

# Comparative Study of Ropivacaine and Bupivacaine in Bilateral Ilioinguinal and Iliohypogastric Nerve Block for Post Caesarean Section Analgesia

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## ABSTRACT

**Introduction:** Optimum analgesia in post caesarean section patient is necessary to provide better care for mother and enhance bonding between mother and neonate. Ilioinguinal and iliohypogastric nerve block is an effective method to provide analgesia in them. Bupivacaine and ropivacaine have been used in various concentrations in many peripheral nerve blocks. Hence We conducted the study in post caesarean section patients to compare bupivacaine and ropivacaine in ilioinguinal and iliohypogastric nerve block with regards to Adequacy of pain relief (visual analogue scale), Duration of analgesia, Comfort at breast feeding (comfort scaling), Hemodynamic parameters ( pulse rate and blood pressure) and Any adverse effect.

**Material and Methods:** The present study was carried out in 60 ASA grade I patients with age above 18 years and weight between 40kg to 80kg, undergoing Caesarean Section. These patients were randomly divided into two groups of 30 each. Group I and Group II was administered 0.25% bupivacaine and 0.25% ropivacaine respectively. SPSS version 17 was used for analysis.

**Results:** Both the drugs provided effective post-operative pain relief. There was no statistically significant difference in VAS score at each time interval postoperatively, except after 7 hrs and 8 hrs between both the groups. Duration of analgesia was significantly longer in bupivacaine group. Both the drugs provided adequate levels of comfort during Breast feeding.

**Conclusion:** Bupivacaine and Ropivacaine were successfully used for post operative analgesia through bilateral ilioinguinal and iliohypogastric nerve block. Duration of analgesia was longer in bupivacaine. Both the drugs provided adequate levels of comfort during breast feeding.

**Keywords:** Ilioinguinal/iliohypogastric nerve block, post-caesarean analgesia, bupivacaine, ropivacaine

## INTRODUCTION

Lower segment caesarean section (LSCS) is one of the most commonly performed surgeries under spinal anaesthesia. The provision of effective postoperative analgesia to lower segment caesarean section (LSCS) patients is of key importance to facilitate early ambulation, infant care (including breast feeding, maternal-infant bonding) and prevention of postoperative morbidity. The analgesic regimen needs to meet the goals of providing safe, effective analgesia, with minimal side effects for the mother and her child.

Caesarean section causes moderate to severe postoperative pain, usually lasting for 48 hrs. Current techniques for post operative analgesia includes administration of non-steroidal anti-inflammatory or opioid drugs.<sup>1,2</sup> However, opioids (Intravenous or Neuraxial route) causes sedation, respiratory

depression and can be secreted in breast milk, sedating the newborn.<sup>3</sup>

Bilateral ilioinguinal block and iliohypogastric block is the preferred technique for pain relief after caesarean section.<sup>4</sup> Bupivacaine and ropivacaine are synthetic amide local anaesthetic drug commonly used drug for anaesthesia, analgesia, infiltration and nerve blocks. Normal safe dose for bupivacaine is 2 mg/kg and for ropivacaine is 3-4 mg/kg. Ropivacaine is a newer drug with slow nerve penetrating power, produces differential blockade and has a cardiostable profile.<sup>5,6</sup> It provides effective anaesthesia at concentration of 0.5% and adequate analgesia at 0.25% as mentioned Su et al in their recent study.<sup>7</sup>

The aim of the study was to compare 0.25% ropivacaine and 0.25% bupivacaine for bilateral ilioinguinal and iliohypogastric nerve block for post caesarean section analgesia. We compared them with respect to adequacy of pain relief (Visual analogue scale), duration of analgesia, comfort level at breast feeding, haemodynamic parameters, any other adverse effect.

