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Original Research Article

Efficacy of Bupivacaine versus Ropivacaine for Bilateral Ilioinguinal and Iliohypogastric Nerve Block for Postoperative Pain after Caesarean Section

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Abstract

Aim and Objectives: The present study was undertaken to compare the efficacy of 0.25% bupivacaine and 0.25% ropivacaine for bilateral ilioinguinal and iliohypogastric nerve block for post caesarean section analgesia.
Methods: In a double blind study, total 60 patients of ASA grade I and II, having age above 18 years and weight between 40- 80 kg were randomly allocated in two equal groups to receive 30 cc volume of either 0.25% bupivacaine (Group A) or 0.25% ropivacaine (Group B). All the results with respect to hemodynamic parameters, adequacy and duration of analgesia, comfort at breast feeding and any adverse effect were tabulated and analyzed statistically.
Results: There was no statistically significant difference in the post-operative mean arterial pressures (MAP) and heart rate (HR) between two groups. Postoperatively, both the drugs were successful in achieving adequate analgesia. Duration of analgesia was significantly longer in group A as compared to group B. Both the drugs provided adequate levels of comfort during Breast feeding. No incidence of any adverse effect was noted between two groups.
Conclusion: Bupivacaine and ropivacaine are successfully used for post operative analgesia through bilateral ilioinguinal and iliohypogastric nerve block.
Keywords: Ropivacaine, Bupivacaine, Bilateral ilioinguinal/Iliohypogastric nerve block, Caesarean section.

1. Introduction

Caesarean section (CS) has been one of the most frequently performed major surgical interventions, and causes severe postoperative pain. Different analgesic modalities have been used for treatment of pain after cesarean delivery. A multimodal approach often incorporates regional anesthetic techniques, in addition to traditionally used systemic opioid analgesia. Opioid drugs are effective in reducing post caesarean pain but side effects such as nausea, vomiting and sedation limit their use [1]. Childbirth is an emotion-filled event and the mother needs to bond with her newborn as early as possible. Any intervention that leads to improvement in pain relief is worthy of investigation. Bilateral ilioinguinal block and iliohypogastric block is the preferred technique for pain relief after caesarean section [2]. It is considered to be advantageous after caesarean section regarding unwanted effect of analgesics that pass into breast milk. Post operative analgesia is required for adequate pain relief in an awake and alert mother to establish early bonding between mother and her newborn.

Bupivacaine is a synthetic amide local anaesthetic drug commonly used for anaesthesia, analgesia, infiltration and nerve block. The long duration of action makes it unnecessary for repeated frequent doses. Ropivacaine is a new synthetic amide local anaesthetic drug with slow nerve penetrating power, produces differential blockade and it has better carditoxic profile [3,4]. Both, bupivacaine and ropivacaine have been used successfully in peripheral nerve

blocks. We hypothesized that both the agents may be useful for bilateral ilioinguinal and iliohypogastric nerve block in achieving post operative pain relief after lower segment caesarean section (LSCS). Hence, the present research was carried out with an objective to study the efficacy of both the drugs in achieving pain relief to provide excellent conditions for bonding between mother and baby.

2. Materials and Methods

After obtaining institutional ethical committee approval and patients written informed consent, the study was conducted in 60 patients of ASA grade I and II, aged above 18 years and weight between 40- 80 kg, scheduled for caesarean section with Pfannenstiel incision under spinal anaesthesia. This prospective randomized controlled, double blinded study was carried out in the Obstetrics and Gynaecology operation theatre of a tertiary care teaching public hospital over a period of 2 year. Patients with major hepatic / renal / cardiovascular dysfunction / respiratory disease, known sensitivity to drugs used in the study, neuromuscular junction disorder, having preeclampsia and eclampsia, patients with history of chronic pain, infection on the nerve block area, incision other than Pfannenstiel incision were excluded from the study. The patients were randomized in two equal groups using a computer generated randomization to receive either injection of 0.25% bupivacaine (Group‘A’) or 0.25% ropivacaine (Group ‘B’). The number 30 per group was selected on the presumption that most variables will have normal distribution at a sample size of 30. This was based on the central limit theorium. A detailed history and a thorough general and systemic examination and all relevant investigations were done at least a day prior to surgery.

