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Intrathecal Meperidine as The Sole Agent for Cesarean Section

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Recently several reports have described the usefulness of meperidine as the sole agent for spinal anesthesia. In this study, meperidine 50mg mixed with 10% dextrose 0.5ml was used for the spinal anesthetic agent for Cesarean section in 182 cases.

The subarachnoid injection of meperidine resulted in anesthesia similar to that noted with the intrathecal administration of local anesthetics. Sensory and motor blockades in all patients with meperidine spinal anesthesia were obtained.

Prolonged analgesic effect (453.7±158.1 minutes) and rapid motor recovery (75.9±17.2 minutes) were obtained. Side effects included nausea (49 patients), hypotension (95 patients) and pruritus (30 patients). Hypotension was easily treated with rapid hydration and ephedrine. Eighteen patients complained of mild pain during the last period of operation. At birth, all newborns cried immediatly and the mean Apgar scores were 9.8±0.4 at one minute and 10 at 5 minutes.

It is concluded that meperidine, which has advantages such as rapid motor recovery, prolonged postoperative analgesia, and mild complications which may be easily treated, can serve as a good alternative agent for spinal anesthesia for Cesarean section.

Key Words: *Spinal anesthesia, obstetric anesthesia, meperidine, Cesarean section*

INTRODUCTION

In recent years there has been a dramatic increase in the frequency of Cesarean section. Currently a Cesarean section rate of 15 to 20% is common. Spinal anesthesia for Cesarean section still continues to be a popular technique because it provides many advantages such as rapid onset, high success rate, minimal maternal and fetal drug exposure and minimal maternal aspiration.

Since a specific opiate receptor was discovered in 1973, the most important new approach of opiate administration is intrathecal and extradural routes. In 1979, Wang et al. reported the first controlled study of intrathecal opioid in humans, while Behar and colleagues (1979) reported the first effective use of epidural opioid in humans. Through the extradural route, all the opiates including meperidine are able to interrupt pain at a spinal level without affecting motor or autonomic control (Cousins et al, 1979). Recent studies have shown that meperidine, unlike morphine, when given intrathecally does not produce a selective segmental analgesia but exhibits all the effects of the subarachnoid administration of local anesthetics including sensory, motor and sympathetic blockade as well (Mircea et al, 1982; Sandu et al, 1983). However, there are very few reports on the use of intrathecal opioids as the sole agent in spinal anesthesia for surgery. In September 1988, we have already reported "Effects of Meperidine, Pentazocine, Bupivacaine and Lidocaine in Spinal Anesthesia for Cesarean Section" (Cheun and Kim, 1988).

In this paper, we have extended our investigations of meperidine as the sole spinal anesthetics for

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Cesarean section.

METHODS

The study consisted of 182 full term patients scheduled for elective Cesarean sections which were performed before the onset of labor at 38 to 40 weeks gestation. The protocol was approved by the Hospital Ethics Committee, and informed consent was obtained from patients. No premedication was administered.

The age of the patients ranged between 22 and 45 years (mean 29.0±4.1 SD), the weights between 52 and 87kg (63.8±7.2) and the heights between 148 and 168cm (157.8±4.5). In the operating room, all patients were rapidly hydrated with a dextrose free balanced salt solution between 300 and 1500ml (935.2±227.7) within 20 to 30 minutes before injection of anesthetics into the subarachnoid space. Spinal anesthesia was induced with the patient in the sitting position. Lumbar puncture was performed at the L2-3 or L3-4 interspace using a 25G spinal needle. Preservative-free meperidine 50mg in 1ml solution was added to the 10% dextrose 0.5ml just before the intrathecal injection. The intrathecal injection was completed in 10 seconds. Immediately after the injection, the patient was gently turned to the supine and the operating table was tilted to the left to establish uterine displacement. From injection to delivery, 5l/min of oxygen was administered through the oxygen mask with a reservoir bag. After delivery, 5mg of Valium was injected and 4l/min of oxygen was administered until the end of surgery.

