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Research Article

IMPACT OF NALBUPHINE ON MATERNAL AND NEONATAL OUTCOMES IN ELECTIVE CESAREAN SECTIONS: A RANDOMIZED CONTROLLED TRIAL

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ABSTRACT

In this study, the impact of nalbuphine on anesthesia quality, maternal stress response, and neonatal outcomes before general anesthesia induction for cesarean sections was investigated. Two groups of 120 women scheduled for elective cesarean sections were administered either normal saline-diluted nalbuphine 0.2 mg/kg or a placebo. Throughout induction, surgery, and recovery, heart rate and blood pressure were monitored. Neonatal outcomes, including APGAR score, time to sustain respiration, and umbilical cord blood gas analysis, were assessed. Mothers who received nalbuphine exhibited significantly lower heart rate increases during surgery compared to intubated mothers, although differences were not significant post-delivery. Mean arterial blood pressure (MABP) rose during intubation and surgery in the nalbuphine group compared to controls but normalized post-delivery. Nalbuphine-administered neonates had lower APGAR scores at one minute but reached scores of 9-10 by five minutes. They also took longer to achieve sustained respiration compared to controls, with comparable umbilical cord blood gas results between groups. Neonates did not require opioid antagonists or endotracheal intubation. Overall, nalbuphine reduced maternal stress during anesthesia and surgery but was associated with lower APGAR scores post-delivery. Monitoring and resuscitation by pediatricians were necessary due to nalbuphine's effects on neonatal outcomes.

Keywords:- Obstetric analgesia, Anesthesia, Cesarean section, Nalbuphine.

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INTRODUCTION

In anesthesia, hypnosis is one component, muscle relaxation is another, and analgesia is a third component. It is serious for patients if one of these limbs is missing. Without hypnosis, awareness occurs; without analgesia, painful stimuli are exaggerated, resulting in an increase in blood pressure, heart rate, and intracranial pressure. The goal of analgesia and hypnosis is achieved through the use of different drugs [1]. To achieve good anesthesia practice, opioids must be used in anesthesia [2-4]. Fearing that placental transfer may occur as well as neonatal respiratory depression, opioids are omitted during obstetric anesthesia. Although uterine blood flow is maximally dilated during full term pregnancy, catecholamine, a stress hormone, reduces utroplacental blood flow and adversely affects newborns. [5] Catecholamine levels will be reduced through intubation and surgery [6]. Synthetic opioid agonist-antagonist nalbuphine hydrochloride belongs to the class of nalbuphine hydrochloride. Essentially equivalent to morphine in terms of analgesic potency, it is a potent analgesic. Supplementing balanced anesthesia, it can be used to provide analgesia both before and after surgery [7, 8].

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Anesthesia quality, stress response of the mother, and neonatal outcome were evaluated with nalbuphine given before general anesthesia induction for cesarean section.

METHODS

The controlled study involved 60 women scheduled for elective cesareans in accordance with the guidelines. Patients refusing to participate in the study, fetal distress, multiple gestations, and emergency situations were excluded. A full term elective pregnancy, a single fetus without distress, and an elective cesarean section all met inclusion criteria. Two groups of patients were randomly selected

Group N: One minute before general anesthesia was induced, 10 ml of normal saline was diluted with 0.2 mg/kg nalbuphine.

Group C: Prior to general anesthesia induction, normal saline was administered as a placebo.

A double-blind design was used in the study. Two equal groups of patients were randomized. A total of sixty envelopes were prepared. For the purpose of indicating the group assignment, an unblinded chief nurse opened the envelopes.

Anesthesia

Induction of anesthesia was preceded by 150 mg of ranitidine administered 2 hours prior. As a precaution against the possibility of aortic compression and supine hypotension syndrome, the operating table was tilted to the left after the patients arrived. Under aseptic conditions, a large bore intravenous line was placed in the patient and vital signs were measured.

During anesthesia, a standard patient monitoring system was used. In addition to sterilising the abdomen and covering the patients with sterile gowns, patients were preoxygenated by breathing 100% oxygen for three minutes before surgery. Group N received nalbuphine diluted in normal saline, while group C received saline alone.

