RESEARCH

EFFICACY OF 0.25% ROPIVACAINE VS 0.25% BUPIVACAINE IN TRANSVERSUS ABDOMINIS PLANE BLOCK FOR ANALGESIA POST CAESAREAN SECTION

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Abstract

Background: The Transversus Abdominis Plane Block (TAPB) is a method of regional anaesthesia. After lower abdominal surgery, it produces analgesia, especially when parietal wall discomfort constitutes a significant portion of pain. By depositing local anaesthetic over the transversus abdominis muscle, it permits sensory blocking of the lower abdominal wall's skin and muscles. In a double-blinded, prospective, randomized controlled clinical study, we assessed the effectiveness of TAPB with bupivacaine and ropivacaine for postoperative analgesia in lower segment caesarean section. **Materials and Methods:** TAP Block was randomly administered to 60 parturients having elective or emergency LSCS and divided into two groups. Group B- TAP Block with 0.25percent Bupivacaine 20 ml each side (n=30). Group R- TAP Block with 0.25percent Ropivacaine 20 ml each side (n=30). At the conclusion of the procedure, TAP Block was done using 20 ml of either 0.25 percent ropivacaine or 0.25 percent bupivacaine on each side. A blinded observer evaluated each patient postoperatively at 30 minutes, 2, 4, 6, 12 and 24 hours after surgery. **Result:** Both clinically and statistically, the outcomes in the two groups were comparable. The mean duration of analgesia was 1419.93 minutes in Group B and 1343.81 minutes in Group R, both of which had statistically significant standard deviations of ± 126.9 minutes and ± 32.18 minutes, respectively. **Conclusion:** When administered in a TAP Block to provide postoperative analgesia following lower segment caesarean section surgery, 0.25 percent Bupivacaine provided a comparatively longer duration of analgesia, lesser VAS Scores than Ropivacaine. Both medications have a very good safety profile. Both medications have exceptional therapeutic value in terms of dependability & potent analgesia.

INTRODUCTION

The parietal peritoneum, as well as the skin and muscles of the anterior abdominal wall, get analgesia via a regional anaesthetic procedure known as the transversus abdominis plane (TAP) block upto T6 level.[1] Since it was initially described few years ago, it has undergone a number of changes, showing its potential utility for an increasing variety of surgical procedures.[2] Despite having a low risk of problems and a success rate when employed with modern methods, TAP blocks remain underutilized.[3,4] Although the block appears straightforward in principle, it has taken a while for it to become used in practical settings. This can be because anesthesiologists don't have enough resources to fully understand the transversus abdominis plane. As a result, we provide a brief history of the TAP block, explain relevant anatomy, discuss current practices, discuss pharmacologic issues, and review the available data on its therapeutic usefulness. Effectiveness of Bupivacaine and Ropivacaine were compared.

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MATERIALS AND METHODS

Method of Data Collection
The study included 60 parturient after receiving clearance from the institutional ethics committee and signed informed consent from the patients.

Mode of Selection of Cases
Using a randomized computer sampling process, 60 parturients were divided into two groups of 30 each.

Group B
TAP Block with 0.25percent Bupivacaine 20 ml each side (n=30)

Group R
TAP Block with 0.25percent Ropivacaine 20 ml each side (n=30)

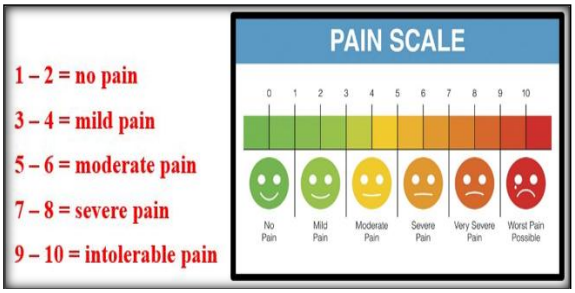
Inclusion Criteria
1. Pregnant women undergoing elective and emergency caesarean sections under spinal anaesthesia.
2. Parturient of ASA grade II

Exclusion Criteria
1. The patient's denial
2. ASA grade III or more parturients.
3. Infection at the site of block.
4. Coagulation problems or bleeding problems.
5. Patients who were switched to general anaesthesia after a subarachnoid block.

