ORIGINAL ARTICLE

COMPARATIVE STUDY OF BUPIVACAINE VS BUPIVACAINE AND KETAMINE (INTRATHECALLY) DURING INTRAOPERATIVE AND POST OPERATIVE ANALGESIA IN NON PIH CAESARIAN SECTION

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ABSTRACT
Obstetric anesthesia is demanding but gratifying subspeciality of anesthesiologist. Anesthetic care of pregnant patient is unique in that two patients are cared for simultaneously; the parturient and the foetus. This study was conducted on 50 parturient of ASA I and ASA II, planed for caesarean section. They were randomly divided into two groups of 25 patients each: Group-A (control) 1.8cc bupivacaine 0.5% + 0.5 cc normal saline. Total 2.3cc and Group-B (study) 1.8cc bupivacaine 0.5% +25 mg ketamine 0.5 cc (preservative free) Total 2.3 cc. We summarized that intrathecal 0.5% bupivacaine with preservative free intrathecal ketamine have rapid onset of sensory block, have better hemodynamic stability and have post operative analgesia without affecting neonate. Thus it is safe modality for the parturient undergoing caesarean section, but central side effects like delirium, nystagmus and sedation can occur in some patients.

KEY WORDS: Caesarean Section, Bupivacaine, Ketamine

INTRODUCTION

In early years many maternal death were reported associated with pregnancy and anesthesia. These deaths are due to many factors of anaesthesia and caesarean surgery. Risk of aspiration of stomach content, drug induced neonatal depression and many problems associated with general anesthesia may largely avoided by using regional anaesthesia technique.

In the recent days regional techniques have come to take an upper hand in anesthesia over general anaesthesia owing to it's certain, often underestimated advantages such as lesser chances of airway compromise and aspiration, facilitation of postoperative analgesia, inherent benefit in some preexisting medical conditions, avoidance of operation theatre pollution and less neonatal exposure to potentially depressant drugs. Lignocaine and bupivacaine are the most commonly used local anaesthetic agent for spinal anaesthesia. Intrathecal ketamine has beneficial effect on cardiovascular function and has good analgesic and local anaesthetic effect.

The aim of our study was to evaluate the effect of intrathecal ketamine in parturient undergoing caesarean section with bupivacaine spinal anesthesia on the onset, duration and recovery of sensory and motor blocked;. to evaluate the protective effect of ketamine on new born baby and to observe the duration of post operative analgesia, the incidence of side effects and cardiovascular effects of intrathecal ketamine.

MATERIALS AND METHODS

After obtaining informed written consent and approved from hospital ethical committee, 50 parturient of ASA I and II scheduled for caesarean section were randomly allocated into two groups of 25 each:

Group A (control) received 1.8cc (9mg) hyperbaric bupivacaine 0.5% + 0.5 cc normal saline Total 2.3cc.

Group B (study) received 1.8cc (9mg) hyperbaric bupivacaine 0.5% +25 mg ketamine 0.5cc (preservative free) Total 2.3cc.

Patients with evidence of any contraindication to regional anaesthesia, preeclampsia, height less than 150cm or more than 180cm, evidence of foetal compromise were not included in the study. The study drug was administered in a double blind manner. After

taking history, physical examination and all routine investigation were done. After placement of routine non invasive monitors, IV access was established and all patients were preloaded with 1000ml of lactated ringer's solution. A subarachnoid puncture was performed in left lateral position at L_{3-4} interspace with 23 gauge quincke point spinal needle. Following injection of the anesthetic mixture of respective group the patients were placed supine immediately with a 20 degree left lateral tilt and 100% O_2 3 liter/min was delivered by face mask till delivery of the baby and there after continued with ventimask 2 liter/min. Blood pressure, heart rate, respiratory rate and oxygen saturation were recorded at regular interval till the end of surgery. Monitoring was continued into the postoperative period up to 24 hours. The onset of sensory block was assessed by pinprick to skin every 2 minutes till the level stabilized for three consecutive tests and was defined as the time from spinal block to peak sensory dermatome level. Regression time, to reach sensory level two segments from the highest level and regression time to reach sensory level up to T12 was recorded. Onset and duration of motor block was assessed and graded by using following criteria, described by Bromage.

Bromage Score

0 No change in movement of legs and feet

1 Barely able to flex knees. No change in feet movement

2 Unable to flex knees and barely able to move feet

3 Unable to move feet and knees

The time taken to reach Bromage Score 3 is time of onset motor blocked and time taken to reach Bromage Score 0 is duration of motor blockade. Duration of analgesia was measured as the time from induction of block to first patient request for supplemental analgesia.