## MATERIAL AND METHODS

It was a prospective Randomized Controlled, Double Blinded study, conducted after approval from institutional ethics committee and valid, written, informed consent from patients. Study was carried out in the Obstetrics and Gynaecology operation theatre of a tertiary care teaching public hospital over a period of 1 year from January 2012 to January 2013 and included total 60 patients. The number 30 per group was selected on the presumption that most variables will have normal distribution at a sample size of 30. This is based on the central limit theorem. We included females undergoing caesarean section via Pfannenstiel incision, American Society of anaesthesiologists (ASA) Grade I, II and weighting 40-60 kgs. We excluded patients with known sensitivity to drugs used in the study, infection on the nerve block area and incision other than Pfannenstiel incision

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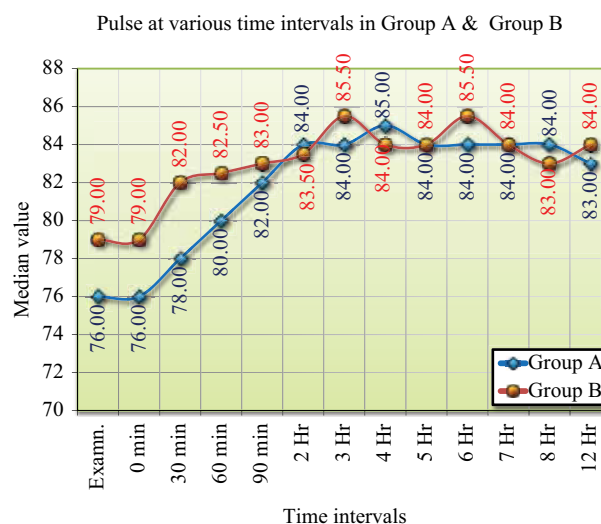
We studied 60 patients, with 30 in each group A (0.25% bupivacaine) and B (0.25% ropivacaine). Patients were randomized using a computer generated randomization. Blinding was done by using pre-filled syringes of the study drug as both bupivacaine as well as ropivacaine are clear colourless drugs. To make 0.25% bupivacaine, or ropivacaine dilution with 0.9% normal saline was done and labelled as "DRUG-X and Y" the contents of which were known only to a third party anaesthesiologists not participating in the study. The observer or patients were not aware of the drug contents in the syringes. The patients were educated about the Visual Analogue Score (VAS). After detailed history, clinical examination, investigations and written informed valid consent was confirmed and LSCS was done under standard spinal anaesthesia technique using 10 mg of 0.5% bupivacaine [Heavy]. At the end of the surgery after regression of two segment level of subarachnoid block, bilateral ilioinguinal and iliohypogastric nerve block was given by landmark technique (Figure 1). Under all aseptic precautions at a point 2cm medial and superior to anterosuperior iliac spine using 22 gauge needle a total of 15ml of the study drug was injected in a fan-like distribution between external and internal oblique and transversus abdominis muscles on each side. After computerised randomisation patients received either drug X1 or Y in the block. To prevent entering the abdomen after piercing the external oblique muscle, the depth was limited to 1.5 cm, continuous aspiration was done while injecting drug. Haemodynamic parameters such as pulse rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure (MAP) and severity of pain was assessed systematically by an investigator blinded to group allocation. These assessments were performed every 30 mins for 2 hrs, hourly for next 6 hrs and 2 hourly for next 4 hrs. Study ended at the time of rescue analgesia. Pain severity was measured using VAS (10 cm unmarked line in which 0 cm = no pain and 10 cm = worst pain imaginable) and time of first dose of rescue analgesia was noted. Time to complete regression of spinal anaesthesia was noted by using pinprick method and Bromage scale. We also noted first breastfeeding time and also the comfort level during breastfeed using will four point scale (Excellent, Good, Fair and Poor).

