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Intrathecal Buprenorphine for Extended Postoperative Analgesia in Patients Undergoing Cesarean Section

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Buprenorphine, cesarean section, bupivacaine, analgesia, a spinal anesthetic

Abstract:

Background: For cesarean section analgesia, opioids are still the gold standard, but they do have a few potentially dangerous side effects that need to be taken into consideration. As a secondary objective, we looked at how long analgesia took to kick in and how severe the side effects were in both the mother and fetus in each of the two groups after surgery. Materials and methods: Subarachnoid block for elective cesarean birth enlisted the participation of 72 pregnant women in this randomized, double-blind trial. Participants in Group B got 45ug of buprenorphine dissolved in 45ug of 10% hyperbaric bupivacaine in 1.5ml saline, whereas those in Group C received 1.5ml saline mixed with 0.5 percent hyperbaric bupivacaine in 2ml (10mg). Motor block, sensory block, analgesia duration, the requirement for rescue analgesia, and any neonatal adverse effects were all detected. Students' t-test and the Chi-square test were used to determine the significance of the difference between the quantitative and subjective components. P-upsides of less than 0.05 were considered enormous. Results: The buprenorphine group had considerably longer analgesic duration (790.33±271.49 minutes) than the control group (296.55±75.13 minutes). The parturients in the research group needed much fewer rescue analgesic doses, and their pain scores were reduced as a result. Both groups saw very minor adverse effects. Conclusion: The current study shows that when low-dose buprenorphine (45g) is combined with bupivacaine, it can offer sustained analgesia during cesarean section without causing severe maternal or newborn adverse effects.

1. Introduction

Cesarean sections are commonly performed under subarachnoid anesthesia because they are cost-efficient, effective, and simple to perform. Spinal anesthesia eliminates the risks of general anesthetic, including aspiration of gastrointestinal contents, problems with airway control, and baby respiratory distress. [1,2]

As compared to other forms of localized anaesthetic, spinal anesthesia has a shorter half-life and is unable to provide patients with long-lasting postoperative pain relief like epidural steroid injections. 3 Poor postoperative analgesia may lead to a slower recovery, impaired lung function, thrombosis, and a lot of physical and emotional stress. [4-6]

Buprenorphine works as an agonist as well as an antagonist at the same time on both Mu () and Kappa (k) opioid receptors . [7] According to a research, Buprenorphine may be administered intrathecally without causing any damage. The purpose of this experiment was to evaluate buprenorphine (45ug) as an adjuvant to hyperbaric bupivacaine for postoperative analgesia in lower segment caesarean procedures. . The

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2. Methodology

Following clearance from the Institutional Ethical Committee, the Department of Anesthesia at Shalinitai Meghe Hospital and Research Center, DMMC in Wanadongri conducted this two-year, prospective, randomized, double-blinded research. A signed informed consent was obtained from each and every one of the trial's participants.

The sample size was calculated for an alpha error of 5% and statistical power at 95%.

$$n = \frac{2\,\sigma 2\,(Z1-\alpha/2\tau + Z1-\beta)2}{(\mu A - \mu B)2}$$

where

μA is the mean of group A = 96.9

μB is the mean of group B = 66.3

σ is pooled standard deviation = 2531.10

τ is the number of pairwise comparisons to be made = 3

α is Type I error = 0.05

β is Type II error, meaning 1−β is power (95% power) = 0.05

Substituting these values from the previous study, the sample size determined was n =72. Hence, there will be n/2 = 36 samples in each group.

Study participants were all 20 to 35-year-old women scheduled for elective cesarean sections and had a body mass index (BMI) from 40 to 75 kg, with an ASA class I and II and a height between 140 and 175cm. The study participants were divided into two equal groups of 36.

“Group B was given 2ml (10mg) of 0.5 percent hyperbaric bupivacaine and 45ug of buprenorphine.

Group C was given 2 mL (10 mg) of 0.5 percent hyperbaric bupivacaine mixed with 1.5 mL of normal saline.”

Each solution has its volume equalized in order to prevent any skepticism.

