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Ultrasound-Guided Transverse Abdominis Plane Block Using Bupivacaine 0.25% vs Ropivacaine 0.2% For Post-Operative Analgesia in Caesarean Section

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Abstract

Introduction: Present study was conducted to compare the analgesic efficacy of 0.25% Bupivacaine and 0.2% Ropivacaine in Transverse Abdominis Plane (TAP) block under ultrasound guidance as a part of a multimodal analgesia regimen for post caesarean delivery pain management. *Materials & Methods:* This prospective study was conducted at IMS and SUM Hospital, Bhubaneswar in 100 pregnant women (ASA grade II and III parturient) undergoing either elective or emergency LSCS under spinal anaesthesia by ultrasound guided transverse abdominis plane block randomised in two groups – 0.25% bupivacaine and 0.2% ropivacaine, given 10 ml on each side. The patients were assessed at post anesthesia care unit (PACU) and at 2, 6, 12, 24, 48 hours postoperatively in the obstetric ward for time of first request for analgesia, pain score of the patients analyzed during rest and movement using visual analogue scale (VAS) and side effects during first 48 hours. *Results:* The two groups were comparable in demographics and baseline characteristics. The time of full regression of block (p=0.731), time required for 1st analgesia (p=0.699) and total consumption of analgesia (p=0.833) were comparable in the two groups. The VAS score at rest and movement at multiple time intervals during follow-up period was similar in both groups. *Conclusion:* Analgesic efficacy and safety of bupivacaine 0.25% and ropivacaine 0.2% is similar in TAP block under ultrasound guidance.

Keywords: Analgesia; Transverse Abdominis Plane; Caesarean; Ultrasound.

Introduction

The ideal postcaesarean section (CS) analgesic regime should be efficacious without impacting the ability of mother to take care of the neonate and with minimal drug transfer through breast milk. However, observational data from country that these goals are far from being achieved because of limited availability of drugs, equipment and expertise are the major issues in providing adequate post-CS analgesia [1].

Though different approaches have been introduced for proper pain relief, these multimodal approaches are still inadequate and unsatisfactory in many patients [2].

The transverse abdominis plane (TAP) is the fascial plane between the internal oblique and transverseabdominis muscle containing the thoracolumbar nerves T10 to L1.

The introduction of local anaesthetic in this plane blocks these nerves (T10 to L1). With the widespread availability of ultrasound guidance for more accurate localization of TAP (than the 'blind' technique), the TAP block is now established as an important technique for reduction of post-operative pain following all abdominal surgeries including CS [3].

Various long acting amide linked LA agents including ropivacaine [3] and bupivacaine [4] have been utilised for post-operative analgesia with ultrasound-guided TAP block. They share a similar

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pKa and plasma protein binding property. Bupivacaine is a racemic molecule while, ropivacaine is a pure enantiomer which has been developed to reduce the potential toxicity and improve the relative sensory and motor blocks [5].

The present study was planned to compare the analgesic efficacy of 0.25% Bupivacaine and 0.2% Ropivacaine in TAP block under ultrasound guidance as a part of a multimodal analgesia regimen for post caesarean delivery pain management.

Materials & Methods

This prospective study was conducted at IMS and SUM Hospital, Bhubaneswar from January 2016 to August 2017. Institutional Ethics Committee permission was obtained. 100 pregnant women (ASA grade II and III parturient) undergoing either elective or emergency LSCS under spinal anaesthesia by ultrasound guided transverse abdominis plane block were randomised in two groups – 0.25% bupivacaine and 0.2% ropivacaine, given 10 ml on each side.

Patients refusing consent, with allergy to opioids or amide group local anaesthetics of NSAIDs, coagulation derangement or bleeding disorders, infection at the site of block, cardiovascular, pulmonary or neurological diseases and those converted to general anaesthesia after giving sub arachnoid block were excluded from the study. Demographic details of the patients were noted.

All patients received subarachnoid block by 25 G Quinckie's needle at L 3-4/L2-3 interspace with a total volume of 2 ml in the same syringe using a standard midline approach. Both Groups received 10 mg of 0.5% of hyperbaric bupivacaine (2 ml). Supplemental O2 was delivered by face mask at 5L/min throughout surgery and during their stay in the post anaesthetic care unit.

Monitoring was done of all patients using the following: a- ECG. b. Pulse oximetry. c- Non Invasive blood pressure monitoring. Surgery was allowed to proceed after T4 to T6 sensory blockade to pin prick sensation was established. IV crystalloids and ephedrine were administered as needed to treat hypotension. All patients received an IV infusion of oxytocin 10 IU after delivery. IV ondansetron 4 mg was administered intra-operatively if nausea and vomiting was not corrected by vasopressor for treatment of hypotension or occurred unrelated to hypotension. At end of surgery, a linear ultrasound probe was placed in the anterior abdominal wall as the three layers are distinct here. After identifying the TAP which was between internal oblique and transverse abdominis muscle the probe was moved postero-laterally to lie along the mid-axillary line. Under all aseptic precautions the block was given with 22 G hypodermic needle attached to a 20 ml syringe containing the drug as per the group allocation. Then the drug was deposited in the fascial plane after aspiration, check aspiration was done every 5 ml to rule out intravascular injection.

The patient was observed for 15 minutes and then shifted to post-anaesthesia care unit. In one group, 10 ml of 0.25% of Bupivacaine injected on either side while other received 10 ml of 0.2% of Ropivacaine injected on either side.

The outcome variables compared in the two groups were time of first request for analgesia, pain score of the patients analyzed during rest and movement using visual analogue scale (0 – no pain and 10 – worst pain) and side effects during first 48 hours.

