

Ultrasound Guided Transversus Abdominis Plane Block with Ropivacaine Versus Bupivacaine for Post Operative Analgesia in Elective Lower Segment Caesarean Section: A Prospective, Double-Blind, Randomized, Comparative Study

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Abstract

Aim: To study ultrasound guided Transversus abdominis plane block with 0.25% ropivacaine versus 0.25% bupivacaine with 2mg dexamethasone as an adjuvant in both groups for post-operative analgesia in patients undergoing elective lower segment caesarean section deliveries.

Material and methods: This prospective, double-blind, randomized, comparative study was conducted in the Department of Anaesthesiology and critical care, Patna Medical College and Hospital, Patna, Bihar, India, for 1 year. 60 American Society of Anesthesiologist's (ASA) grade I and II patients, between 18-40 years of age posted for elective caesarean section were included in a prospective, randomized, double-blind, controlled clinical trial over a period of 1 year. Patients were randomized by computer generated random number to receive USG guided TAP block at the end of caesarean section with either Inj. bupivacaine 0.25% 15 ml + Inj. dexamethasone 2mg each side in group B (n = 25) or Inj. ropivacaine 0.25% 15 ml + Inj. dexamethasone 2mg each side in group R (n = 25).

Results: Mean age was 22.90 ± 3.78 years. Demographic profile, baseline pulse, mean arterial blood pressure and duration of surgery were comparable in both groups. Baseline pulse and blood pressure was considered at the end of surgery before performing the block and there was no significant difference between the two groups. The pulse rate and mean arterial blood pressure during study interval, was higher in Group B than Group R, though it was within normal physiological range for both the groups. There was significant difference at 2 & 4 h ($p < 0.05$). Time for rescue analgesia was earlier in Group B compared to Group R which was 6.7 h and 9.47 h respectively ($p = 0.00$).

Conclusion: This study concludes that 0.25% Ropivacaine + 2mg dexamethasone provided a longer duration of analgesia compared to 0.25% Bupivacaine+2mg dexamethasone when used in TAP block for postoperative analgesia in lower segment caesarean section deliveries.

Keywords: Ropivacaine, Bupivacaine, caesarean section

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Introduction

Caesarean section is the most widely performed obstetric procedure, with an increasing prevalence, 8.5 % (NFHS-3) to 17.2 % (NFHS-4). [1] Postoperative pain is one of the greatest concerns during and after abdominal surgery. [2] Inadequate postoperative pain relief adversely affects ambulation, breastfeeding and even maternal bonding but providing effective analgesia improves the outcomes in terms of breastfeeding, infant weight gain and ambulation. [3,4]

Opioids are the gold standard choice of analgesia in the postoperative period, but its use after caesarean section, is commonly associated with many undesirable side effects such as nausea, vomiting, sedation, urinary retention, respiratory depression and prolonged postoperative ileus.[5-7] To overcome opioid-related adverse effects the need arises for other modes of analgesia.

As part of multi-modal analgesia regimens, infiltration of local anaesthetic into the surgical site is commonly used.[8] Studies have indicated that wound infiltration with local anaesthetic for post-caesarean section analgesia was effective in reducing opioid consumption. However, the use of local anaesthetic wound infiltration for alleviating post-operative pain has been studied in past decades with conflicting reports and scholars hold distinctly different views towards this issue. Also, most published studies indicated there was not a significant improvement in reduced pain scores.[9-11]

Over the last decade Transversus abdominis Plane (TAP) block has gained popularity as an analgesic technique. Transversus abdominis plane block was formally documented by Rafi [12] in 2001. TAP block involves injection of local anaesthetic into the fascial plane between internal oblique and transversus abdominis

muscles, where the thoraco-lumbar nerves T6-L1 course innervating the anterior abdominal wall, with the help of ultrasound or anatomical landmark guidance. TAP block technique has been shown to be a safe and effective postoperative adjunct analgesia method in most of the lower abdominal surgeries.[13,14] Advantages of TAP block include the avoidance of neuraxial analgesic techniques and their associated risk, reduction in post-operative opioid consumption and also known to increase the patients' satisfaction. [6,7] Thus, we conducted a study to compare the analgesic efficacy of 15ml bupivacaine 0.25% +2mg dexamethasone versus 15ml ropivacaine 0.25%+2mg dexamethasone in transversus abdominis plane block in patients undergoing elective lower segment caesarean section under spinal anaesthesia, in terms of duration and quality of analgesia.

Material and methods

This prospective, double-blind, randomized, comparative study was conducted in the Department of Anaesthesiology and critical care, Patna Medical College and Hospital, Patna, Bihar, India, for 1 year.

Inclusion criteria

60 American Society of Anesthesiologist's (ASA) grade I and II patients, between 18-40 years of age posted for elective lower segment caesarean section were included in a prospective, randomized, double-blind, controlled clinical trial over a period of 1 year.