Pain Score used was Visual Analoge Scale (0-10):

0 No Pain
5 Moderate Pain
10 Maximum pain

Episodes of perioperative hypotension (systolic BP<80mm of hg or 30% from baseline), bradycardia (heart rate <60bpn) and desaturation (Spo_2<90%) were recorded. Presence of side effect mainly sedation, nausea, vomiting, pruritus and respiratory depression were noted along with any treatment require. Respiratory depression was defined as a rate less than 10bpn. All patients received oxytocin 20i.u. added to i.v. fluids after delivery. The surgical technique was uniform in all patients and included extireorization of uterus. Urinary retention could not be evaluated as all patients were electively catheterized. Neonatal well being was assessed by APGAR score at 1 and 5 minutes. Analysis of data was performed using student's t-test and chi-square test with Yates correction for small frequencies as applicable. Significance was defined as p<0.

OBSERVATION AND RESULTS

In our study we have selected 50 parturient of ASA group I-II undergoing caesarean section and divided into two groups, 25 patients in each group. According to mean age in years, mean height and mean weight, there is no statistical significant difference in patients of both groups.

Table 1: Changes in Pulse Rate

Time	Group A (Mean ± SD)	Group B (Mean ± SD)	P value
Basic	107.4 ± 2.15	104.90 ± 5.86	NS
2 Min	110.5 ± 4.16	109.3 ± 3.16	NS
5 Min	101.44 ± 4.52	105.16 ± 3.31	NS
10 Min	85.96 ± 1.71	93.08 ± 4.11	P<0.05
15 Min	83.12 ± 2.10	90.21 ± 3.16	P<0.05
20 Min	80.60 ± 1.97	86.04 ± 4.21	P<0.05
30 Min	68.64 ± 3.05	76 ± 4.63	P<0.05
40 Min	68.20 ± 3.50	75.33 ± 4.70	P<0.05
50 Min	68.12 ± 5.15	75 ± 5.96	P<0.05
60 Min	70.88 ± 1.85	76.32 ± 2.65	P<0.05
90 Min	76.96 ± 2.53	81.24 ± 3.13	NS

Table shows changes in pulse rate after induction. Pulse rate of group B remain higher side than group A, which is statistically significant.

Table 2: Changes in Systolic Blood Pessure

Time	Group A (Mean ± SD)	Group B (Mean ± SD)	P Value
Basic	110.44 ± 6.01	111 ± 5.74	NS
2 Min	108.54 ± 4.03	110 ± 4.10	NS
5 Min	96.16 ± 4.97	98.24 ± 4.74	NS
10 Min	80.96 ± 5.1	94 ± 5.88	P < 0.05
15 Min	90.16 ± 4.67	92.24 ± 4.12	NS
20 Min	92.08 ± 4.30	94.08 ± 5.80	NS
30 Min	98.16 ± 2.88	100.24 ± 4.37	NS
40 Min	102.24 ± 3.76	103.2 ± 4.32	NS
50 Min	110 ± 4.16	114 ± 4.26	NS
60 Min	104.24 ± 4.33	105.33 ± 4.42	NS
90 Min	106.56 ± 3.96	106.56 ± 3.80	NS

Table shows changes in systolic blood pressure between two groups. At 10 min systolic blood pressure of group – A is 80.96 ± 5.1 and group – B is 94 ± 5.88, which is statistically significant.

Table 4 shows that median highest level of sensory blockade in both groups is T5. Time is achieving highest sensory blockade in group A is 7.1 ± 0.72 and group B is 4.56 ± 0.86, it is statistically significant. Table 5 shows that there are not statistically significant differences in motor blockade between two groups.

Table 3: Changes in Diastolic Blood Pessure

Time	Group A (Mean ± SD)	Group B (Mean ± SD)	P Value
Basic	73.68 ± 5.90	74. 56 ± 6.12	NS
2 Min	71 ± 3.25	72.4 ± 3.1	NS
5 Min	66.56 ± 5.60	68.8 ± 5.80	NS
10 Min	58.96 ± 3.37	65.36 ± 4.92	P < 0.05
15 Min	60.34 ± 2.45	64.4 ± 2.3	NS
20 Min	64.64 ± 3.45	66.4 ± 3.5	NS
30 Min	67.68 ± 3.21	66.56 ± 3	NS
40 Min	68.4 ± 3.89	69.56 ± 3.89	NS
50 Min	66 ± 5.16	70 ± 4.86	NS
60 Min	70.16 ± 3.43	71 .36 ± 3.72	NS
90 Min	71.6 ± 3.55	72.8 ± 4.35	NS

There are statistically significant changes in diastolic blood pressure of both groups, at 10 min.

Table 6: Duration of Surgery

	Duration of surgery
Group A	61.24 ± 5.29
Group B	60.72 ± 4.07

Table 6 shows that no statistically significant changes in duration of surgery between two groups.