The presence and severity of pain, nausea, vomiting and any other side effects were assessed in the post anesthesia care unit (PACU) and at 2, 6, 12, 24, 48 hours postoperatively in the obstetric ward.

Data was analysed using SPSS version 21 software. Data with normal distribution between two groups was compared using independent samples t test while data which was not normally distributed was compared using Mann-Whitney test. Chi square test was used to compare categorical data between the two groups. Level of significance in the study was 0.05.

Results

Hundred patients were randomized to bupivacaine 0.25% (n=49) and ropivacaine 0.2% (n=51) groups. Demographics and baseline characteristics of patients have been described in Table 1. Patients in the two groups were comparable in age, weight, height and gravida status. The duration of surgery in both groups was similar (p=0.606).

The outcome variables have been described in Table 2. The time of full regression of block (p=0.731), time required for 1st analgesia (p=0.699) and total consumption of analgesia (p=0.833) were comparable in the two groups. The VAS score at rest and movement at multiple time intervals during follow-up period was similar in both groups.

Postoperative nausea and vomiting was noted in 5 patients in bupivacaine and 6 patients in ropivacaine group.

Table 1: Demographics and Baseline characteristics

	Bupivacaine (n=49)	Ropivacaine (n=51)	P value
Age (in years)	25.7±3.1	26.4±3.1	0.233
Weight (kg)	75.7±8.3	74±9.5	0.347
Height (cm)	157.9±2.3	158±2.7	0.748
Previous status			
G1	23 (46.9%)	26 (51%)	0.506
G2	22 (44.9%)	18 (35.3%)	
G3	4 (8.2%)	7 (13.7%)	
Duration of surgery (min)	44.7±5.7	45.3±5.9	0.606

Table 2: Outcome variables

	Bupivacaine (n=49)	Ropivacaine (N=51)	P value
Time of full regression of block (in min)	128.9±13.9	129.8±13	0.731
Time required for 1st analgesia (in min)	456±30.2	453.3±37.4	0.699
Total consumption of analgesia	406.1±42.9	404.4±38	0.833
VAS at rest (median)			
0 hrs	0 (0-0)	0 (0-0)	1
2 hrs	0 (0-0)	0 (0-0)	1
6 hrs	0 (0-0)	0 (0-0)	0.047
12 hrs	0 (0-2)	2 (0-2)	0.504
24 hrs	0 (0-2)	2 (0-2)	0.635
48 hrs	0 (0-0)	0 (0-0)	0.486
VAS at movement (median)			
0 hrs	0 (0-0)	0 (0-0)	1
2 hrs	0 (0-0)	0 (0-0)	1
6 hrs	0 (0-0)	0 (0-0)	0.29
12 hrs	2 (2-2)	0 (0-2)	0.144
24 hrs	2 (0-2)	0 (0-2)	0.823
48 hrs	2 (0-2)	0 (0-2)	0.647

Discussion

Rafi introduced the TAP block in 2001, while the USG guided approach was described by Hebbard et al in 2017 [6,7]. TAP block has been shown to benefit by providing good analgesia in the anterior abdominal wall. Owing to poor vascularity in TAP, the action of LA is prolonged and is devoid of major complications. Use of USG guided technique further reduces complications associated with blind approach [8]. This property has been used in post Caesarean section (CS) analgesia. Accordingly, 0.25% Bupivacaine [4] and 0.5% Ropivacaine [3] have been demonstrated effective post CS analgesia in TAP. A TAP block with lower concentration of 0.375% for analgesia post CS was demonstrated by Chansoria et al [9].

A number of studies have compared bupivacaine 0.25% and ropivacaine 0.5% in different types of abdominal surgeries [10-12]. In all these studies, 0.5% ropivacaine has been shown to provide longer duration of analgesia compared to 0.25% bupivacaine. In the present study, a lower concentration of ropivacaine (0.2%) has been used to compare the post CS analgesia with bupivacaine 0.25%. Such lower dose comparison of the ropivacaine has been done by Jalil et al in TAP block for postoperative analgesia after appendectomy, and they found comparable efficacy in the two groups [13]. However, head-to-head comparisons between these two drugs in post CS analgesia are lacking.

Bupivacaine being a potential cardiotoxic and CNS toxic agent, led to development of newer molecules like ropivacaine [5]. The present study demonstrated comparable efficacy in bupivacaine 0.25% and ropivacaine 0.2% in providing post-CS analgesia by TAP block. The adverse events occurrence was similar in the two groups. However, the inherent toxicity with ropivacaine is less and advocates its use over bupivacaine in TAP block.

In current study, the mean time for first analgesic request was 453.3±37.4 minutes in the ropivacaine group. This was lower compared to Chansoria et al [9] in the ropivacaine group (12.36±2.57 hours). Similarly, in study by Srivastava et al [4] the median time for request for analgesia was 12 hours in Bupivacaine group, which was higher than the current study. This difference can be explained as both these studies had a standard postoperative analgesic regimen on shifting to the recovery room.

Present study did not include any such regimen and the exact time to analgesia without any additional factors was observed in the present study. Mankikar et al [3] also did not give additional analgesic regimen in their study and found the mean time to first rescue analgesic as 9.53 hours in the group receiving ropivacaine 0.5%. Higher dose in their study may explain the slightly longer time than the present study.The present study also overcame the limitations of the previous studies, as the patients were observed for > 24 hours till 48 hours. Srivastava et al [4] and Chansoria et al [9] used blind procedures for giving TAP while Mankikar et al [3] practiced USG guided technique similar to that in the present study.

Conclusion

The analgesic efficacy and safety of bupivacaine 0.25% and ropivacaine 0.2% is similar in TAP block under ultrasound guidance as a part of a multimodal analgesia regimen for post caesarean delivery pain management.

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