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Original Research Article

Randomized Control Study to Compare the Efficacy of Ultrasound-Guided Bilateral Posterior Transversus Abdominis Plane Block (US-BPTAB) versus Ultrasound-Guided Bilateral Rectus Sheath Block (US-BRSB) in Caesarean Section for Post-Operative Analgesia

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Conflict of interest: Nil

Abstract

Background: In this study, the analgesic effectiveness of bilateral ultrasound-guided posterior transversus abdominis plane block (US-BPTAB) and bilateral ultrasound-guided rectus sheath block (US-BRSB) following caesarean delivery was examined.

Aims and objective: The purpose of the current study was to assess post-operative pain using the Visual Analogue Scale as a measure of pain intensity (VAS). Duration of analgesia, total requirement of analgesic drug in first 24 hours, time for first rescue analgesia and patient's satisfaction.

Material and Methods: The posterior TAP block or Rectus sheath block was randomly assigned to 30 moms scheduled for caesarean sections under spinal anaesthesia. At the conclusion of surgery, the US-BPTAB group and the US-BRSB group each received a 20 mL injection of 0.25% ropivacaine into the Rectus sheath and posterior transversus abdominis plane under ultrasound guidance. The postoperative pain intensity in the first 24 hours was the main result. The duration of analgesia attained by each block, the total amount of tramadol consumed, and patient satisfaction were secondary outcomes.

Results: Postoperatively at all time points, the VAS score in the PTAB group was significantly lower (P 0.0001). When compared to the RS group, the PTAB group's 24-hour tramadol intake was significantly lower (91.43 vs. 145.71 vs. 61.08 mg, P 0.0001). When comparing the PTAB group to the RS group, the time for the first rescue analgesia was substantially longer (787.14±377.87 minutes vs. 445.71±264.44 minutes, $p<0.0001$).

Conclusion: Posterior TAP block is more effective at relieving pain than the Rectus sheath block, has a longer duration of analgesic action, extends the time before the need for analgesia, is linked

to lower tramadol consumption, and can be used in multimodal analgesia and opioid-sparing regimens following caesarean delivery.

Keywords: Caesarean Section, Post-Operative Analgesia, Posterior Transversus Abdominis Plane Block, Rectus Sheath Block, Ropivacaine.

Introduction

Caesarean section is one of the most commonly performed surgical procedure in the world. It is done as lower transverse or Pfannenstiel incision on the skin below the umbilicus to ease the delivery of the baby under spinal anaesthesia [1].

Technically simple to conduct, spinal anaesthesia offers quick and effective anaesthesia. There are also no risks associated with unsuccessful intubation or aspiration of gastric contents, and no need to take any depressant medications, which are additional benefits. Nevertheless, despite these advantages, spinal anaesthesia does not sufficiently relieve postoperative pain. Early ambulation, nursing, mother attachment, and newborn weight gain can all suffer from insufficient pain management [2,3]. It might be difficult to provide postoperative pain management after an elective caesarean section since it must satisfy the mother without endangering the baby.

Peripheral nerve blocks are carried out as a multimodal analgesic to prevent NSAID and opioid side effects, as several research have emphasised. Ultrasound guided bilateral Posterior transversus abdominis plane block and ultrasound guided bilateral Rectus sheath block escapes the risk of neuraxial and opioid complications. They are commonly used due to its easiness and presence of ultrasound guidance [4,5]. After spreading the local anaesthetic in the neuro-fascial plane between the internal oblique and transversus abdominis muscle, the posterior transversus abdominis plane block, a popular analgesia technique for mothers having caesarean sections, blocks the anterior rami of the spinal nerves of the abdominal anterior wall, relieving the pain of the procedure.

Rectus sheath block provides abdominal wall muscle relaxation and analgesia by blocking terminal branches of thoracolumbar nerves within the substance of the rectus abdominis muscle. This procedure is a useful part of a multimodal regimen for pain relief following various types of operations, including caesarean section [6].

After an elective caesarean delivery, we predicted that bilateral Posterior transversus abdominis plane block would relieve pain more quickly and effectively than Rectus sheath block, and that it might be utilised as a component of a multimodal opioid-sparing analgesia approach. This study compared the analgesic effectiveness of bilateral posterior transversus abdominis plane block with bilateral rectus sheath block following elective caesarean surgery under spinal anaesthesia. The major research objective was the degree of postoperative pain in the first 24 hours, while the secondary outcomes were the length of time each block of analgesia lasted, the total amount of analgesic medication used in the first 24 hours, and the time taken for the first rescue analgesic.