Exclusion criteria

Patient refusal, contraindications to spinal anaesthesia, local anaesthetic sensitivity, morbid obesity, known comorbidities (Pregnancy Induced Hypertension, Post-Partum haemorrhage, anaemia, Gestational

Diabetes Mellitus, hypothyroid), inadequate spinal anaesthesia, intraoperative hemodynamic instability and who required general anaesthesia.

Patients were randomized by computer generated random number to receive ultrasound guided TAP block with either Inj. bupivacaine 0.25% 15 ml + Inj. dexamethasone 2mg each side in group B (n = 30) or Inj. ropivacaine 0.25% 15 ml + Inj. dexamethasone 2mg each side in group R (n = 30). The patients and anaesthesiologist were blinded to the allotment. Drug was prepared by a nursing staff not involved in the study.

Following a comprehensive pre-anaesthetic evaluation, all the patients were explained about Visual Analogue Score (VAS) for pain in their own vernacular language and were electively fasted 8 hours pre-operatively.

In the operating room, standard monitoring, including electrocardiogram, non-invasive blood pressure, arterial oxygen saturation was used throughout and two wide bore venous access was secured. Patients were premedicated with intravenous ranitidine 50mg and intravenous ondansetron 4mg. Patients were preloaded with 10ml/ kg of Ringer Lactate. All patients received spinal anaesthesia with 0.5% hyperbaric bupivacaine 2.2 ml without any additive in sitting position without any table tilt. Assessment of block was done by pinprick. Surgery was started after block level of T6 was achieved. Patients were monitored intraoperatively. Hypotension was taken as fall in systolic blood pressure > 20% of baseline and was treated with incremental doses of Inj. mephenteramine 6 mg and bolus of 200 ml of Ringer Lactate. Bradycardia was taken as heart rate < 50 beats per minute and treated with Inj. atropine 0.6 mg. No analgesic or sedation was given to any patient intra operatively. At the completion of surgery patient received USG guided TAP block according to the allocated group. The

anaesthesiologist who observed the patients in PACU was blinded to the drug injected in TAP block.. Study interval was taken from the performance of TAP block till demand of rescue analgesia. Patient was monitored every 15 minutes for an hour, then hourly for 2 h in PACU, then after shifting to ward at 4, 8, 16, 24, 48 h postoperatively for pulse rate, blood pressure and, pain and complications if any. Pain was assessed according to Visual Analogue Score (0 = no pain and 10 = worst possible pain). Patient were given rescue analgesia in the form of inj. tramadol 2 mg/kg iv. at VAS score 4 (i.e. moderate pain). Recession of motor block of spinal anaesthesia was noted by Modified Bromage Scale. The duration of analgesia was considered to be from the time of TAP block injection to VAS score of 4. Patient's satisfaction with pain management on a scale of 0-10 at the time of discharge was enquired. Patient was also observed for any other postoperative complications like haematoma, flank fullness, swelling at the site of injection, etc.

Statistical analysis: Taking results of other similar studies performed elsewhere we presumed that the time to first requirement of rescue analgesia would be at least 60 min less in the Bupivacaine group when compared to Ropivacaine group. With SD of ± 2.5 a sample size of 35 cases was considered adequate for a study with 80% Power and 95% Confidence interval. Quantitative data is presented as mean \pm SD. For normally distributed data mean has been compared using unpaired *t*-test. For skewed data or scores Mann-Whitney test was applied. Categorical variables have been presented as number and percentages.

Chi-square test or Fisher's exact test has been applied for categorical data. Ordinal data has also been presented as number and percentage. Between two groups it has been compared using Mann Whitney test. All calculations are two sided and were

performed using SPSS version 20 (Statistical Packages for the Social Sciences, Chicago, IL). A *P* value of <0.05 has been considered statistically significant.

Results

In our study of 60 samples the demographic data were comparable in both the groups. Mean age was 22.90 ± 3.78 years. Demographic profile, baseline pulse, mean arterial blood pressure and duration of surgery were comparable in both groups (Table 1). Baseline pulse and blood pressure was considered at the end of surgery before performing the block and

there was no significant difference between the two groups. The pulse rate and mean arterial blood pressure during study interval (from performance of TAP block to demand of rescue analgesia) was higher in Group B than Group R, though it was within normal physiological range for both the groups.

There was significant difference in mean VAS score at 2 & 4 h postoperatively ($p < 0.05$). Time for rescue analgesia was earlier in Group B compared to Group R which was 6.7 h and 9.47 h respectively ($p = 0.00$).