In the operation theatre, intravenous access using an 18 G cannula was secured. The multipara monitor such as oxygen saturation probe (Pulse oximeter), cardioscope, blood pressure apparatus (NIBP) were applied to the patient and baseline parameters were recorded. 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. Lower segmental caesarean section was done under standard spinal anaesthesia technique using 10 mg of 0.5% bupivacaine [Heavy]. Level of sensory block was noted. 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. Under all aseptic precautionsat a point 2cm medial and superior to anterosuperior iliac spine using 22 gauge needles a total of 15ml of the study drugwas injected in a fan-like distribution between external and internal oblique and transversus abdomen is muscles on each side. After computerized randomization patients received either drug X 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 minutes 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).

2.1 Statistical analysis

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 was graphically represented where deemed necessary. SPSS Version 17 was used for most analysis.

3. Observations and Results

Sixty patients were selected for the study, divided into Group ‘A’ and Group ‘B’. The mean age of patients in group A was 26.63 ± 4.12 years and in group B was 25.00 ± 3.03 years. The demographic profiles (age, weight and ASA status) of the patients were comparable in both the groups with no statistically significant difference, (p value >0.05) and seems that it has no influence on outcome of the study.

Baseline pulse rate and mean arterial pressure in both the groups were comparable but when comparing baseline heart rate with post-operative heart rate in both groups, we found statistically significant difference at each time interval except at 0 min in group A and except at 0 min, 30 min and 5 hrs in group B. Similarly, there was

statistically significant difference in the baseline mean arterial pressure and post-operative mean arterial pressure at each time interval, except at 0 min and 30 min in group A and except at 60 min in group B. There was no statistically and clinically significant variation in pulse rate and mean arterial pressure in both the groups after giving nerve block and throughout the postoperative period, (Figure 1 and 2).

Figure 1: Comparison of Pulse at various time intervals between Group A & Group B cases

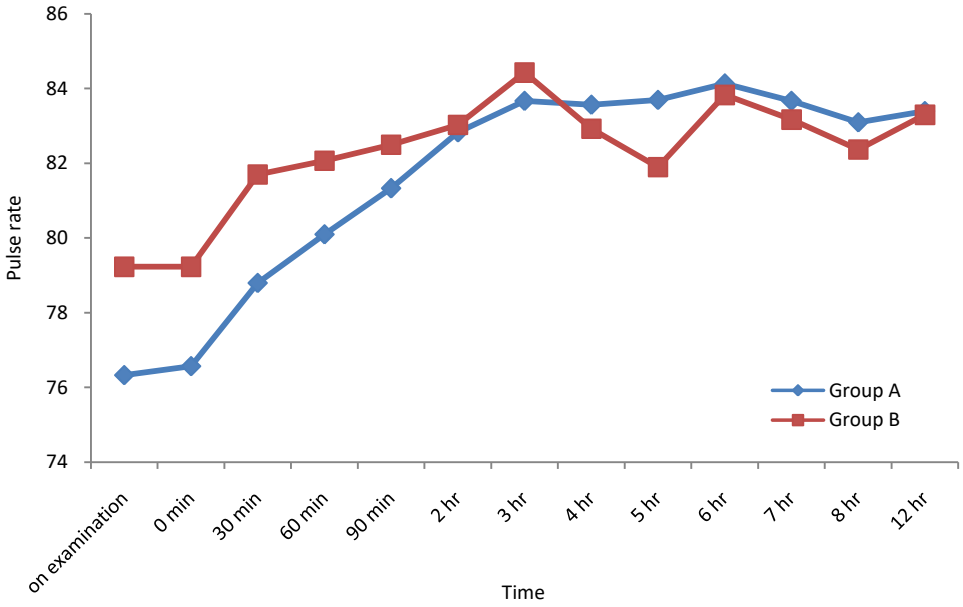
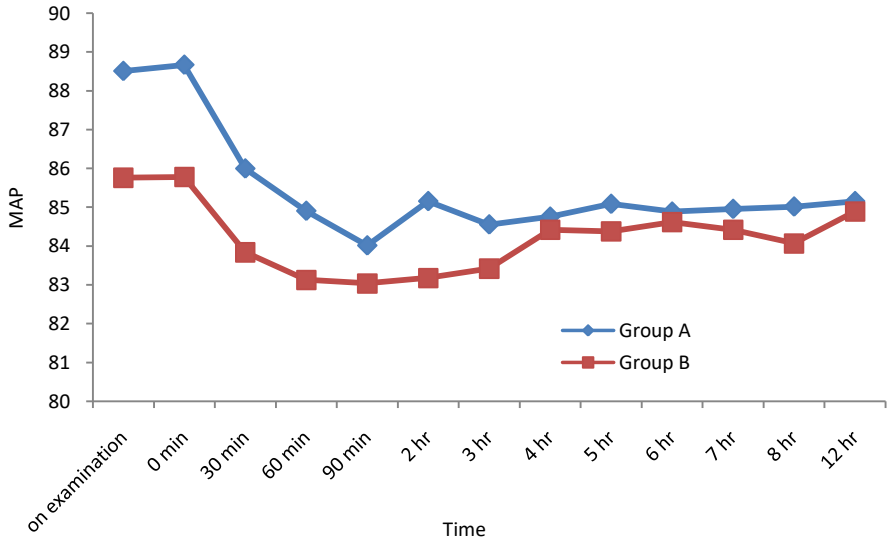