Material and Methods

This prospective randomized interventional study was conducted on patients posted for Caesarean section at a tertiary care teaching hospital in India, after obtaining ethical clearance. The study period was 7 months from 1-02-2022 till 30-08-2022. Patients who refused to give consent, had allergies to or sensitivities to local anaesthetic agents, had

bleeding disorders or were taking anticoagulants, had an American Society of Anaesthesiologists (ASA) physical status >II, had a neurological deficit, had a psychiatric condition, or had an infection at the injection site were all excluded. For this study, patients between the ages of 18 and 40 with an ASA physical status of II were enrolled. A signed informed permission was obtained from each patient after verifying the results of all basic blood tests. Using a computer-based random number generator, the participants were divided into two groups of 15 each.

Prior to the scheduled operation day, all patients were fasted for the previous night. All procedures were performed while sedated with spinal anaesthesia. All patients received 15 ml per kilogramme of Ringer's Lactate solution prior to spinal anaesthesia when they arrived in the operating room and after the implantation of an 18 G venous cannula. The baseline values were recorded while standard monitors like electrocardiography (ECG), non-invasive blood pressure (NIBP) monitoring, and pulse oximetry were attached. In the patient's seated position, a conventional 25 G Quincke's spinal needle was used to do a lumbar puncture at the L3-L4 area. A single intrathecal dosage of the medication 0.5% hyperbaric bupivacaine totalling 2.2 ml was given to each patient. After positioning each patient roughly in the surgical position, they each received 5 L/min of oxygen through a face mask for the duration of the procedure.

By using the sterile pin prick method in the midaxillary line on both sides, sensory block was evaluated. Following the evaluation of the sensory block, the motor block was evaluated using a modified Bromage scale. The maximum level of sensory block at the dermatomal level and the lengths of time it took for both sensory and motor block to recover were noted.

After the procedure, a linear 6-13 MHz ultrasound transducer and a portable ultrasound device from SonoSite were used to execute a bilateral Posterior transversus abdominis plane block or bilateral rectus sheath block under strict sterile conditions. To get better exposure, the patient in the PTAB group was rotated to a semi-lateral position. The ultrasonic probe was then positioned posterior to the most posterior limit of the TAP between the internal oblique and axillary lines. From medial (anterior) to lateral, a 22-gauge spinal needle was inserted (posterior). Hydro-dissection by normal saline was used to identify the ideal injection site. The posterior junction of the transverse abdominal plane and the anterolateral border of the quadratus lumborum muscle received an injection of 20 ml of 0.25% ropivacaine following negative aspiration. The local anaesthetic spread beneath the fascia, which verified the injection's success. Bilateral execution of this operation was used.

In the RS group, an ultrasound probe was placed in the midline, above the umbilicus, in a transverse plane. It was determined that the only muscle in the midline was the rectus abdominis muscle. From medial (anterior) to lateral, a 22-gauge spinal needle was inserted (posterior). Using hydro-dissection with normal saline, the ideal injection location was identified. In a supine position, 20mL of ropivacaine 0.25% was injected on either side in the fascial plane between the rectus muscle and posterior rectus sheath.

In both groups, postoperative pain was measured using the visual analogue scale. Vital indicators(heart rate, blood pressure, respiratory rate, and SpO2) as well as VAS scores at 2, 4, 6, 8, 10, 12and 24 hours after surgery were recorded. After the procedure was finished, the length of postoperative analgesia was considered up until the initial need for analgesia. There were complications with the posterior TAP block and RS block.