Intraoperative
Using a typical midline technique, all the patients of both the groups were given subarachnoid block using a 25 G Quincke's needle at the L 3-4/L2-3 intervertebral space with 10 mg of 0.5 percent hyperbaric bupivacaine. They received oxygen supplementation at a rate of 4L/min using a face mask both intra-operatively and during their stay in the post-anesthesia care unit.[5,6] All patients were monitored with ECG, pulse oximeter, non-invasive blood pressure monitors. Surgery was initiated after T4 to T6 sensory blockage to pinprick sensation was achieved.[7] To address hypotension, IV fluid boluses and vasopressors like ephedrine were given as and when required. If nausea and vomiting were not relieved by a vasopressor for the treatment of hypotension or were unrelated to hypotension, IV ondansetron 4 mg was given intra-operatively.[8,9] Following birth, all patients received a 10 IU oxytocin IV infusion.
Petit's triangle was identified on both sides above the iliac crest between the fibres of the external oblique and latissimus dorsi muscles after surgery.[10] The block was administered using a 22 G hypodermic needle linked to a 20 ml syringe with the medication according to the group allocation. The needle was inserted perpendicular to the skin and progressed until it made two "POPS" or "give way" sounds.[11] Following aspiration, the medication was deposited in the fascial plane, with a check aspiration every 2 ml to rule against intravascular injection. After 15 minutes of observation, the patient was transferred to the post-anaesthesia care unit. Group A received 20 ml of 0.25 percent Bupivacaine injected on either side (for a total of 40 ml) while Group B received 20 ml of 0.25 percent Ropivacaine injected on either side (for a total of 40 ml).

Postoperative
The presence and intensity of pain, nausea, vomiting, and any other negative symptoms were assessed in both groups of patients. For 30 minutes in the PACU and again at 2, 4, 6, 12, and 24 hours following surgery, these tests were performed. All patients were asked to rate their level of pain and nausea at each interval. A visual analogue scale (VAS 0 = no pain, 10 = the most agonizing pain imaginable) was used to measure the intensity of the discomfort. A rescue analgesic, IV tramadol 2 mg/kg, was administered for a visual analogue scale (VAS) of 4 or above.
The first onset and the first request for analgesic requirements were both noted throughout the first 24 hours. Antiemetics were administered to any patient who reported nausea or vomiting. Any indications of local site infection, hematoma development, local anaesthetic toxicity due to intravascular injection of anaesthetic, including dizziness, tinnitus, perioral numbness and tingling, lethargy, seizures, and indications of cardiac toxicity such as atrioventricular conduction block, arrhythmias, myocardial depression, and cardiac arrest (like atrioventricular conduction block, arrhythmia) were assessed.

Visual Analogue Scale
The Scale consists of a 10cm or 100-millimetre line with labels "no pain" at one end and "the greatest agony imaginable" or "pain as awful as can be" at the other. The patient simply uses a slide-rule-like gadget with the line on the patient's side to indicate pain severity. In clinical practice, the VAS is the most frequent tool for assessing pain and pain alleviation.



RESULTS

The study involved 60 patients who were split into two groups at random. Patients in group B received a 0.25 percent Bupivacaine TAP block, whereas those in group R received a 0.25 percent Ropivacaine TAP block for postoperative analgesia.

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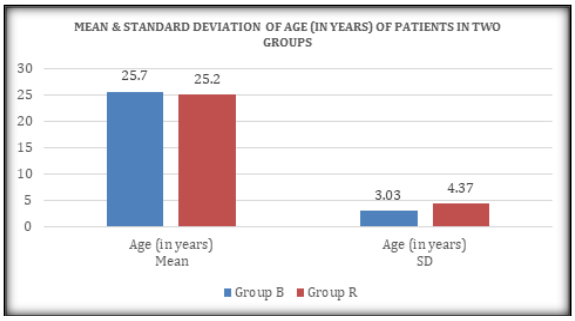

Figure 1: Mean & Standard Deviation of age (in years) of patients in two groups.

