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Comparison of Intrathecal Buprenorphine and Dexmedetomidine as an Adjuvant to Bupivacaine Heavy for Post-Operative Analgesia in Patients Undergoing Caesarean Section

Dr. Archana Vaghela, Dr. Jaimin Patel, Dr. Bhavana Soni

Abstract: ***Introduction: Pain relief is very important aspect in postoperative period in parturient. Addition of adjuvants with Bupivacaine for spinal anaesthesia improve the quality of perioperative analgesia. Materials and methods: Each patient was informed about the study and informed consent was taken after approval from institutional ethical committee. This study includes 50 patients of ASA grade I and grade II.The patients were allocated into two groups in each 25 patients included. Group B receive 2.5ml of 0.5% bupivacaine with 60µg of buprenorphine and Group D 2.5ml of 0.5% bupivacaine with 5µg of dexmedetomidine intrathecally. The onset time to sensory level, motor block, haemodynamic, sedation, duration of analgesia, motor block and any side effects were noted. APGAR score was used to observed Neonatal outcome. Results: There was no significant difference between groups regarding demographic characteristics and type of surgery. The motor, sensory blockade, time of rescue analgesia and sedation were significantly prolonged in Group D compared to Group B. There was no significant difference found in haemodynamic variables. Neonatal outcome was normal in both groups. Conclusion: Addition of dexmedetomidine causes prolonged anaesthesia and analgesia. So there was reduction in need for sedation and rescue analgesics when compared with buprenorphine.***

Keywords: Bupivacaine, Buprenorphine, Dexmedetomidine, Caesarean section, Spinal anaesthesia

1. Introduction

Most of the patients feel moderate to severe pain after Cesarean section and if untreated, affect mother-baby bonding and breastfeeding. [(1)] The pain management should be safe for the breastfeeding baby. There are two components of pain in cesarean section: somatic due to abdominal wall incision and visceral from the uterus. A substantial component of pain is mainly derived from incision on abdomen. [(2)(3)] Adequate postoperative pain management helps mother for early mobilization after caesarean. [(4)]

Spinal anesthesia is an anesthetic technique for both elective and emergency cesarean sections in all around the world. Bupivacaine used as a sole agent provide short duration of analgesia. To achieve prolong analgesia, various drug combination and techniques have been tried. Drugs such as opioids, alpha 2 agonist have been tried as adjutants to Hyperbaric Bupivacaine.[(5)]

Dexmedetomidine is a highly specific alpha-2 agonist with action of prolonging both sensory and motor block. It has also a nociceptive action for both visceral and somatic pain. Dexmedetomidine do not cross placenta due to its property of highly lipid solubility with retention of the placenta. [(4)]

Buprenorphine acts on µ and κ opiate receptors with mixed agonist-antagonist property. It has both spinal and supraspinal components of analgesia.[(6)]

This study compared the effects of dexmedetomidine and Buprenorphine added to bupivacaine heavy in terms of duration of analgesia, subarachnoid blockade characteristics and any side effects.

2. Material and Method

This study was conducted in tertiary teaching institute in Surat, Gujarat after ethical approval.Written informed consent was taken from patients. The study was conducted on 50 patients of ASA grade I and grade II listed for caesarean section.ASA grade I, II; Age: 18 to 45 years; Height: 145 to 175 cm; Weight: 45 to 70 kg were included in the study. Patients with Infection at the site of injection, coagulopathy disorder, previous complicated pregnancy, fetal destress, hypertension, preeclampsia, Preexisting motor and sensory deficit, known allergy to study drugs were excluded from the study. They were randomized into two groups: Group B and Group D of 25 each.

1) Group B receivedintrathecal 2.0ml bupivacaine heavy (0.5%) with 60µg of buprenorphine plus normal saline.
2) Group D receivedintrathecal 2.0ml of bupivacaine heavy (0.5%) with 5µg of dexmedetomidine plus normal saline.

Pre-anesthetic checkup was carried out in outpatient basis. All investigations such as complete blood count, LFT, RFT was reviewed. Inform consent was taken.

Preoperative pulse, Blood pressure, ECG, SPO2 were noted in OR. Intravenous Line was secured with 20G canula. All Patients were given Inj.Glycopyrolate 5-10mcg/kg and Inj. Ondansetron 4 mg i.v before giving spinal anesthesia in each group of patients as a premedication.Patients were preloaded with Ringer's lactate (RL) solution 10–15 ml/kg over 10 min before operation.