Figure 2: Comparison of MAP at various time intervals between Group A & Group B cases



We found no statistically significant difference in the VAS scores between the two groups at each time interval postoperatively, except after 7hrs {Group A (mean= 3.00±0.87) vs. Group B (mean= 3.50±0.86)} and after 8hrs {Group A (mean= 3.80±0.81) vs. Group B (mean= 4.23±0.50)}, (Table 1). There was statistically significant difference in duration of analgesia between bupivacaine (mean duration = 480±67.34 min) and ropivacaine (mean duration = 420±56.48 min) groups ($P \leq 0.05$). There was no incidence of postoperative adverse effects between the two groups.

Table 1: Comparison of VAS at various time intervals between group A and B

VAS at- ^	Group A		Group B		Mann-Whitney test applied		
	Mean	SD	Mean	SD	Z-value	p-value	Difference
0 min	0.00	0.00	0.00	0.00	0.000	1.000	ns
30 min	0.00	0.00	0.00	0.00	0.000	1.000	ns
60 min	0.03	0.18	0.00	0.00	-1.000	0.317	ns
90 min	0.13	0.35	0.10	0.31	-0.399	0.690	ns
2 Hr	0.13	0.35	0.13	0.35	0.000	1.000	ns
3 Hr	0.57	0.57	0.73	0.69	-0.873	0.383	ns
4 Hr	1.10	0.71	1.37	0.62	-1.702	0.089	ns
5 Hr	1.63	0.89	1.90	0.89	-1.027	0.305	ns
6 Hr	2.57	0.68	2.63	1.00	-0.237	0.813	ns
7 Hr	3.00	0.87	3.50	0.86	-2.261	0.024	**s**
8 Hr	3.80	0.81	4.23	0.50	-2.602	0.00927	**s**
12 Hr	4.73	0.87	5.07	0.74	-1.569	0.117	ns

'VAS' represents Visual analogue Score; 'ns' represent non significant and 's' represent significant

4. Discussion

Postoperative pain is one of the most undesirable experiences for a patient undergoing caesarean delivery. Deliberate action should be taken to prophylactically treat the pain. If postoperative pain does develop, it should be managed early and aggressively, because severe pain not only induces a delay in discharge and poorer patient satisfaction, but also can create a hyperalgesic condition known as persistent postoperative pain (PPP) [5]. Therefore, it is in the anesthesiologist's best interest to be aware of the severity of this problem.

In caesarean delivery adequate analgesia is provided with the intention of providing comfort to new mother, enhancing bonding between mother and neonate. Various physiological methods and pharmacological agents have been used for post-operative pain relief after caesarean section. An ideal post-caesarean analgesic regimen would be one that was cost-effective, simple to implement and with minimal impact on staff workload. It would provide consistent and high quality pain relief while catering for wide inters patient variability but have a low incidence of side-effects and complications. It would not interfere with the maternal care of the newborn or with the establishment of breastfeeding and there would be minimal drug transfer into breast milk and no adverse effects on the newborn. In this regard, a multimodal approach is commonly recommended.

In present study, we used bupivacaine and ropivacaine for the bilateral ilioinguinal and iliohypogastric nerve block as part of a multimodal analgesic regimen for postoperative pain in patients undergoing caesarean delivery. The study only focused on the efficacy of bilateral ilioinguinal and iliohypogastric nerve block performed after surgery and present data indicate that is effective in reducing postoperative pain and analgesic consumption after CS.