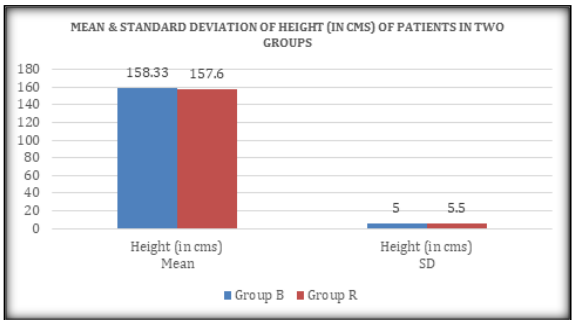

Figure 2: Mean & Standard Deviation of height (cms) of patients in two groups.

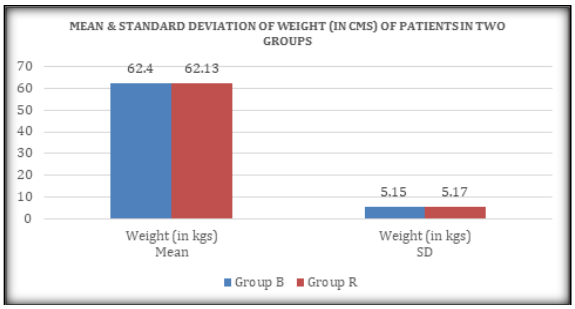

Figure 3: Mean & Standard Deviation of weight (kgs) of patients in two groups.

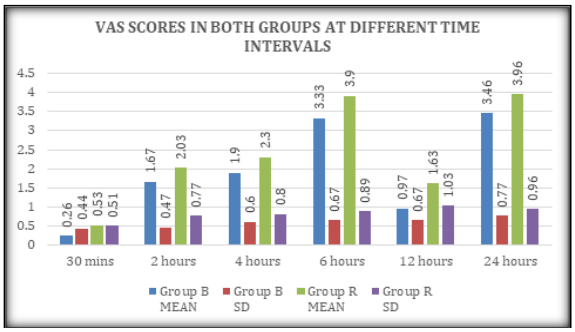

Figure 4: Mean VAS scores in both groups.

Demographic Profile

In Group B, the mean age (mean S.D.) was 25.7 ±3.03 years, but in Group R, it was 25.2± 4.373 years. Age distribution between the groups was same (p = 0.60). Group B's average height was 158.33 cm, whereas group R's was 157.60 cm ±5.506 cm. The groups were of comparable height. (p=0.591). The mean weights for Groups B and R were 62.40 ±5.15 kilograms and 62.13 ±5.17 kilograms, respectively, and were not statistically significant (p=0.842). As a result, the demographic traits of both groups were comparable.

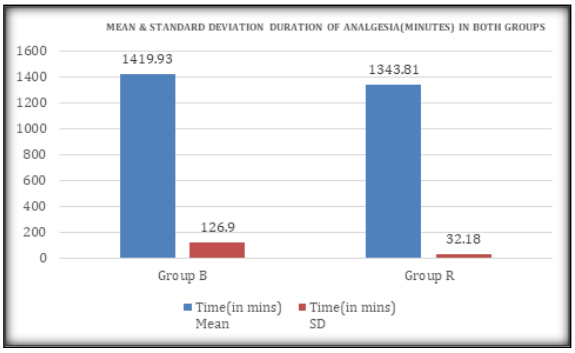

Figure 5: Mean & Standard Deviation of duration of analgesia(minutes) in both groups

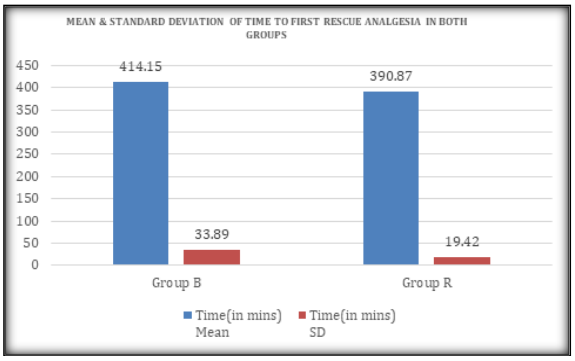

Figure 6: Mean & Standard Deviation of time to first rescue analgesia in both groups.