Spinal anesthesia was given under all aseptic and antiseptic precaution in midline approach at L2-L3 or L3-L4 intervertebral space with 25 G Quincke Babcock spinal needle. After free flow of clear CSF study drugs was

administered intrathecal according to their group. Following subarachnoid block, patients were made lie supine.

The sensory block level was assessed at the midclavicular line. The motor block was assessed by Modified Bromage scale:

0- Free movement of legs and feet;
1-just able to flex knees, free movement of feet;
2-unable to flex knees, free movement of feet;
3- unable to move legs and feet.

Following parameters was assessed: The onset of sensory block at T10, Time to reach maximum sensory block level at T6, Time for complete motor block-bromage 3, Pulse, Mean BP, SPO2 and side effect assessed at 2 min., 3 min., 4 min., 5 min., 10 min, 20 min., 30 min., 45min., 1hr.

Side effects like hypotension, bradycardia, itching, nausea and vomiting, shivering was observed. Time to 2 segmental regressions, Time for regression to Bromage 1, Time to sensory level regression to S1 was assessed postoperatively. Visual analogue scale (0-10) was used for post-operative pain assessment.APGAR score at 1 min and 5 mins to assess Neonatal outcome.

The duration of analgesia was defined as the time from intrathecal injection up to the first requirement of rescue analgesic. Time to first rescue analgesia (Inj. Diclofenac sodium 75 mg i.v.) is time between injection of drug to the first complain of pain by patient (VAS≥4).Sedation was observed by Ramsay sedation score. Score 1 - the patient is awake, anxious, agitated and restless; 2 - the patient is awake, cooperative, oriented and alert; 3 - the patient is awake and responds only to commands; 4 - the patient is asleep and response to a light, glabellar tap, loud noise; 5- the patient is asleep and sluggish response to a light, glabellar tap, loud noise and 6 - the patient is asleep with no response to light, glabellar tap. Vital parameters assessed for 24hr.

Statistical analysis was done by SPSS expressed as mean and standard deviation. Chi-square test was also used in some case. P-value < 0.05 was considered significant.

All the patients completed the study. There was no significant difference found in demographic profile such as age, height, weight. Data such as duration of surgery and gestational age was found insignificant shown in Table 1.

3. Observation and Results

Table 1: Demographic Data

Demographic Data	MEAN ± SD		P value
	Group B	Group D	
Age (years)	24.63 ± 3.65	25.33 ± 3.07	0.42
Height (cm)	154 ± 3.81	154.63 ±3.42	0.99
Weight (kg)	58.5 ± 7.89	56.93 ± 6.19	0.39
Duration of surgery (min)	55.16 ± 3.35	54.9 ± 4.24	0.79
Gestational age (weeks)	36.4 ± 1.06	36.6 ± 1.4	0.70

P<0.05 is significant, SD-standard deviation

Comparison of intra-operative pulse rate, mean blood pressure (MAP) and oxygen saturation was done. There was not significant difference between two groups (p >0.05) as shown in fig-1, 2 and3.