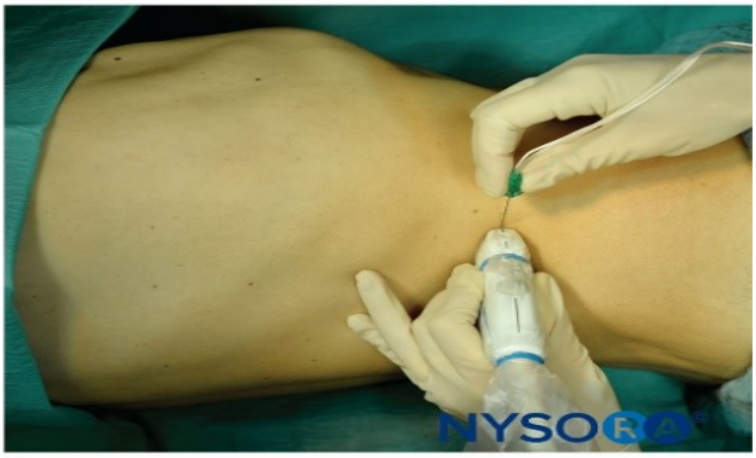

Figure 1: Ultrasound Guided Posterior Tap Block Technique

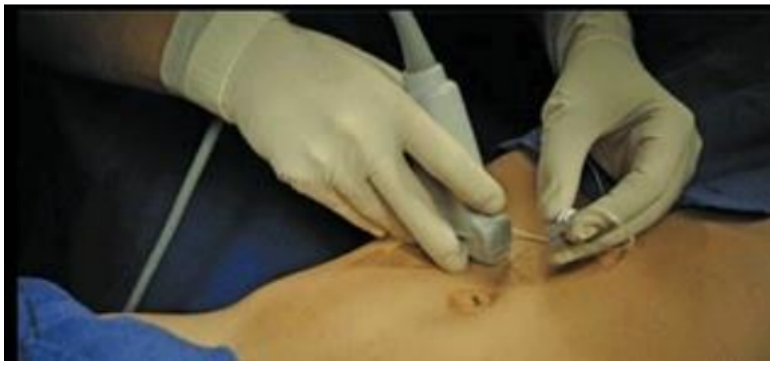

Figure 2: Ultrasound Guided Rectus Sheath Block Technique

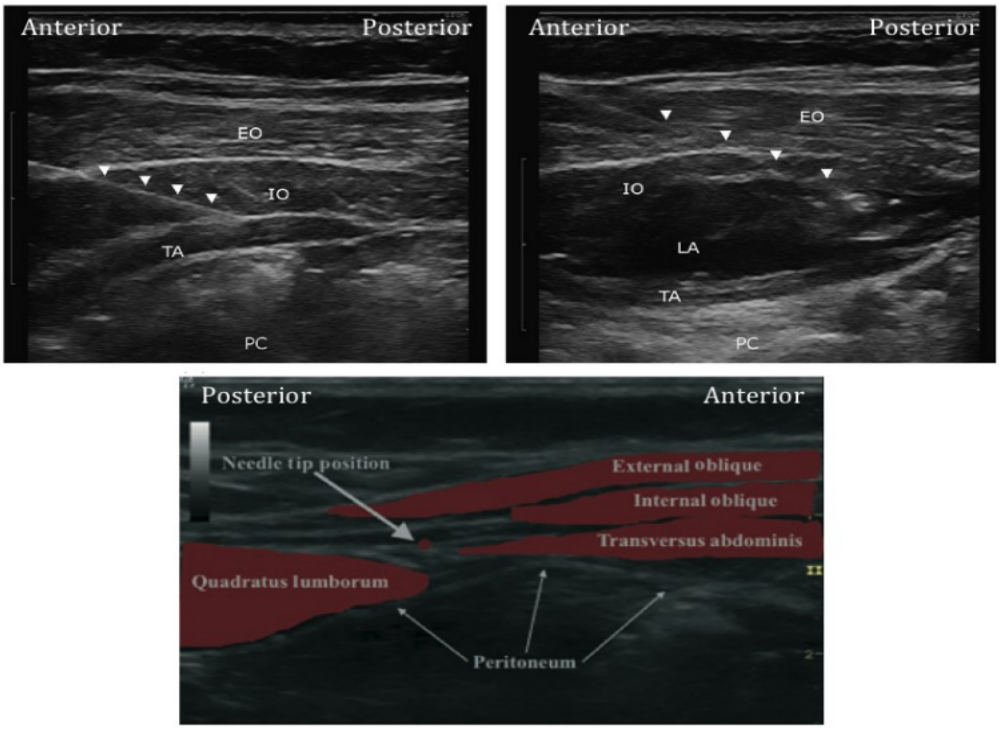

Figure 3: Ultrasound Guided Posterior Tap Block

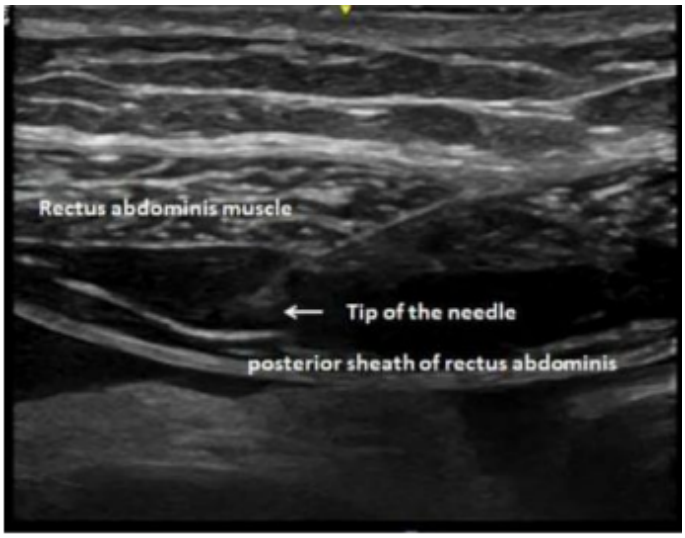

Figure 4: Ultrasound Guided Rectus Sheath Block

Statistical Analysis

When primary comparison is between means of two samples in experimental design, the statistical formula for sample size calculation was:

$$N > \frac{2\,(Z\alpha + Z\beta)^2 \times SD^2}{d^2};$$

Alpha (α) Error - 0.05 [Zα = 1.96]

Beta (β) Error - 0.20 [Zβ =0.842], (power of the study 90 %)

S.D. = Estimated standard deviation (S.D.) of pain score (vas score) = 2

d = Estimated difference of means of pain score (vas score) in two groups = 2

Standardised difference=difference between two mean in two treatment group divided by population standard deviation= $\frac{4-2}{2} = 1$

According to this formula-based nomogram, sample size for proposed study was:

N = 15 patients were taken in each group.

PTAB group (n=15) patient received USG guided Posterior TAP block with injection ropivacaine.

RS group (n=15) patient received USG guided RS block with injection ropivacaine.

Both the groups were given injection tramadol on demand as per VAS score for post-operative analgesia as per institute protocol for routine surgery.

In our study sample size was 15 in each group and equal in both groups so we used unpaired student t-test for analysis. Using the unpaired student t-test, demographic data were analysed. The unpaired t-test was used to