## STATISTICAL ANALYSIS

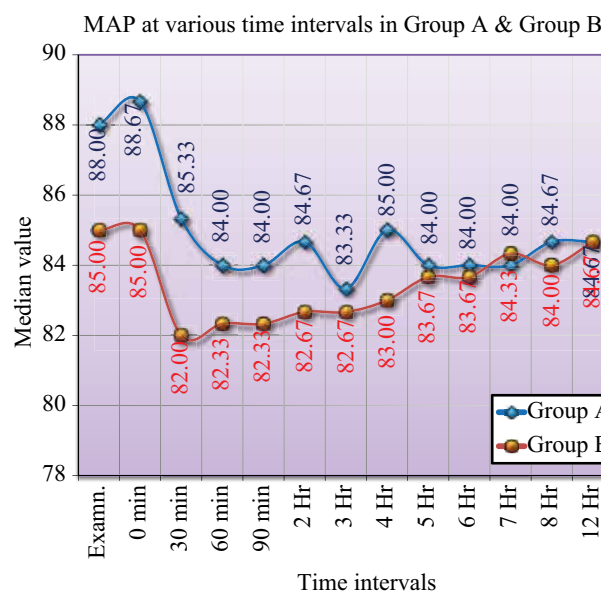
The number 30 per group was selected on the presumption that most variables will have normal distribution at a sample size of 30 based on the central limit theorem. Qualitative data was represented in form of frequency and percentage. Association between qualitative variables was assessed by Chi-Square test and Fisher's exact test where p-value of Chi-Square test was not valid due to small counts. Quantitative data was represented using mean±sd and Median and Interquartile range (IQR). Analysis of Quantitative data between the two groups was done using unpaired t-test or by Mann-Whitney Test. Results were graphically represented where deemed necessary. SPSS Version 17 was used for most analysis.

## RESULTS

Both the group were comparable with respect to demo-



**Figure-1:** Comparison of pulse rate at various time intervals between bupivacaine (Group A) and ropivacaine (Group B) groups



**Figure-2:** Comparison of MAP at various time intervals between bupivacaine (Group A) and ropivacaine (Group B) groups

graphic and vital parameters. Age, weight and ASA status and baseline pulse rate and mean arterial pressure in both the groups were comparable. There was no statistically and clinically significant variation in pulse rate and mean arterial pressure in both the groups during the study period. (Figure 1 and 2)

The VAS scores between the two groups showed statistically significant difference after 7 hrs {Group A (mean= 3.00±0.87) vs. Group B (mean= 3.50±0.86)} (p=0.024) and after 8 hrs {Group A (mean= 3.80±0.81) vs. Group B (mean= 4.23±0.50)} (p=0.00927). However before that VAS scores were comparable in both the groups (Table 1). There was statistically significant difference of duration of analgesia between bupivacaine and ropivacaine groups (p=0.000604). (Table 2). There was no statistically significant difference among duration of spinal anaesthesia between both the groups and observed time was between 90-120 minutes in both the groups.

Out of 30 patients in group A; comfort during first breast

VAS at- ^	Group A				Group B				Mann-Whitney test applied		
	Mean	SD	Median	IQR	Mean	SD	Median	IQR	Z-value	p-value	Difference
At 0 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000	Not significant
After 30 min	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	1.000	Not significant
After 60 min	0.03	0.18	0.00	0.00	0.00	0.00	0.00	0.00	-1.000	0.317	Not significant
After 90 min	0.13	0.35	0.00	0.00	0.10	0.31	0.00	0.00	-0.399	0.690	Not significant
After 2 Hr	0.13	0.35	0.00	0.00	0.13	0.35	0.00	0.00	0.000	1.000	Not significant
After 3 Hr	0.57	0.57	1.00	1.00	0.73	0.69	1.00	1.00	-0.873	0.383	Not significant
After 4 Hr	1.10	0.71	1.00	0.25	1.37	0.62	1.00	1.00	-1.702	0.089	Not significant
After 5 Hr	1.63	0.89	2.00	1.00	1.90	0.89	2.00	1.25	-1.027	0.305	Not significant
After 6 Hr	2.57	0.68	3.00	1.00	2.63	1.00	3.00	1.25	-0.237	0.813	Not significant
After 7 Hr	3.00	0.87	3.00	2.00	3.50	0.86	4.00	1.00	-2.261	0.024	Significant
After 8 Hr	3.80	0.81	4.00	0.00	4.23	0.50	4.00	1.00	-2.602	0.00927	Significant
After 12 Hr	4.73	0.87	5.00	1.25	5.07	0.74	5.00	1.25	-1.569	0.117	Not significant

**Table-1:** Comparison of Visual analogue Score (VAS) at various time intervals between bupivacaine (Group A) and ropivacaine (Group B) groups.