A full preoperative assessment was conducted the day before the surgery. Detailed records were kept of the patients' vital signs, weight, and level of consciousness. Patients were given a thorough explanation of the technique and the scale used. Preventative inj Ranitidine 50mg and Inj Metoclopramide 10mg target prophylaxis were administered 30mins before the start of surgery. In the operating room, patients were examined using circulatory strain sleeves, beat oximeters, and electrocardiograph leads. It was preloaded with a 20ml/kg crystalloid and an 18-check cannula was used for intravenous access.

SAB was given with 25G Quinckie Spinal needle. When CSF levels were confirmed to have been reduced, the medication was administered to subarachnoid space. Planned infusions of medicine have been noted in detail. Every minute, a face mask was used to provide 3 liters of oxygen. Initially, the absence of pinprick sensation was a sign that something was wrong. Viable pain abstinence time was calculated by observing how long it took from intrathecal medication infusion to the onset of terrible suffering in rats.

For the first 10 minutes of the medical treatment, the limits of the patient's cardiovascular and respiratory systems were calculated like clockwork. Treatment for hypotension (a systolic pulse below 90mmHg or a 20% decrease from the gauge) included an increase in intravenous liquid organization, the removal of the left uterus, and the infusion of mephentermine (3-6 mg iv). Atropine i.v. 0.02 mg/kg was used to treat a patient with a pulse rate of less than 50 beats per minute.

Ten units of injectable oxytocin were administered intravenously in a flowing mixed bottle after delivery of the infant. Apgar scores were obtained for all of the infants at 1, 3, and 5 minutes. There is a way to keep track of how long a medical treatment takes in total. A patient's heartbeat, pulse, respiration rate, and level of oxygen immersion were measured hourly during the first four hours after a medical operation and every hour thereafter for the next 24 hours. Before and after

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the medical treatment, patients were closely monitored for any neurological or respiratory issues.

Infusion It was decided to provide intramuscularly administered diclofenac sodium when the VAS score was more than 4. The amount of time that passed between the intrathecal medication infusion and the diclofenac infusion was used to determine the duration of pain relief. Among the side effects were vomiting, spit-up, itchiness, and respiratory depression.

Statistical Analysis

An analysis of the data was carried out using SPSS 22.0 for Windows. According to Student's t tests and the Chi-square tests, statistically significant differences were found in the quantitative and qualitative data. p-value less than 0.05 was considered significant.

3. Results

In all, seventy two women participated in the research. During the course of the study, the hemodynamics of both groups of parturient were steady. The two groups were found to have a negligible difference in age, level, weight, and exercise duration. There was no significant difference between the two meetings when it came to Class I and Class II ASA cases, gravida 1 and 2. (See table 1)

"Table 1: Demographic data and duration of surgery

Variables	Group B (n=36)	Group C (n=36)	p value
Age (years)*	29.3 ± 2.42	27.6 ± 3.33	0.1468, **NS**
Height (cm)*	159.6 ± 7.15	156.7 ± 5.71	0.2190, **NS**
Weight (kg)*	58.03 ± 7.37	58.16 ± 5.05	0.9460, **NS**
ASA (I:II)	7:8	6:9	$x^2 = 0.36$ p = 0.65, **NS**
Gravida (1:2)	7:8	8:7	$x^2 = 0.075$ p = 0.788, **NS**
Duration of surgery(minutes)*	43.8 ± 10.06	42.56 ± 8.13	0.7458, **NS**

[*Data: Mean ± SD, SD= Standard deviation, NS= Non significant]"

An appropriate surgical block was achieved before the start of the operation. While in group B, the sensory block reached the T10 level in 2.77± 0.38 minutes, it took 4.30 ±1.47 minutes in group C for the block to reach this level. The average onset time of sensory block differed significantly between the two groups (p = 0.00001). The duration of analgesia in groups A and B differed statistically significantly. In group B, the beginning of motor blockage was faster than in the other two groups, on average (Group C, 4.88 and 1.25 minutes). There was a statistically significant difference between the two groups (p 0.0001). There was no statistically significant difference in motor blockage time between B (187.4±54.4 minutes) and C (182.8 ±24.2 minutes). There was a statistically significant difference (p = 0.0003) between group C and group B in the number of rescue analgesic doses required. (See Table 2)

"Table 2: Spinal block characteristics

Variables	Group B (n=36)	Group C (n=36)	p value
Onset of sensory block (min)*	2.77 ± 0.38	4.30 ± 1.47	p < 0.00001, **S**