LSCS is performed by Pfannenstiel incision which lies on L1-L2 dermatoms. Sensory innervation of L1-L2 dermatoms is accomplished by ilioinguinal and iliohypogastric nerves. Block of these nerves enables somatic pain relief in CS operations, but is ineffective for visceral pain, as viscerae are innervated by nerve roots from T 10-L1 segments [6]. Ilioinguinal and iliohypogastric nerve block have been reported to decrease the need for postoperative analgesics at rates of 35% to 78%, depending on the operative procedure or anatomical variations [7]. Bunting *et al* [6] performed ilioinguinal and iliohypogastric nerve block technique on CS patients with 0.5% bupivacaine and found out that both the block group had lower pain scores and lower analgesic requirements compared to no- block group. Ilioinguinal and iliohypogastric nerve block had been performed with ropivacaine in numerous studies [8,9]. Solutions of ropivacaine 5-10 mg ml (0.5%- 1%) are likely to have wide clinical application compared to bupivacaine [10,11] due to their lower systemic potential for central nervous system and cardiovascular toxicity [12,13].

Bupivacaine is synthetic local anaesthetic and is not expected to cause any variation in heart rate in our study but it produced a statistically significant variation in the mean arterial pressure (MAP) in postoperative period when compared with the baseline value. In both the groups, post-operative HR and MAP at each time interval showed an increased trend from baseline value once dose was given, with a p value ≤ 0.05 which was statistically significant. There was no significant difference between the two groups in terms of the post-operative heart rate and mean arterial pressure mm Hg with p value >0.05. Because the block is

limited to the lower abdominal wall and inguinal region, any hemodynamic changes were unusual.

In current study, post-operative pain was measured using a Visual Analogue Scale (VAS). When the patients complained of VAS score of >3, they were treated with rescue analgesics and patients were observed for at least 12 hrs and more than that. The VAS scores in both the groups were comparable during the entire duration of stay in the Post Anaesthesia Care Unit (PACU) and this was attributable to the analgesic actions of both the drugs. VAS scores 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±0.87) vs. group B (Mean= 3.50±0.86) ($p \leq 0.05$), 8hrs :- group A (Mean= 3.80 ±0.81) vs. group B (Mean= 4.23±0.50) ($p \leq 0.05$). Thus both the drugs provided effective post-operative analgesia. Our findings were supported by similar results of various studies [6,14,15].

We found statistically significant difference in duration of rescue analgesia between bupivacaine (mean duration = 480±67.34 min) and ropivacaine (mean duration = 420±56.48 min) groups ($P \leq 0.05$). Similar results observed in various studies [16-18].

The optimum time to begin nursing is as early as possible after delivery. Persistent pain negatively affects mother and child bonding and success of breast feeding [19,20]. 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 [19,20].

5. Limitations of study

1) We did not assess pain on movement, assessing pain on movement which includes both visceral and parietal components of pain would have influenced the duration of analgesia. We studied only the parietal component of pain originating from the anterior abdominal wall due to the surgical incision and not the visceral component of pain.
2) The study did not use ultrasound to confirm needle position because it was not available in our institution during the study period. It is a promising approach that should increase success rate and further reduce the risk of complications. It will enlarge patient safety margin.
3) All blocks were performed by the same investigator. Although this was done to decrease variability in the performance of the block, this approach may limit the extent to which our findings can be generalized.
4) Chronic pain occurs commonly after a Pfannenstiel incision. Nerve entrapment was found to be a frequent cause of moderate-to-severe pain. However we did not follow up the patients after discharge.

6. Conclusion

From the observations of present study, we concluded that both bupivacaine and ropivacaine were effectively used for post operative analgesia through bilateral ilioinguinal and iliohypogastric nerve block. Duration of analgesia was longer in bupivacaine use but both the drugs provided adequate levels of comfort during breast feeding. The application of bilateral ilioinguinal and iliohypogastric nerve block using bupivacaine and ropivacaine is considered to be advantageous after caesarean section regarding the unwanted effects of analgesics that passes into breast milk in newborns and has definite and promising role in multimodal approach for postoperative analgesia after caesarean section.

The current study suggested that the bilateral ilioinguinal and iliohypogastric nerve block, performed after caesarean section operations under general anaesthesia, increased the quality of pain control in the postoperative period and apparently decreased the consumption of analgesics. Therefore it is a preferable technique for the pain control after caesarean section.

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