The ECG was monitored continuously. Intraoperative arterial blood pressure measured with an automatic cycling device (Accutorr 1, Data-scope) and heart rate (from ECG) were monitored during operation. Respiration was monitored by counting the respiratory rate and observing the patients color. Hypotension was defined as a 20% decrease in systolic blood pressure. Hypotension was promptly treated by increasing the rate of the infusion of Hartmann's solution and by the injection of ephedrine 8mg increments. Nausea associated with hypotension was treated by correction of hypotension and if needed thiopental sodium 100mg was administered for sedation. Respiratory depression was defined as a respiratory rate of 10 breath/min and cyanosis. The pinprick test was carried out every minute until the onset of sensory block.

At birth, the neonates were assessed by the use of the Apgar score. The times of meperidine injection, start of surgery, delivery and termination of surgery were recorded. Mild pain during the operation was treated with 67% nitrous oxide through the mask but no narcotics were administered intravenously. In addition the patients were observed for pain, pruritus and other side effects during the postoperative period.

On arrival at the recovery room, motor weakness was assessed using the modified Bromage Scale as follows:

0, No motor block;

1, Impaired hip flexion, normal knee and ankle movements;

2, Impaired hip and knee movements, normal ankle movements;

3, Impaired movements at hip, knee, and ankle joints.

The time of complete motor recovery ranged from the time of subarachnoid injection to the modified Bromage Scale 0. The duration and quality of postoperative analgesia were assessed by asking the patient and the ward nurse. The patient was instructed to ask for additional analgesia when it was felt necessary. Postoperative analgesia was evaluated by determining the time between subarachnoid injection and the need for analgesia.

RESULTS

The subarachniod injection of meperidine resulted in anesthesia similar to that noted with the intrathecal administration of local anesthetics. Sensory and motor blockades in all patients with meperidine spinal anethesia were obtained. The maximum level of sensory block varied between T7 and C8 with a mean of T4.

A decrease (less than 20 per cent of pre-block value) of blood pressure occured in 95 patients (52.2%) within the first 15 minutes of the block. The mean doses of ephedrine used to correct maternal hypotension was 13.6±9.1mg. Nausea occured in 38 patients (20.1%) with hypotension and 11 patients (6%) without hypotension during the operation. No patients showed evidence of respiratory depression clinically during the intraoperative and postoperative periods. Thirty patients (16.5%) developed pruritus. This was more commonly experienced on the face (especially the nose) and anterior upper chest. In only one patient, pruritus was treated with naloxone 0.4mg at the ward.

The other 29 patients complained of mild pruritus which was transient and tolerable. Eighteen patients (9.9%) complained of mild pain at the end of surgery

when the peritoneum was to be closed.

At birth, all newborns cried immediately and the mean Apgar scores were 9.8±0.4 at one minute and 10 at 5 minutes. It bears out that meperidine 50mg intrathecally injected does not cross the placental barrier rapidly and does not influence Apgar scores.

The mean time intervals from intrathecal meperidine injection to the skin incision, delivery and termination of surgery are shown in Table 1. The mean time of complete motor recovery was 75.9±17.2 minutes. This is significantly shorter compared with lidocaine spinal anesthesia (Cheun and Kim, 1988). The mean duration of analgesia was 453.7±158.1 minutes. This is also significantly longer in comparison with lidocaine spinal anesthesia (Cheun and Kim, 1988).

Urinary retention could not be assesed because indwelling urinary catheters were left in place for approximatery 24 hours postoperatively. No urinary problems were observed after the catheter was removed.