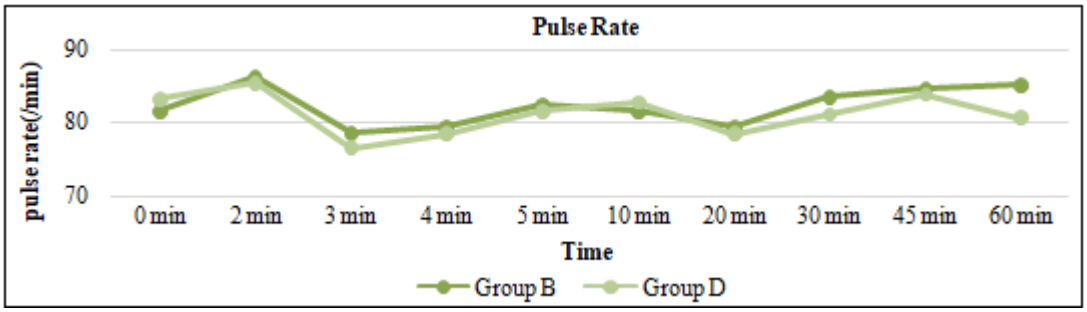

Figure 1: Comparison of Intraoperative Pulse Rate

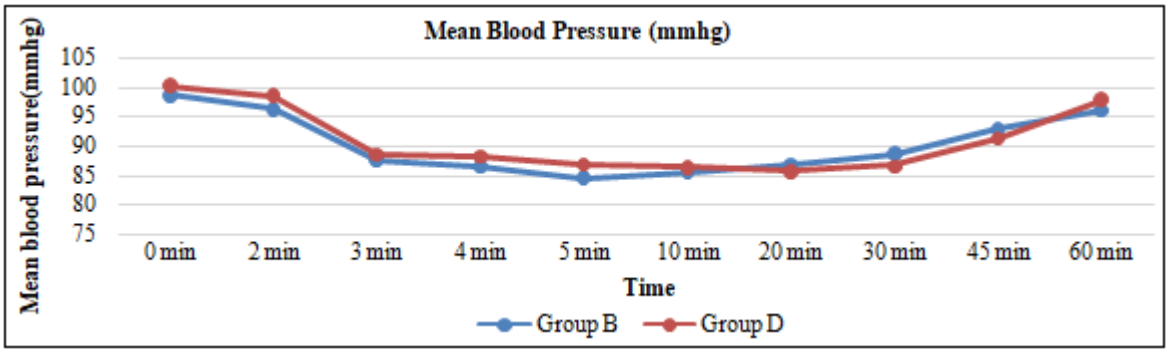

Figure 2: Comparison of Intraoperative Mean Blood Pressure:

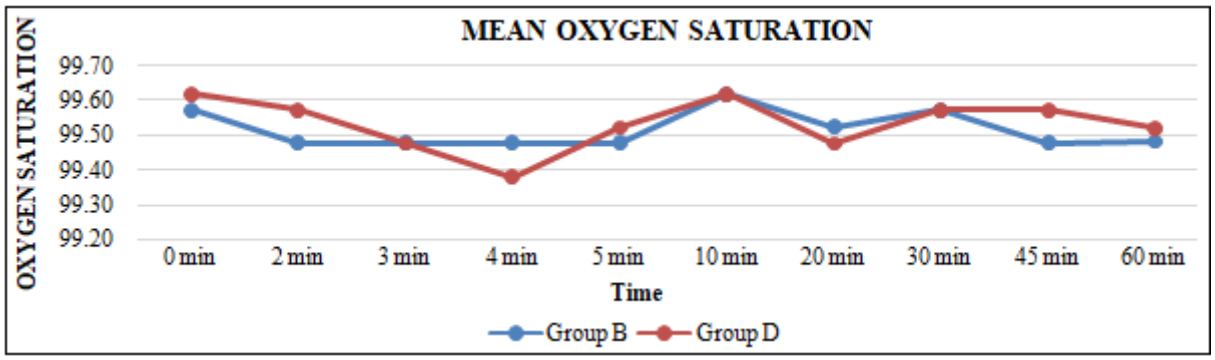

Figure 3: Comparison of Intraoperative Oxygen Saturation

Table 2: Characteristic of Sensory and Motor Block

Parameter	MEAN ± SD (min)		P Value
	Group B	Group D	
Onset of sensory block (T10)	2.43±1.64	2.10±0.98	0.016
Time to maximum sensory block (T6)	4.93±1.91	3.71±0.98	0.005
Time to maximum motor block	5.23±1.95	4.20±0.97	0.020
Time to two segment regression	122.37±25.7	150.18±24.3	0.001
Time to regression to bromage scale 1	210.0±38.4	260.0±48.8	0.001
Regression time to sensory S1	268±56.4	312±65.2	0.008

Onset of sensory block, time to maximum sensory block at T6 and time to maximum motor block were compared which was significantly shorter in group D with compared to group B. Time to two segment regression, time to regression to bromage scale 1 and regression time to sensory S1 were significantly longer in group D compared with group B. The characteristics of sensory and motor block are shown in Table 2.

In Group D patients, duration of analgesia were prolong and so need for inj Diclofenac sodium 75mg is less than that of group B. This is shown in Table 3.

Table 3: Duration of Analgesia

Parameter	MEAN ± SD (min)		Value
	Group B	Group D	
Time to 1st rescue analgesia	318.17±48.50	450.51±40.57	0.0001

Group D patients achieved significantly higher sedation score compared with group B patients. This is shown in table 3.

Table 3: Sedation Score

Sedation Score	Group B	Group D
<3	21	5
>3	4	20

APGAR score was compared without any significant difference shown in fig-4.