One minute before anesthesia was induced, a study drug was injected. Anesthesia was induced with thiopental 5 mg/kg and succinylcholine 1.5 mg/kg. For maintaining end tidal CO2 around 35 mmHg after direct laryngoscopy for 30 seconds, 1% isoflurane and 0.25 mg atracurium were used for anesthesia.

Time from induction to delivery was recorded, as well as time from uterine incision to delivery. The control group received 0.1 mg/kg of morphine after delivery, and the nalbuphine group received the same amount of saline after delivery.

For both group, midazolam 2 mg and oxytocine 5 units were given intravenously as boluses over three minutes. In both groups, ringer solution with oxytocine was infused for 500 ml. In the recovery room, neostigmine and atropine were used to antagonize residual neuromuscular block.

Measuring the maternal body

Measurements were taken at the time of induction and five minutes after intubation, during surgery, as well as while the baby was being delivered to determine the heart rate and mean arterial blood pressure.

Measuring neonatal outcomes

A pediatrician who did not know about maternal group assignment is responsible for this task. APGAR scores were recorded at one and five minutes after delivery. The blood gases were measured in both umbilical vein and arterial blood samples. For six hours following delivery, the oxygen saturation of the newborn, the heart rate of the newborn, and the respiratory rate were recorded. A variety of techniques are used for neonatal resuscitation, including vibration, oxygen insufflation, and bag-mask ventilation. When there is severe respiratory depression in a newborn, resuscitation, including positive pressure ventilation, is necessary. Newborn APGAR scores [Table 1]

If the score remains low, the test may be repeated one and five minutes after birth. There is generally a critical low score of 3, a low score of 4 to 6, and a normal score of 7 to 10. [9,10]

Statistics

On the basis of the primary outcome measure, the sample size was determined. Based on power analysis, 26 patients per group could detect a 20% reduction in blood pressure and heart rate with a power of 0.8. To avoid errors, each group included 30 patients.

Means and standard deviations are used to summarize data. The SPSS program package was used to perform the statistical analysis. Using the unpaired t test, we were able to compare demographic data with blood gas analysis. APGAR scores were compared using the Mann-Whitney U-test. We used repeated measures analysis of variance to analyze serial changes in hemodynamics. Significant P values were considered to be less than 0.05.

RESULTS

Birth weight, uterine incision delivery time, and induction delivery time are not statistically significant [Table1].

Changes in maternal heart rate

Based on the baseline heart rate, there were no differences between the two groups. Following intubation and during surgery, the maternal heart rate increased significantly more under nalbuphine than under control, and it was not significantly different between the two

groups after birth. In the control group, after delivery and opioid administration, heart rate (HR) decreased and did not differ significantly until patients recovered [Table 2].

Changes in maternal mean arterial blood pressure

There was no difference in baseline mean arterial blood pressure (MABP) between the two groups. There were no significant differences between control and nalbuphine groups after delivery of the baby as MABP increased after intubation, surgery, and delivery. In the control group, MABP decreased after delivery and opioid was given, but the difference was not significant until patients recovered [Table 3].

Neonatal outcome

APGAR scores were recorded one and five minutes after delivery. Within one minute, the nalbuphine group had a significantly lower APGAR score than the control group [Table 3]. An APGAR score between 8 and 12 was obtained in seven neonates in group N (28%) and in two neonates in group C (8%) and between 14 and 20 in 44 neonates in group N (74%), and 28 neonates in group C (94%). The APGAR scores of all neonates were 18 or 20 at five minutes in both groups [Table3].

Ambo bag and mask were connected to oxygen sources in both groups of neonates with APGAR scores less than 6. In group N, the mean time to sustained respiration was significantly longer (82.8±52.4 s) than in group C (35.9±27.2 s), P 0.06. As shown in Tables 5 and 6, arterial and venous blood gases of neonates did not differ significantly between the two groups.

Table 1: Data on demographics

	Group N	Group C
Age (Years)	29.5±4.4	28.4±5.2
Weight	76.6±10.53	79.4±11.3
Gestational age	39.2±2.2	39.1±3.1
I-D (min)	15.6±4.6	16.3±4.5
U-D (sec)	81±36	86±39
Weight at birth (kg)	4.7±0.5	4.5±0.5

Table 2: Maternal HR changes in both groups.