Table 7: Intraoperative Complication

Complication	Group A	Group B
Hypotension	15	1
Bradycardia	5	1
Nausea	6	9
Vomiting	6	7
Respiratory Depression	0	0
Nystagmus	0	3
Sedation	0	2
Delirium	0	2
Salivation	0	2

Table 7 shows that hypotension is more with group A and less with Group B. Incidence of hypotension is treated with inj. Mephentramine and rapid infusion of inj. Ringer Lactate. None of patients required inotropic support. Incidence of bradycardia is more with group-A than group-B.

Table 4: Sensory Blockede

Parameter	Group A	Group B	P Value
Highest level of block (Median)	T_5	T_5	
Time to achieve highest sensory blocked (Min)	7.1 ± 0.72	4.56 ± 0.86	P < 0.05
Duration of sensory level to reach T12(hr)	2.66 ± 0.12	2.7 ± 0.13	NS

Table 5: Motor Blockade

Parameter	Group A	Group B	P Value
Time to achieve Bromage scale 3	12.76 ± 1.70	11.8 ± 1.68	NS
Time to achieve Bromage scale 0	2.41 ± 0.091	2.45 ± 0.19	NS

Episode of bradycardia is treated with inj. Atropine 0.6 mg i.v. Nystagmus, sedation, delirium and salivation are found with group-B. Incidence of nausea and vomiting are more in group-B. Episode of vomiting is treated with inj. Ondensetron. None of patients of both groups have respiratory depression.

Table 8: Duration of Analgesia

	Duration of Analgesia (hrs)
Group A	2.19 ± 0.15
Group B	3.50 ± 2.1
P Value	P<0.05

Table shows that duration of analgesia is more with group-B which is statistically significant.

DISCUSSION

With increase knowledge of potential safety benefits and increased experience with the technique, regional anaesthesia is becoming more popular and preferred technique in caesarean section specially the spinal anaesthesia. Spinal anaesthesia is easier to perform, it has rapid and predictable onset, produces more intense and complete block and has very high success rate. As compare to general anaesthesia it require very smaller dose of local anaesthetics thereby foetal and maternal side effects can be minimized, risk of maternal pulmonary aspiration, neonatal exposure to potentially depressant drugs minimized. The most important sequel is an awake mother at the time of her child which immediately establishes maternal – infant bonding and successful breast feeding and lastly but not the least, there is always an option of using intraspinal analgesic for post operative pain relief. In our study we have selected 50 parturient of ASA group I and II undergoing caesarean section and divided into two groups, 25 patients in each group. Group-A (control): patients were given 1.8cc bupivacaine 0.5% + 0.5 cc normal saline Total 2.3 cc. Group-B (study): patients were given 1.8cc bupivacaine 0.5% + 25mg ketamine (0.5cc) Total 2.3cc (preservative free). We observed and compared effect of height and weight, age of patients, indication for operation, surgical time, highest level of sensory block achieved and time to achieved motor block and wear off sensory and motor

block, we also observed the duration of analgesia, incidence of intra operative side effects and neonatal condition at the time of birth.

Demographic Data

In this study, group-A has mean age of 23.84 ± 0.74 years and group B has 23.52 ± 1.26 years. Mean height 154.04 ± 2.54 cm for group-A; 154 ± 3.21 cm for group-B; mean weight 58.56 ± 3.66 kg for group A and 58.24 ± 2.71 kg for group-B. From these data we observed that both group are comparable by age, height and body weight distribution. In present study, indication for caesarean section did not influence any of the group. There was no significant difference between total surgical time in both the groups.

Effect on Onset of Time and Highest Level of Block

Highest level of block (median) in both groups is T5. No difference in highest level of block between two groups. Time to achieve T5 level in group-A is 7.1 ± 0.72 and in group-B is 4.56 ± 0.86. Time to achieve T5 level is more rapid with group B. Onset of time is more rapid with group –B. Singh SP, Sinha AK, Jha AK (1997)[1] studied preservative free ketamine (50 mg) was mixed with 2-2, 5 ml of 0.5% bupivacaine and injected intrathecally. They found that mixture produced quick sensory loss. Unlugenc H, Ozalevli M. Gunes Y, et al (2006)[2] studied the double-blined comparison of intrathecal S(+) ketamine combined with bupivacaine 0.5% for caesarean delivery. In patients undergoing caesarean section with spinal anaethesia, the addition of S (+) ketamine (0.05 mg/kg) to 10 mg of spinal plain bupivacaine (0.5%) lead to rapid onset of sensory blockade and enhanced the segmental spread of spinal block.