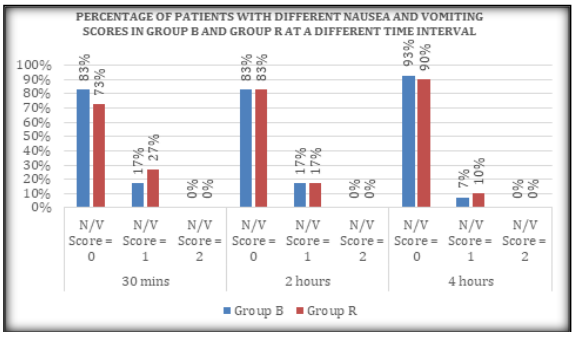

Figure 7.1: Percentage of Patients with Different Nausea and Vomiting Scores in Group B And Group R At a Different Time Interval.

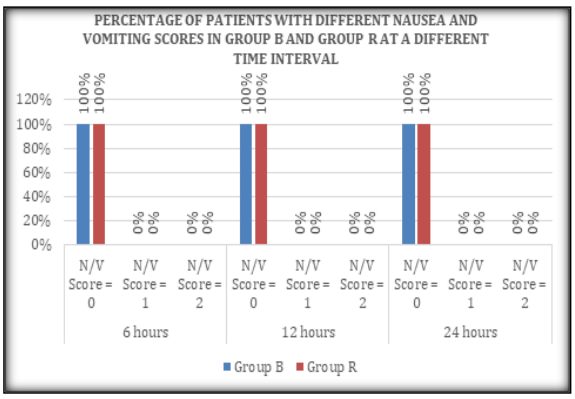

Figure 7.2: Percentage of patients with different nausea and vomiting scores in Group B and Group R at a different time interval.

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Table 1: Mean & SD of Age in years, Height in cm, Weight in kg of patients in two groups

Group	Age in years (Mean ± S.D.)	Height in cm (Mean ± S.D.)	Weight in kg (Mean ± S.D.)
Group B	25.7 ± 3.03	158.33 ± 5.00	62.40 ± 5.15
Group R	25.2 ± 4.37	157.60 ± 5.50	62.13 ± 5.17
P value	0.60	0.59	0.84

Postoperative Pain

At 30 minutes, 2, 4, 6, 12, and 24 hours, group B's mean VAS score was 0.26±0.44, 1.67±0.47, 1.9±0.6, 3.33±0.67, 0.97±0.67, and 3.46±0.77, respectively.

At 30 minutes, 2, 4, 6, 12, and 24 hours, group R's mean VAS score was 0.53 ±0.51, 2.03±0.77, 2.3±0.8, 3.9±0.89, 1.63±1.03, and 3.96±0.96, respectively.

At all-time intervals, group B had a smaller mean VAS score difference, and it was statistically significant. ($p<0.05$)

Six patients in the Bupivacaine group and eight patients in the Ropivacaine group required rescue analgesia during the first 12 hours.

Table 2: VAS Scores in Both Groups at Different Time Intervals

VAS (Mean ± S.D.)	30 mins	2 hrs	4 hrs	6 hrs	12 hrs	24 hrs
Group B	0.26±0.44	1.67±0.47	1.9±0.6	3.33±0.67	0.97±0.67	3.46±0.77
Group R	0.53±0.51	2.03±0.77	2.3±0.8	3.9±0.89	1.63±1.03	3.96±0.96
P value	0.03	0.03	0.03	0.007	0.004	0.03

Duration of Analgesia:

The mean duration of analgesia in Group B was 1419.93 minutes, with a standard deviation of 126.9 minutes, and in Group R it was 1343.81 minutes, with a standard deviation of 32.18 minutes. These differences were statistically significant. ($P<0.05$).