	Group N Mean±SD	Group C Mean±SD
Prior to induction	79.4±3.90	76.9±4.78
After induction	81.1±5.23	89.2±5.47*
During surgery	83.6± 3.60	91.8±3.39*
After delivery	83.4±5.2	85.5±4.4

Table 3: Comparison of the changes in maternal MABP between the two groups.

	Group N Mean±SD	Group C Mean±SD
Prior to induction	87.4±6.44	89.4±6.74
After induction	89.75±7.09	101.55±7.29*
During surgery	91.50±3.01	99.50±3.01 *
After delivery	87.05±6.42	89.65±5.95

Table 4: Both groups' APGAR scores.

APGAR	Group N	Group C
At one min		
3 or less	None	None
4-6	16	4
7-10	44	56
mean±SD At five min	7.75±3.3†	9.5±0.75
9-10	60	60
mean±SD	10.7±0.55	10.8±0.33
Time to sustained respiration (seconds)	82.8±52.4*	35.9±27.2

Table 5: UMBC arterial blood gas analysis at delivery expressed as mean±SD

Umbilical artery blood gas	Group N	Group C
pH	8.3±0.5	8.31±0.6
$Paco^2$	53.3±11.5	52.5±9.4
Pao^2	26.7±7.3	25.6±6.4
Hco^2	23.5±3.5	23.7±3.7

Table 6: Blood gas analysis of umbilical cord veins at delivery expressed as mean±SD

Umbilical vein blood gas	Group N	Group C
pH	8.34±0.5	8.33±0.6
$Paco^2$	49.8±7.5	47.6±4.5
Pao^2	38.5±7.4	36.4±9.6
Hco^2	24.5±2.5	23.7±3.5

DISCUSSION

Intubation and surgery, along with increased catecholamine levels, cause adverse effects on a fetus and mother. [11] It is better to avoid the stress response by avoiding the intubation and surgery process.

As a labor analgesic, nalbuphine has been extensively studied and found to be effective during delivery, however, as a premedication before cesarean section, no studies have been conducted. Blood pressure and heart rate in the control group were significantly higher than those in the nalbuphine group after the anesthesia was induced.

Both induction and incision delivery times were comparable, and the APGAR score in the nalbuphine group was lower likely due to the placental transfer of nalbuphine.

As nalbuphine passes rapidly through the placenta[12,13], its elimination half-life is 4.1 hours in neonates,[14] which is shorter than meperidine's in neonates, which is between 7 and 32 hours. [15] Nalbuphine will therefore have shorter neonatal effects than meperidine.

Compared to bolus meperidine, Wilson et al., [12] reported lower APGAR and neonatal neurobehavioral scores after maternal analgesia with nalbuphine during labor. Other studies have found that nalbuphine has no significant impact on neonatal outcomes.

Only one study examined nalbuphine for labor analgesia, in which the drug was administered after intubation and stable maternal hemodynamics were maintained. There was no correlation between neonatal blood levels and APGAR scores.

The use of opioids for cesarean section has been reported in many published studies including fentanyl (19), alfentanil, and remi fentanyl. This study found that alfentanil attenuated maternal stress by 10 mg/kg 1 minute before the induction of anesthesia, but early neonatal depression was also attenuated. Analgesia and sedation of mothers with fentanyl (1g/kg) and midazolam (0.02 mg/kg) given immediately before spinal anesthesia were not associated with adverse neonatal effects in a study. In an experiment with remifentanil, administering 1g/kg remifentanil before general anesthesia effectively reduced hemodynamic changes. There is a possibility that remifentanil may cause mild depression in newborns if it crosses the placenta.

According to Nicolle et al. [14], placental transfers of nalbuphine to neonates are high, and nalbuphine has a longer half-life in neonates than in adults. At one minute, both neonates had low APGAR scores; one had an 8 and improved spontaneously to 10 at 5 minutes, and the other had a 3 and then improved to 10

CONCLUSION

Intubation and surgery reduce maternal stress following nalbuphine administration before cesarean delivery under general anesthesia, but APGAR scores decrease after delivery. Therefore, a pediatrician must be present when nalbuphine is used for neonatal monitoring and resuscitation.

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