubscript{CO\textsubscript{2}}, and P\textsubscript{O\textsubscript{2}} with an Instrumentation Laboratory 213/227 or a Corning 175 blood-gas analyzer.

Blood pressure was measured frequently, and at least at 3-min intervals, as long as the parturient was not in the left lateral position after each supplemental dose. The incidence of hypotension, defined as a decrease in systolic blood pressure of more than 30 per cent or a pressure below 100 torr, and maternal complications such as dural puncture, toxic reactions, neurologic sequelae, pain on injection, and extensive spread of analgesia were recorded. P values were calculated according to the chi-square test for two independent samples.⁷

Results

Analgesia was excellent in 84 per cent of the parturients and good in 8 per cent. In 8 per cent it was incomplete or a failure; unilateral pain was accountable for 41 per cent of the incomplete analgesias or failures. Incomplete analgesia was found to be lower in primigravidas (6 per cent) than in multigravidas (9 per cent) (P < 0.01). The mean duration of analgesia and the mean dose per hour were significantly different between the two groups of parturients (table 1). The extremes in duration in this series were 20 min and 20 hours, 40 min. The mean duration of analgesia after the first dose was 58 ± 15 min. In 17 per cent of patients, the first dose did not provide adequate analgesia, and an additional 10 ml was given within 30 min. In 66 per cent there was no discernible motor blockade. Motor blockade of more than 33 per cent occurred in 4 per cent of the patients. The mean duration of the second stage was 21 ± 13 min in the primigravidas and 14 ± 11 min in the multigravidas (P < 0.01).

The mean expulsion time for 61 primigravidas with breech presentations was 25 ± 24 min and that for 38 multigravidas, 18 ± 15 min. Spontaneous delivery occurred in 39 per cent of the primigravidas and in 73 per cent of the multigravidas (P < 0.01). Forceps were rarely applied (1 per cent). Forty-three per cent of the patients (59 per cent primigravidas and 26 per cent multigravidas) (P < 0.01) had vacuum extraction.

Ninety-one per cent of the babies were delivered via head presentations, and 91 per cent had Apgar scores of 7 or more at 1 min; 99 per cent had scores of 7 or more at 5 min. There were 36 twin deliveries. Of firstborn twins, 83 per cent scored 7 or more at 1 min and 94 per cent scored 7 or more at 5 min. For the secondborn those figures were 75 and 100 per cent, respectively. Only 60 per cent of the infants with breech presentations delivered to the 61 primigravidas had Apgar scores of 7 or more at 1 min, but 98 per cent were vigorous at 5 min. For the 38 corresponding infants delivered to multigravidas, these figures were 82 and 96 per cent, respectively.

The infants' blood-gas values were within normal ranges⁸ (table 2). Ten per cent of the mothers had episodes of hypotension, which were treated effectively with uterine displacement and hydration. Dural punctures occurred in four cases. In two of these cases, the catheter was placed in the subarachnoid space. We decided to give continuous spinal anesthesia after the patient was informed, using the same solution of bupivacaine, 0.125 per cent, with epinephrine, 1: 800,000, injected with the patient in the 15-degree Trendelenburg position. The first patient had cervical dilatation of 3 cm when analgesia was started. She needed 16 ml for complete relief of pain. The infant was delivered after 90 min. The second patient

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* Significantly different, P < 0.01.
had cervical dilatation of 5 cm when analgesia was started. She was completely pain-free with 10 ml, and the infant was delivered after 65 min. Both patients received 500 ml of physiologic saline solution, and hypotension did not occur. Motor blockade was complete. Maximal spread of analgesia was T10 to S5. It lasted longest in the sacral segments, and disappeared completely after 290 min in the first patient, and after 230 min in the second. The solution behaved as though it were hypobaric. Convulsions and toxic reactions were not seen. The follow-up period of a week revealed no neurologic sequelae. Pain on injection was experienced by one patient, who previously had had an operation for a herniated disc. In one per cent of our patients, analgesia of the skin after the first dose of 10 ml extended over ten (or as many as 16) bilateral skin segments. There was no hypotension or slowing of labor in these patients.

**Discussion**

Excellent or good analgesia were obtained in 92 per cent of our patients. The incidence of incomplete analgesia in this study with bupivacaine, 0.125 per cent, was similar to incidences found by other investigators using 0.125 per cent or 0.5 per cent.9-11 The faster progress of labor in multigravidas necessitated more frequent injections and hence, a higher anesthetic dose per hour.

Whether the extradural injection of local anesthetic prolongs the first stage of labor is still controversial.12-14 Comparisons are difficult, as the mean durations of the first stage vary widely from one study to another (e.g., 6.3 to 12.5 hours in multiparas).15,16 Moreover, 48 per cent of our patients had elective inductions, with oxytocin infusion being started before the beginning of the epidural analgesia. Overall, oxytocin was given to 86 per cent of our patients. Our obstetricians, in agreement with others,2,17 believe that epidural analgesia improved the progress of labor in conditions such as dyskinetic contraction and slow cervical dilatation.

The duration of the second stage of labor was not prolonged in our study. The absence of the Ferguson reflex can easily be compensated for by pain-free, coordinated bearing down by instructed women when muscle power is intact.5 This is illustrated by the short second stages in the 99 breech presentations, where mechanical assistance was not used.13

The concentration of bupivacaine, 0.125 per cent, results in maternal and fetal plasma concentrations that are considerably less than those found when higher concentrations are used.18-21 The low dose per injection decreases the risk in the event of intravenous injection, and especially, the danger of inadvertent subarachnoid injection, as shown in the two cases where the catheter was introduced accidentally into the subarachnoid space.

Additionally, the majority of parturients in our study did not experience unpleasant subjective awareness of numbness and paralysis. The heavier workload for the anesthesiologist due to an earlier start and the need for more frequent injections is compensated for by the greater safety, the lower plasma levels of drug in mother and child, and the avoidance of significant motor blockade.

Having used this technique in more than 3,000 cases, we conclude that epidural block with bupivacaine, 0.125 per cent, with epinephrine, 1:800,000, is effective and safe for control of pain during vaginal delivery.

**References**

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