Table 3: Mean & Standard Deviation of Duration of Analgesia (Minutes) in Both Groups

Group	(Mean ± S.D.) (in minutes)
Group B	1419.93 ± 126.9
Group R	1343.81 ± 32.18
P value	0.002

Mean Time to First Rescue Analgesia

The mean time to first rescue analgesia in Group B was 414.15 ± 33.89 min and in Group R it was 390.87 ± 19.42 min which was significant statistically. ($p<0.05$).

Table 4: Mean & Standard Deviation of Time to First Rescue Analgesia in Both Groups

Group	(Mean ± S.D.) (in minutes)
Group B	414.15 ± 33.89
Group R	390.87 ± 19.42
P value	0.002

Postoperative Nausea and Vomiting

In Group B, nausea was detected in 17%, 7%, and 7% of patients after 30 minutes, 2 hours, and 4 hours, respectively, while in Group R, it was discovered in 27%, 17%, and 10% of patients after 30 minutes, 2 hours, and 4 hours. At 6, 12, and 24 hours, there was no nausea in either group of patients. At all-time intervals, the incidence of nausea between the two groups was found to be equal ($p>0.05$). In 24 hours, none of the patients had a history of vomiting. There was no need for rescue antiemetics in any group.

Table 5: Percentage of Patients with Postoperative Nausea and Vomiting

N/V Score	30 mins		2 hours		4hours		6hours		12 hours		24 hours	
	Group B	Group R	Group B	Group R	Group B	Group R	Group B	Group R	Group B	Group R	Group B	Group R
0	83%	73%	83%	83%	93%	90%	100%	100%	100%	100%	100%	100%
1	17%	27%	17%	17%	7%	10%	0%	0%	0%	0%	0%	0%
2	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
P value		0.347		1.0				0.640				

DISCUSSION

A reduction in the postoperative stress response, a decrease in postoperative morbidity, and in certain cases, a better surgical result are only a few of the benefits of postoperative analgesia. Effective pain management also speeds up recovery following surgery and promotes rehabilitation. Several modalities have been used to alleviate pain after surgery – like nonsteroidal anti-inflammatory drugs

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(NSAIDs) (including parecoxib/valdecoxib [12], ketoprofen[13], paracetamol), opioids (both intravenous and patient controlled analgesia), infiltration of local anaesthetic (both before and after creation of pneumoperitoneum), thoracic epidural block[14], multimodal analgesia[15] (using opioids, NSAID and infiltration of local anaesthetic) and ultrasound guided TAP block. Effective localised analgesic treatments also lessen intensity of pain, lower the likelihood of systemic analgesic side effects, and enhances patient comfort. In patients undergoing abdominal surgical procedures like caesarean section, direct blockade of the neural afferent fibres of the abdominal wall, such as abdominal field blocks, ilioinguinal and hypogastric nerve blocks, has long been recognized as being capable of providing significant postoperative analgesia. Ultrasound guided transversus abdominis plane block has become an integral part of multimodal analgesia after abdominal surgeries. Various drugs such as ropivacaine [16], bupivacaine [17], and levobupivacaine have been used in ultrasound guided TAP block. In posterior approach of TAP block, a local anaesthetic is injected in the neurofascial plane between internal oblique and the transversus abdominis muscles, in order to block the nerves of the abdominal wall – namely the T7-T12 intercostal nerves, ilioinguinal nerve, iliohypogastric nerve and the lateral cutaneous branches of dorsal rami of the L1-L3 spinal nerves. [18] Performance of TAP block has become an integral part of the multimodal regimen for providing postoperative analgesia in number of surgeries. In addition to providing real time visualization of the neural structures, use of ultrasound helps in delineating trajectory of needle and navigating it away from other anatomical structures. Thus, it avoids intravascular and intraneuronal injection.

The principal finding of our study is that 0.25 percent bupivacaine and 0.25 percent ropivacaine were similarly efficient in TAP block and offered good postoperative analgesia in patients undergoing Lower Segment Caesarean Section, with Bupivacaine providing a comparatively longer duration of analgesia, lesser VAS Scores than Ropivacaine.

Our study data were comparable in both the groups in terms of demographic data, VAS score, duration post-op analgesia, mean time to first rescue analgesia, nausea/ vomiting or any other side effects.