Effect on Duration oOf Sensory and Motor Block

In our study we did not find any difference on duration of sensory and motor block between two groups. Pulse rate of group-B remain higher side than group-A throughout the in itraoperative period. Incidence of bradycardia are 5 times with group-A, while with group-B 1 time. This is significantly advantage with group-B.

Effect on Systolic Blood Pressure and Diastolic Blood Pressure

Systolic blood pressure at 10 minute with group-A is 80 ± 5.1 and with group-B is 94 ± 5.88. Diastolic blood pressure at 10 minute with group-A is 58.96 ± 3.37 and with group-B is 65.36 ± 4.92. There was hypotension with group-A at 10 minutes which is corrected with injection mephentermine and i.v. fluids. There was no such hypotension with group-B during the intraoperative period. Incidence of hypotension with group-A was 15 times while with group-B was 1 time. This is significant advantage with group-B. Kathirvel S, Sadhashivam S, Saxena A, et al (2000)[3] found that requirement for intravenous fluids in the perioperative period were less in the ketamine group. Kaliyani Govindan, Rajmani Krishnan, Marc P. Kaufman, et al (2001)[4] studied intrathecal ketamine in surgeries for lower abdomen and lower extremities and found that due to cardiovascular stimulant action of ketamine, there was a mild rise in heart rate and blood pressure, which is a definite advantage over local anaesthetics. T. Togal, S. Demirbilek, A. Koroglu, et al (2003)[5] studied intrathecal ketamine with bupivacaine for prostate surgery in elderly patients and observed that lack of cardiovascular depression with intrathecal ketamine, provided definite advantage in an elderly population.

Effect on Post Operative Analgesia

Duration of analgesia with group-A is 2.19 ± 0.15 and with group-B is 3.50 ± 2.1. Duration of analgesia with group-B is longer than group-A. But not much of longer duration. Yang CY, Wrong CS, Chang JY, et al (1996)[6] used intrathecal ketamine in patients with terminal cancer pain and demonstrate that ketamine enhances the analgesic effect of morphine, thus reducing the dose of intrathecal morphine. There for intrathecal ketamine has analgesic property. Singh SP, Sinha AK, Jha Ak (1997)[1] evaluated intrathecal ketamine for intraoperative and postoperative analgesia. Preservative free ketamine (50 mg) was mixed with 2-2, 5 ml of 0.5% bupivacaine and was injected intrathecally. The duration of analgesia was 4-12 hours and it was definitely better than bupivacaine alone. Dipasriv Bhattacharya, Arnab Banerjee (2004)[7] demonstrated comparative study between intrathecal bupivacaine and intrathecal ketamine. The duration of postoperative analgesia was 155-160 minutes with intrathecal ketamine as compared to 125-130 minutes with intrathecal bupivacaine, which was significant ($P<0.001$).

Intraoperative Complication

Incidence of nausea with group-B is 9 times as with group-A is 6 times. Incidence of vomiting with group-B is 7 times as with group-A is 6 times. Incidence of nausea and vomiting is more with group-B. Nystagmus, sedation, delirium and salivation are found with group-B. Incidence of intraoperative complication is more with group-B. Bion JF (1984)[8] said that central effects (drowsiness, dizziness and nystagmus) also occurred with intrathecal ketamine. Kathirvel S, Sadhasivam S, Saxena, A, et al (2000)[3] observed that significantly more patients in the ketamine group had adverse events, such as sedation, dizziness, Nystagmus, 'strange feelings' and postoperative nausea and vomiting.

Neonatle Condition and Apgar Score

In present study no adverse effect was noted in the newborns in either group. Apgar scores were 7.36 ± 0.48 at one minute and 8.56 ± 0.58 at 5 minute with group-A, and with group-B 7.4 ± 0.5 and 8.64 ± 0.4. None of the newborn was required resuscitation. When ketamine was given by i.v. route, placental transfer was noted. But in our study, ketamine given intrathecally as a adjuvant to bupivacaine in very low dose, so placental transfer of this drug is negligible and no effect on neonate.

CONCLUSION

We have concluded that Onset of sensory block is more rapid by adding ketamine to intrathecal bupivacaine. There was no change in highest level of sensory block by adding ketamine to intrathecal bupivacaine. Incidence of hypotension and bradycardia are much less after adding ketamine to intrathecal bupivacaine. Hemodynamic stability is better maintained with intrathecal bupivacaine + intrathecal ketamine. Duration of analgesia is longer with intrathecal bupivacaine + intrathecal ketamine than bupivacaine alone. But not provide postoperative analgesia for longer time. There were no side effects on neonate by adding ketamine to intrathecal bupivacaine. Incidences of intra operative side effects are more with intrathecal ketamine.

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