Table 1: Demographic profile of the patients

Variables	Group B (n=30)	Group R (n=30)	P value
Age (Years)	22.90 ± 3.78	4.49 ± 3.78	0.321
Weight (KG)	67 ± 5	68 ± 4	0.20
Height (cm)	153 ± 3	153 ± 2	0.711
Baseline Pulse (Per Min)	87.33 ± 10.56	85 ± 10.87	0.632
Baseline Mean Arterial Blood Pressure (mmHg)	90.03 ± 5.33	89.51 ± 9.27	0.481
Duration of Surgery (min)	49.6 ± 4.33	48 ± 5.82	0.220

Table 2: Mean Visual Analog Score (VAS)

Time	Ropivacaine	Bupivacaine	P value
Baseline	0	0	0.291
15 min	0.2	0.2	0.118
30 min	0	0.4	0.721
45 min	0.3	0.4	0.284
1 Hour	0.3	0.5	0.812
2 Hour	0.4	1	0.001*
4 Hour	1.3	2.3	0.001*
8 Hour	3.8	4.4	0.452
16 Hour	5.3	5.5	0.212
24 Hour	4.4	4.9	0.112

Table 3: Patient satisfaction

Patient satisfaction	Group B (n=30)	Group R (n=30)	P value
	Number (%age)	Number (%age)	0.341
Excellent	15 (50%)	17 (56.6%)	
Good	10 (33.3%)	7 (23.3)	
Satisfactory	5 (16.6%)	6 (20%)	
Unsatisfactory	Nil	Nil	

Discussion

Pain after caesarean delivery has certain peculiarities. Surgery related pain, frequently described as 'aching' in nature, is generally limited near the surgical site. The postoperative analgesia is beneficial because it is proven to cause decrease in the postoperative stress response, morbidity, and also helps in improved surgical outcome. To achieve these goals, a multimodal analgesic regimen is most likely used. However, the optimal components of a multimodal analgesic regimen continue to evolve. [15]

Multimodal analgesia is an approach used to treat pain through several mechanisms via multiple sites of the pain pathway. By directly blocking the afferent nerve supply of the abdominal wall we are capable of providing significant postoperative analgesia in patients undergoing abdominal surgeries, with techniques such as abdominal field blocks, ilioinguinal, and hypogastric nerve blocks. TAP blocks are one such safe procedures for postoperative multimodal analgesia. Since the transversus abdominus plane has relatively less blood vessels, the risk of vessel puncture, intravascular injection and systemic toxicity of local anaesthetics, which are often associated with other peripheral nerve block procedures are reduced. A technical advantage is provided by the simplicity of the procedure for clinical use. It can be best achieved with the combination of long-acting local anaesthetics with an adjuvant. [16] TAP block has been used for various abdominal procedures other than caesarean section

such as large bowel resection, open/laparoscopic appendectomy, total abdominal hysterectomy, laparoscopic cholecystectomy, open prostatectomy, abdominoplasty with or without flank liposuction, inguinal hernia and iliac crest bone graft. [17-24]

A meta-analysis conducted by R Champaneria et al [25] tested the effectiveness of TAP block for acute pain relief after caesarean section. It compared 20 studies and concluded that TAP blocks significantly reduced pain at rest when compared with placebo or no TAP blocks ($p=0.008$) and intrathecal morphine ($p<0.0001$). Both these comparisons showed the greatest improvement with pain on movement, ($p=0.005$ and $p<0.00001$). Morphine consumption was significantly reduced with TAP blocks when compared to placebo or no TAP blocks ($p<0.00001$). In a study conducted by A.Z. El Abdein Mohamed, [26] bilateral 20 ml of ropivacaine 0.2% when used in TAP block provided postoperative analgesia similar to bilateral 20 ml of ropivacaine 0.5% in TAP block after caesarean delivery performed with general anaesthesia. In our study we used 0.25% ropivacaine and 0.25% bupivacaine with 2mg dexamethasone as an adjuvant.

Sirvasta et al.n [27] conducted a randomized double-blind study on 62 pregnant women scheduled for caesarean delivery to assess the role of TAP block as a component of multimodal postoperative analgesia. They found that TAP block significantly decreased pain score at all study times during rest and movement and also decreased parturients consumption of

tramadol through patient-controlled analgesia. In our study, TAP block provided good analgesia and reduced requirements for intravenous tramadol postoperatively. McDonnell et al. [28] in their study evaluated the effectiveness of TAP block with ropivacaine for postoperative analgesia in caesarean delivery performed under spinal anaesthesia, and they found that TAP block significantly decreased the pain score and 48 h morphine consumption. In our study the overall intravenous analgesic requirement was reduced and patient had reduced pain scores 24hrs post-operatively.

Conclusion

This study concludes that 0.25% Ropivacaine along with 2 mg dexamethasone provided a longer duration of analgesia compared to 0.25% Bupivacaine with dexamethasone when used in TAP block for postoperative analgesia in lower segment caesarean section deliveries.

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