TITLE: CONTINUOUS EPIDURAL INFUSION OF ALFENTANIL AND BUPIVACAINE FOR LABOR AND DELIVERY

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Introduction: Alfentanil is a potent lipid soluble narcotic with a rapid onset and ultra-short duration of action.(1) In spite of these desirable pharmacologic properties, the use of epidural alfentanil alone (without additional local anesthestic) during labor has been unsatisfactory because of the large doses required, inadequate pain relief during the second stage of labor, and neurobehavioral changes reported to occur in the neonates.(2) However, the combination of a narcotic and a local anesthetic is more effective than either drug alone. This permits lower doses of each drug to be used and may reduce the incidence of side effects. Therefore, the analgesic efficacy of small doses of epidural alfentanil infused in combination with low concentrations of bupivacaine was evaluated during labor.

Methods: Institutional approval and written informed consent were obtained. All patients were multiparous ASA Class I with a pain score of at least 5 on a 10 cm visual analogue scale (VAS). The study was single-blinded and the patients were randomly assigned to Group A or Group B. All epidural catheters were placed at L3-4 and 3 ml of 0.25% bupivacaine was administered to both groups. Following uterine displacement, the eighteen patients in Group A received 10 µg/kg of alfentanil contained in 10 ml of 0.125% bupivacaine. A preliminary evaluation demonstrated that 0.125% bupivacaine plain (10 ml) gave adequate analgesia in only 50% of the patients (n=5) and this group was discontinued. Therefore, the 17 patients in Group B received 10 ml of 0.25% bupivacaine. All drug solutions were injected in 3 ml increments. Next, a continuous infusion of 0.125% bupivacaine was administered to both groups, at the rate of 10ml per hour until delivery. Group A patients also received 10 µg/kg/hr of alfentanil added to the bupivacaine infusion (final alfentanil concentration of 1 µg/kg/ml in the infusate).

Epidural top-up doses were given only when the patient requested additional analgesia. Group A patients were given 10 µg/kg of alfentanil in 10 ml saline and Group B patients were given 10 ml of 0.25% bupivacaine as a top-up dose. Prior to cesarean or forceps delivery, patients in both groups were always given 3%-chloroprocaine. The incidence of instrumental and cesarean deliveries was recorded. Sensory levels, motor block, the time from completion of epidural injection to the first painless contraction, VAS pain scores and vital signs were assessed every 2 min for the first 30 minutes and every 30 minutes thereafter until delivery. Umbilical blood gases and Apgar scores were obtained at delivery. Neurobehavioral examinations (Neurological and Adaptive Capacity Score (NACS)) were performed at 30 minutes after delivery.

Results: Patients in the two groups were similar with respect to age, weight, parity, cervical dilation and severity of pain (VAS) prior to epidural block. Following epidural placement, the time to the first pain-free contraction was significantly shorter in Group A (5.6 ± 2.0 min vs 22.7 ± 7.3 min, $p<0.05$) and the mean pain score was still lower in Group A at 30 min. The number of patients requiring top-up doses during the first stage of labor was similar in both groups (approximately 15%). The maximum level of dermatomal spread and the numbers of patients with sacral anesthesia (approx. 25%; measured by pin-prick) was not different between the two groups. However, sixty percent of the patients delivering spontaneously in Group B required top-up doses during the second stage of labor, compared to only eleven percent of the patients in Group A ($p<0.05$). The duration of labor from epidural placement to delivery was similar in both groups (approx 4 hrs). The total dose of bupivacaine was significantly lower in Group A compared to Group B (61 ± 10 mg vs 114 ± 35 mg, $p<0.05$). Group A patients received a total mean dose of 43 ± 9.7 µg/kg of alfentanil. Significant motor block was not detectable in either group. Nine patients in Group A reported they had pruritis but none required treatment. The incidence of hypotension was similar in both groups. Five patients in Group A and 4 patients in Group B required cesarean or forceps delivery. The incidence of abnormal fetal heart rate patterns following epidural placement was similar in both groups and no specific fetal heart rate abnormality was associated with alfentanil. There was no difference in umbilical venous pH, Apgar scores, or post delivery neonatal respiratory rates between the two groups. Neurobehavioral examinations (NACS) failed to show a statistically significant difference between the two groups when analyzed as a total score or when component test scores were compared separately. Finally, within Group A there was no correlation between NACS scores and the total dose of alfentanil or the time interval between alfentanil administration and delivery.

Discussion: This study demonstrates that continuous epidural infusion of small amounts of alfentanil combined with low concentrations of bupivacaine provides excellent analgesia throughout the first and second stages of labor. With the doses of alfentanil used in the present study there were no neonatal side-effects noted and neurobehavioral studies were not affected by alfentanil administration. A previous study using much larger doses of alfentanil alone (not in combination with bupivacaine) was associated with depressed neonatal neurobehavior scores, as well as inadequate pain relief during the second stage of labor.(2) Combining alfentanil with bupivacaine in the present study permits lower doses of each drug to be used while increasing the quality of second stage analgesia and decreasing the incidence of side-effects.

References:

1. Stanski D, et al:. Anesthesiology 57:435-438, 1982.
2. Heytens H, et al: Br J Anaesth 59:331-337, 1987.