Variable	Group A				Group B				Mann-Whitney test applied		
	Mean	SD	Median	IQR	Mean	SD	Median	IQR	Z-value	p-value	Difference is-
Duration of Analgesia (min) ^	460.83	67.34	480.00	60.00	404.83	56.48	420.00	97.50	-3.430	0.000604	Significant

^ Data failed 'Normality' test. Hence Mann-Whitney test applied. T-value replaced by Z-value.

**Table-2:** Comparison of Duration of Analgesia between bupivacaine (Group A) and ropivacaine (Group B).



**Figure-3:** Puncture site showing ilioinguinal/iliohypogastric nerve block in post caesarean patient

feeding was “excellent” in all 30 (100%). Similarly, out of 30 patients in group B; comfort during first breast feeding was “excellent” in all 30 (100%). None of the patients in both the groups experienced “poor” comfort level during first breast feeding.

There was no incidence of any postoperative adverse event between both the groups.

## DISCUSSION

The relief of pain has been the basic aspect of the practice of anaesthesiology. High quality analgesia is important after caesarean delivery to promote early recovery and optimise the mother's ability to care for her newborn. An ideal post-caesarean analgesic regimen should provide consistent and high quality pain relief, simple, cost-effective, but have a low incidence of side-effects and without any adverse effects

on the newborn.

McDonnell et al observed that opioids, with patient-controlled techniques and appropriate local anaesthetic blocks forms basis for multimodal approach for post LSCS analgesia.<sup>1</sup> Bunting P. et al and other studies mentioned bilateral Ilioinguinal nerve blockade for analgesia after caesarean.<sup>8</sup> Ganta R. et al studied the comparison of the effectiveness of ilioinguinal nerve block and wound infiltration for postoperative analgesia significantly the pain scores and analgesic requirements in the immediate postoperative period.<sup>9</sup> Bupivacaine and ropivacaine are synthetic amide local anaesthetic drugs and are used successfully to achieve adequate analgesia in postoperative period. Kocum A et al<sup>10</sup>, de lima E Souza R<sup>11</sup> et al and Hickey et al<sup>12</sup> showed that the ropivacaine 0.25% is as effective as bupivacaine 0.25% in various lower limb and upper limb surgeries. The duration of sensory and motor block also was not significantly different between the two groups and the mean duration of analgesia ranged from 9.2 to 13.0 hrs.<sup>11</sup> There was no statistically significant difference between the two groups in terms of the post-operative heart rate and post-operative mean arterial pressure mm Hg with p value >0.05.<sup>10</sup> In the present study there was no statistically and clinically significant variation in pulse rate and mean arterial pressure in both the groups during the study period.

One of the advantages of giving nerve block at the end of the surgery after regression of two segment level of subarachnoid block is that patient did not feel the pain of puncture and remains comfortable. Also being LSCS standard low dose spinal anaesthesia (10mg, 0.5% bupivacaine) was used without any additive and complete spinal level (sensory and motor) regression was observed by pinprick and Bromage scale of lower limb.