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Onset of motor block (min)*	3.36 ± 1.48	4.88 ± 1.25	p < 0.0001, **S**
Duration of analgesia (min)*	790.33 ± 271.49	296.55 ± 75.13	p < 0.00001, **S**
Duration of motor block (min)*	182.8±24.2	187.4 ± 54.4	p = 0.5883, **NS**
Mean number of rescue analgesic doses	1.0	1.36	p = 0.0003, **S**

[*Data: Mean±SD, SD= Standard deviation, NS= Non significant, S= Significant]"

Ondansetron 4 mg i.v. was given to one patient in both groups who was experiencing nausea and vomiting. There were no signs of respiratory depression, hypotension, bradycardia, or sleepiness in any of the patients. (See Table 3)

The Apgar score for all of the newborns in both groups was greater than 7.

"Table 3: Complications

Complications	**Group C (n=36)**	**Group B (n=36)**
Nausea and vomiting	02 (6.67%)	02 (6.67%)
Respiratory depression	0	0
Hypotension	0	0
Bradycardia	0	0
Drowsiness	0	0
Pruritus	0	0
Urinary retention	0	0
Headache	0	0"

4. Discussion

With the development of intrathecal opioid injection, the concept of intraoperative and postoperative pain treatment was drastically altered. Narcotic receptors are particularly dense in lamina I and II of the spinal cord. When a narcotic is administered directly to these receptors, it creates zones of strength. [8] Intravenously administered drugs prevent the entry of substance P and hence the transfer of nociceptive motives. [9] As an adjuvant to sedatives, buprenorphine is an excellent choice for reducing postoperative pain because of its strong affinity for narcotic receptors, its high lipid solubility, and its long-lasting effects. [10]

In women undergoing a cesarean section, a larger dose of buprenorphine (3g/kg) was linked to more adverse effects. This dose is within the range of recommended dosages, thus we decided to use 45 g as our unit of measurement. It was determined that 45g of buprenorphine administered in conjunction with hyperbaric bupivacaine would provide postoperative pain relief for cesarean section patients who had been divided into two groups of 15 each in this trial. Both of these meetings were comparable in terms of socioeconomics and the importance of time. In our research, the buprenorphine group started the tactile block substantially earlier than the benchmark group (4.30 1.47 minutes) (p = 0.00001), which was much

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quicker than the standard group. Tactile block onset was 4.8 1.16 minutes in the benchmark group, but 2.84 0.75 minutes in the buprenorphine (1g/kg) group. This expedition's findings are coming in at a steady rate. The buprenorphine group in Dubey et al study also suffered tactile block in 2.28±1.31 minutes, which is approaching our findings.

The buprenorphine group's time without pain was shown to be much longer [790.33±271.49 minutes (13.17±4.52 hours)] than the benchmark group's [296.55 ±75.13 minutes (4.94±1.25 hours). Letha et al. discovered that buprenorphine had a 3.55-hour duration of pain relief, which is consistent with our findings. Up to 50g of buprenorphine intravenously was administered by Thomas and colleagues. Buprenorphine's expansion has been shown to have a negative impact on pain relief. The time now is 15:25 minutes. These findings are comparable to what we found in our investigation.[11]

During our testing, we found that the start time of the engine was 3.36±1.48 minutes for batch B and 4.88 ±1.25 minutes for batch C. The two meetings are very different from one other. Apart from that, there was not a large difference in the amount of engine bar time spent at the two events at all. Dubey et al. published a review that matches our own and follows down analogous findings.

There were 13.3 percent of patients who spewed, 10 percent who were unwell, and 26.7 percent of patients who were able to maintain their bladders. These findings are consistent with our own. Only two patients (6.67%) in our study was ill and spouting during the two events. As a result, the combination of 45 g of buprenorphine and bupivacaine provided patients with a longer period of pain relief with fewer adverse effects.[12-14]

5. Conclusion

According to the continuing study, the addition of low-portion buprenorphine (45 g) to the subarachnoid block in lower fragment cesarean segments delays postoperative absense of postoperative pain, diminishes the need for salvage analgesics, and reduces the risk of mother and baby unfriendly effects.

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