analyse the measurements of pain scores at each time interval. For homogeneous variables like the length of analgesia and the time to first tramadol demand (as determined by the Shapiro-Wilk normality test), the t test was applied. Using a student t-test, vitals were also analysed. Statistical significance was defined as a difference with a significant level (p-value 0.05).

Thirty ASA II patients who had caesarean sections participated in this prospective study. They were split up into two groups at random. Patients in the PTAB group underwent bilateral, 20 ml of ropivacaine (0.25%) guided posterior TAP block surgery. RS group: Patients underwent a 20 ml, bilateral, USG-guided RS block using ropivacaine (0.25%).

Results

Table 1: Demographic Data

Group	Ptab	Rs	P Value*
AGE (YEARS)*	36.63±8.80	34.47±7.74	0.1587
WEIGHT(KG)*	64.2±9.27	65.06±9.38	0.702
HEIGHT(CM)*	161.91±5.27	160.6±6.01	0.334

(*using unpaired student's t-test); P > 0.05, Values are mean ± SD and numbers

Both groups of patients ranged in age from 18 to 40 years old. Age, weight, and height were similar across the two groups. When comparing demographic information between the two groups, no real difference was seen.

Table 2: Vas Score in the Study and Control Groups

Group	2hr	4hr	6hr	8hr	10hr	12hr	24hr
PTAB	0.49±0.61	0.91±0.82	1.66±1.00	1.94±1.30	1.83±0.89	1.97±0.86	1.31±0.58
RS	1.14±0.81	1.66±1.11	3.11±1.11	3.20±1.16	2.83±0.86	2.71±0.67	2.31±0.63
P value*	<0.0001	<0.002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

(*using unpaired student's t-test); P* <0.05, Significant difference in both group

VAS score was significantly higher in RS group as compared to the PTAB group at all the time.