In our study, in post-operative period, when the patients



complained of VAS score of  $>3$ , were treated with rescue analgesics and observed for at least 12hrs and more. The VAS scores in all other patients from both the groups were comparable during the entire postoperative observation period. This is attributable to the analgesic actions of both the drugs. VAS showed no significant difference throughout post operative period, except after 7 hrs and 8 hrs. There was statistical difference in the VAS scores between the groups after, 7hrs:- Group A (Mean=  $3.00 \pm 0.87$ ) vs. Group B (Mean=  $3.50 \pm 0.86$ ) ( $p \leq 0.05$ ), 8hrs:- Group A (Mean=  $3.80 \pm 0.81$ ) vs. Group B (Mean=  $4.23 \pm 0.50$ ) ( $p \leq 0.05$ ). Both the drugs provided effective post-operative analgesia. Our findings are supported by similar results of various studies. Ganta R. et al studied, both ilioinguinal block and wound infiltration reduced significantly the pain scores and analgesic requirements in the immediate postoperative period. The differences in pain scores and analgesic requirements between the study groups were not statistically significant ( $P > 0.05$ ).<sup>9</sup> Bunting P. et al observed that pain scores were less in the block patients at all times during the first day after elective Caesarean section with the exception of 12 hrs. There was an increased time from the patient's recovery from anaesthesia to the first injection of opioid in the block group.<sup>8</sup> Sakalli M et al compared ilioinguinal/ iliohypogastric block with Sham block in post casearean groups and concluded that tramadol usage in ilioinguinal/ iliohypogastric block group was significantly less than in sham block group at all estimated time intervals ( $p < 0.05$ ). Total tramadol consumption was  $331 \pm 82$  mg in II-IH block group and  $622 \pm 107$  mg in sham block group ( $p < 0.05$ ).<sup>13</sup>

Tsuchiya N et al confirmed that bupivacaine and ropivacaine were more effective than lidocaine in the prevention of post-operative pain after children's inguinal hernia repair.<sup>14</sup>

In the present study, there was statistically significant difference of duration of rescue analgesia between bupivacaine (mean duration =  $480 \pm 67.34$  min) and ropivacaine (mean duration =  $420 \pm 56.48$  min) groups ( $P \leq 0.05$ ). Similar results observed in various studies, Greengrass RA et al concluded that, 0.5% bupivacaine and 0.5% ropivacaine had a similar onset of motor and sensory blockade when used for lumbar plexus and sciatic nerve block. Analgesic duration after using 0.5% bupivacaine was prolonged by four hours compared with an equal volume of 0.5% ropivacaine.<sup>15</sup>

Locatelli et al mentions that caudal levobupivacaine, ropivacaine and bupivacaine have comparable analgesia however bupivacaine has high motor block and longer analgesia.<sup>16</sup> The optimum time to begin nursing should be as early as possible after delivery. Persistent pain negatively affects mother and child bonding and success of breast feeding.<sup>17,18</sup> In our study, from non tabulated data, out of 30 patients in group A; comfort during first breast feeding was "excellent" in all 30 (100%). Similarly, out of 30 patients in group B; comfort during first breast feeding was "excellent" in all 30 (100%).

None of the patients in both the groups experienced "poor" comfort level during first breast feeding. Various studies have emphasized that, better quality of analgesia improves success of breast feeding.<sup>17,18</sup>

There was no incidence of postoperative adverse effects be-

tween the two groups. As the block is limited to the lower abdominal wall and inguinal region, no hemodynamic changes were noted also any other complication like intravascular injection, local anaesthetic toxicity, hematoma, intra-peritoneal injection and bowel injury did not occur as it mentioned in literature although rare.<sup>19</sup> To prevent above complications, the depth of 22 gauge hypodermic needle was limited to 1.5 cm and continuous aspiration was done while injecting the drug.

This study was not without limitation as we did not use ultrasound to confirm needle position because it was not available in our institution during the study period. Ultrasound-guided block has the advantage of less dose requirement and increase in safety margin.<sup>19,20</sup>

## CONCLUSION

Adequate postoperative analgesia after LSCS should be provided with the intention of providing comfort to new mother, enhancing bonding between mother and neonate. A multimodal approach is recommended including regional technique whenever possible thus reducing the amount of opioids and non-steroidal anti inflammatory agents in post-operative period. From the present study we conclude that both bupivacaine and ropivacaine were successfully used for post operative analgesia through bilateral ilioinguinal and iliohypogastric nerve block. However bupivacaine found to have longer action of analgesia but both the drugs provided adequate levels of comfort during breast feeding. Thus bilateral ilioinguinal and iliohypogastric nerve block using bupivacaine and ropivacaine has definite and promising role in multimodal approach for postoperative analgesia after caesarean section. Consequently, the number of post-caesarean analgesic options continues to expand whilst existing methods are refined.

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