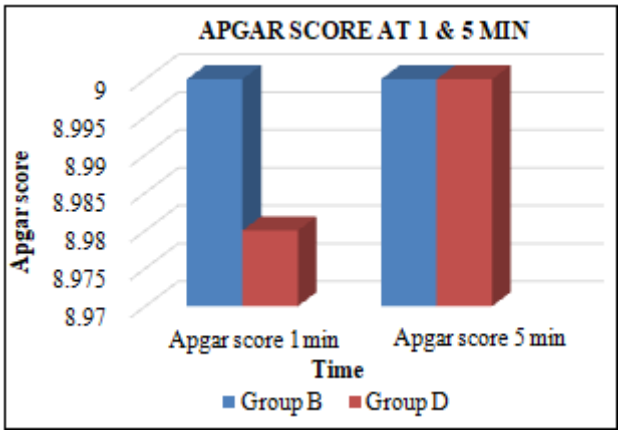

Figure 4: Comparison of Apgar Score At 1 & 5 Min

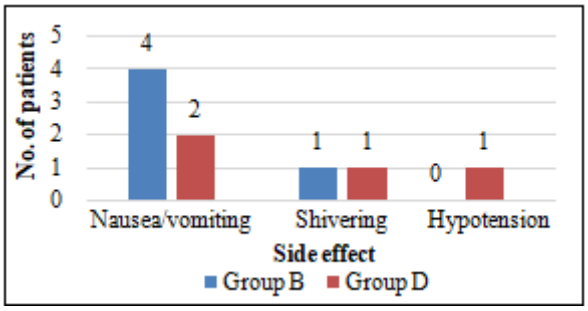

Figure 5: Side Effects

Some of group D and group B patients experienced Nausea, vomiting, Shivering and hypotension shown in Fig-5

4. Discussion

Pain relief is very important aspect in postoperative period in parturient. It will allow early ambulation to the mother and ensure bonding with her baby. Most important things which should be care for is to give analgesic with no undesirable side effects and should have longer duration of action.[6]

In this study, we used injection dexmedetomidine and buprenorphine as an adjuvant to intrathecal bupivacaine heavy for postoperative analgesia in patients undergoing caesarean section.

Buprenorphine is a centrally acting partial opioid agonist. It has both spinal and supraspinal component of analgesia. [7]Drug has very low rostral spread due to its high lipid solubility and it has less side effects. [8]

Dexmedetomidine has specific α2 adrenergic agonist property. It prolongs sensory block and motor block. This action is explained by its action on presynaptic C fibres and motor neurons. [8][9]

In present study, demographic data such as patients' age, height and weight were comparable and found no significant difference.

The present study shows that addition of adjuvant to intrathecal bupivacaine in spinal anesthesia in patient undergoing cesarean section prolong the duration of postoperative analgesia.

This study shows that duration of analgesia with dexmedetomidine group was 450 mins and with buprenorphine group it was 318 mins. There were significant differences found in both the groups. These findings are consistent with some other studies.

Ashem jack et al [4] and Mahima gupta et al [8] conducted similar study and found increase in duration of postoperative analgesia in dexmedetomidine group of patients.

In present study, characteristics of sensory and motor block were compared. Patients who received dexmedetomidine have favourable characteristics of sensory block and motor block. Sensory block was achieved earlier in group D patients and motor block was prolonged. These findings are consistent with study conducted by Mahima gupta et al.[8]

The sedation score was achieved higher in patients receiving dexmedetomidine and so requirement of further intraoperative sedation is less in dexmedetomidine group compared with buprenorphine group. It is explained by the action of dexmedetomidine on alpha-2 receptors on locus ceruleus. [8]

All fetal outcomes were comparable and within normal range. APGAR score, assessed by 1 min & 5 min, was compared without any significant difference in both the groups. Studies like Rashmi Ravindra et al (6) and Yong-hong bi et al [10]found no sign of fetal distress, evidenced by Apgar score.

Side effects like nausea, vomiting and shivering found in both the group but was not statistically significant. [8]

5. Conclusion

From above study we concluded that, the addition of Dexmedetomidine to bupivacaine heavy prolongs the duration of postoperative analgesia (450.51 min) with prolonged duration of sensory and motor blockade with mild sedative effect. The addition of Buprenorphine 60 µg to bupivacaine heavy also prolongs the duration of analgesia (318.17 min) but less duration than that of Dexmedetomidine. All the patients remained hemodynamically stable perioperatively and there were no clinically significant side effects observed in any patients. None of the study drug has effect on Neonatal outcome.

Thus, we recommend that Dexmedetomidine is safe and effective adjuvant to intrathecal bupivacaine for postoperative analgesia in patients undergoing caesarean section.

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