Table 1. Time Intervals of Skin Incision, Delivery and Termination of Surgery

Interval (min)	Mean	SD
From Injection to Skin Incision	7.3	3.4
From Injection to Delivery	14.3	4.4
From Injection to Termination of Surgery	65.5	12.7

Table 2. Complications

	Number of Patients	Percent
Hypotension	95	52.2%
Nausea	49	26.1%
Pruritus	30	16.5%
Mild pain	18	9.9%
Urinary retention	None	0%

DISCUSSION

Our results bear out the efficacy of meperidine as a spinal anesthetic following subarachnoid injection. Of the opioids, the phenylperidine derivatives such as meperidine have the closest structure to the local anesthetics, with similar molecular weights and pka (Cousins and Mather, 1984). For instance, meperidine has a molecular weight of 247 and a pka of 8.5, while lidocaine has a molecular weight of 234 and pka of 7.9. Yaksh and Rudy (1967) demonstrated in unanesthetized rats that intrathecal narcotics produced profound segmental analgesia which was dose dependent and naloxone reversible. However, recent studies by Mircea et al. (1982) and Sandu et al. (1983) showed that meperidine, unlike morphine, when given intrathecally did not produce a selective segmental analgesia whereas it exhibited all the effects of subarachnoid administration of local anesthetics including motor, sensory and symphathetic blockades (Micera et al, 1982; Sandu et al, 1983).

Opioids are thought to act on presynaptic and postsynaptic receptors in the substantia gelatinosa of the spinal cord dorsal horn where they inhibit neuron cell excitation (Crawford, 1980; Willer and Bussel, 1980). Local anesthetics, on the other hand, act by axonal membrane blockade, predominantly in the spinal nerve roots. The mechanism of motor blockade and prolonged postoperative analgesia following intrathecal meperidine is not completely understood. Presumably, this reflects combined local anesthetic and opiate effects. However, motor blockade could not be obtained after the extradural administration of 100mg meperiding the sole effect being a selective analgesia (Cousins et al, 1979). The loss from vascular absorption and distribution into epidural fat may explain the absence of motor blockade. But subarachnoid injection of meperidine avoid loss of drug.

Absorption into the capillaries of the spinal cord is very slow and a high lipid soluble drug like meperidine is rapidily absorbed by the lipid tissue of the spinal roots leading to the development of an anesthetic blockade. Mircea et al. (1982) have also reported successful spinal anesthesia with intrathecal meperidine, 1mg/kg body weight.

The prolonged postoperative analgesia and more rapid motor recovery observed are remarkable, and some of these patients did not require any additional analgesic postoperatively. No neurological complications were observed.

With regard to side effects, decrease in blood pressure occured in some patients but this usually responded well to intravenous fluid and ephedrine administration. It is pertinent to not that there was no incident of early or late respiratory depression in this series. Most of reported cases of respiratory depression following spinal opioids have been with morphine (Glynn et al, 1979; Davies et al, 1980).

Morphine is a highly ionized and hydrophilic drug so that intrathecal injection moves out slowly into the

spinal cord receptor (Moore et al, 1984; Nordberg et al, 1984) with rosaral spread which may result in delayed respiratory depression. Meperidine with high lipid solubility has a rapid onset, minimal residual CSF concentration of the drug available from rostral spread to the brain, and relatively short duration of action (Famewo and Naguib, 1985)

The mechanism of pruritus associated with spinal opioids is not certain. It is unlikely to be due to histamin release since pruritus occurs with fentanyl which does not cause systemic release of histamine (Roscow et al, 1982) and antihistamines are ineffective in treating it. The prominent feature of facial pruritus has been explained by the rapid penetration of the opioid to the superficially placed caudal portions of the spinal tract of the trigeminal nerve (Cousins and Mather, 1984).

The low incidence of complications indicates that the rostral spread of meperidine in CSF is minimal and could be attributed to its higher lipid solubility. Although not very prolonged, the associated postoperative analgesia was advantageous. More rapid motor recovery is very comfortable to the patients in the recovery room.

Finally, newborns delivered of mothers given intrathecal meperidine had high Apgar scores which are similar to the other local anesthetics. We conclude that intrathecal meperidine 50mg mixed with 10% dextrose 50mg (SG is 1.030 at 20°C) has advantages such as rapid motor recovery, prolonged postoperative analgesia and high Apgar scores.

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