Table 3: Duration of Analgesia

Groups	Time for first dose of rescue analgesia in minute
PTAB	787.14±377.87 minutes
RS	445.71±264.44 minutes
P value*	< 0.0001 (Extremely statistically significant difference)

(*using unpaired student's t-test); P*<0.0001 highly significant difference

Duration of analgesia in PTAB group was at 787.14±377.87 minutes and in RS group was 445.71±264.44 minutes which was statistically highly significant.

Table 4: Average Tramadol Requirement

Group	TRAMADOL dose in mg
PTAB	91.43±61.22mg
RS	145.71±61.08 mg
P value*	< 0.0001 (Extremely statistically significant difference)

(*using unpaired student's t-test); P* < 0.0001 statistically very highly significant

Total dose of TRAMADOL consumption in PTAB group was 91.43±61.22 mg and in RS group it was 145.71±61.08 mg**,** which showed that TRAMADOL consumption was significantly decreased in PTAB group.

Table 5: Complications of PTAB and RS Block

Complication	PTAB group n=15	RS group n=15	P Value
Failure	0	0	0
Local anaesthetic toxicity	0	0	0
Intra peritoneal injection	0	0	0
Bowel injury	0	0	0
Hepatic injury	0	0	0

There were no any complications related to the USG guided Posterior TAP block & rectus sheath block technique in any patient.

Discussion

Unwanted physiological and psychological effects of poorly managed post-operative pain include morbidity, a slower rate of recovery, and patient discontent. After a caesarean section, moderate or severe pain may lengthen the hospital stay, result in an unanticipated readmission, cause a delay in getting back to routine activities, and increase related costs [7,8].

Postoperative pain management employs a variety of techniques and drugs. Multimodal pain management utilising NSAIDs, opioids, and local infiltration of local anaesthetic is the most typical method for treating post-operative pain.

Opioids are useful for treating postoperative pain, but they also have side effects like drowsiness, respiratory depression, nausea, vomiting, and impaired gastrointestinal motility that add to the patient's morbidity. Deep muscle pain is not relieved by local infiltration, and NSAIDs can affect hemostasis and cause kidney and gastrointestinal bleeding.

When a patient is undergoing an operation, an ultrasound-guided posterior TAP block and rectus sheath block are employed as a part of a multimodal analgesia. The current study is one of the few that compares the safety and efficacy of posterior transversus abdominis plane block versus rectus sheath for the treatment of post-caesarean pain. According to the findings, posterior TAP block is linked to a significant pain decrease without an increase in postoperative nausea or vomiting. In any of the groups under study, there was no evidence of hemodynamic instability [9-13].

Ripollés *et al* described TAP block for post-operative pain relief following abdominal surgeries. In addition, the current work revealed that, postoperative analgesic was superior with posterior TAP block, and lasts more than it (as demonstrated by the time for first analgesic request). Carney *et al* [11] reported that TAP block was effective in female undergoing total abdominal hysterectomy; where visual analogue scores were lower in TAP block group in most points of time. Faiz and colleagues showed ultrasound-guided posterior TAP block to be more effective for pain relief in elective caesarean section.

In our study amount of tramadol requirement was significantly lower in patients receiving posterior TAP block as compared to Rectus sheath block. Our study showed reduced side effects in the form of nausea and vomiting with additional analgesic.

One study from India found that the first 24 hours following an anterior TAP block with ropivacaine required much less tramadol than the first 24 hours following a control procedure. 14 In our study, patients undergoing caesarean sections also experienced considerably longer times for rescue analgesia following posterior TAP block with ropivacaine.

Posterior TAP block used in our practice leads to better VAS score and longer duration of analgesia despite open abdominal surgery. PTAB group required less tramadol mean dose at 24 hours than RS group. Posterior TAP block is highly efficacious in providing post-operative analgesia with lower VAS score which has been confirmed by our as well as various studies.

Conclusion

The Posterior TAP block offers more effective pain relief than the Rectus sheath block, has a longer duration of analgesic action, extends the time until the first analgesic requirement, is linked to lower tramadol consumption, and can be used in multimodal analgesia and opioid-sparing regimens following caesarean delivery. Both blocks are simple to execute, rapid, safe, precise, and have a low risk of problems.

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