We have found the superiority of TAP block in providing immediate postoperative analgesia reflected by a lower VAS score. Our finding is consistent with McDonnell et al, who found that TAP block as a component of a multimodal analgesic regimen provided superior analgesia when compared with placebo block up to 48 postoperative hours after elective caesarean delivery. Carney et al, in total abdominal hysterectomy found that anatomical TAP block significantly reduces postoperative pain scores up to 48 h period.

The present study showed that when administered via ultrasound guided TAP block with bupivacaine (0.25%) provided more effective pain relief in the immediate post-operative period as compared to ropivacaine (0.25%). The findings are in synchrony with the previous studies, which found bupivacaine to be more effective than ropivacaine.[19],[20],[21]

Demographic Data

The difference in the mean age (mean ± SD) 25.7 ± 3.03 and 25.2 ± 4.37 years, body weight 62.40 ± 5.15 and 62.13 ± 5.17 kgs of the patients in B group and R group were statistically not significant ($p>0.05$).

VAS Pain Score

In the present study, at 30 minutes, 2, 4, 6, 12, and 24 hours, group B's mean VAS score was 0.26±0.44, 1.67±0.47, 1.9±0.6, 3.33±0.67, 0.97±0.67, and 3.46±0.77, respectively. At 30 minutes, 2, 4, 6, 12, and 24 hours, group R's mean VAS score was 0.53 ±0.51, 2.03±0.77, 2.3±0.8, 3.9±0.89, 1.63±1.03, and 3.96±0.96, respectively. At all-time intervals, group B had a smaller mean VAS score difference, and it was statistically significant. ($p<0.05$)

At 12hrs (group B 3.33±0.67 vs. group R 3.9±0.89) the Ropivacaine group had significantly more pain when compared to the Bupivacaine group. This was because group B had already received rescue analgesia. Neha Sharma et al[19] conducted a study in 60 adult patients undergoing elective abdominal surgery under general anaesthesia. They compared 0.25% Bupivacaine with 0.5% Ropivacaine in TAP block. The mean pain scores at 0 min, 30 min and 4 h were similar in both the groups and inter group comparison was not statistically significant. However, comparison of pain score at 8 h and 12h post operatively showed significant difference in both the groups with Ropivacaine having significantly higher VAS scores both at rest and on coughing. Dipika patel et al [20] found that there was statistically significant difference in VAS score at 6 hours ($p<0.05$) and 12 hours ($p<0.01$) after performing the block. They found that VAS scores were higher in the Ropivacaine group as compared to the Bupivacaine group.

Duration of Analgesia

The mean duration of analgesia in patients receiving 0.25% Bupivacaine was 1419.93 ± 126.9 mins and 1343.81 ± 32.18 mins in patients receiving 0.25% Ropivacaine. It indicates that mean duration of analgesia with 0.25% ropivacaine lower than 0.25% bupivacaine. This finding is similar to that of other studies which showed bupivacaine to have better analgesic potency as well as longer duration of analgesia following TAP block.

Time to First Rescue Analgesia

The mean time to first rescue analgesia in Group B was 414.15 ± 33.89 min and in Group R it was 390.87 ± 19.42 min which was significant statistically. ($p<0.05$).

These results suggest that 0.25% bupivacaine provided longer duration of analgesia in majority of

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patients when compared to 0.25% ropivacaine. El Dawlatley et al[21] studied the analgesia of USG guided TAP block following laparoscopic cholecystectomy and reported reduced rescue analgesic requirement.

CONCLUSION

Our findings show that 0.25 percent bupivacaine and 0.25 percent ropivacaine were similarly efficient in TAP block and offered good postoperative analgesia, with Bupivacaine providing a comparatively longer duration of analgesia, lesser VAS Scores than Ropivacaine. Transversus abdominis plane blocks are a relatively recent method for providing postoperative analgesia following abdominal surgery in a multimodal approach. It is regarded as a technically straight forward block with a large margin of safety. TAP block is a safe and effective addition to multimodal postoperative analgesia. Multiple studies have shown that it is better than normal medical therapy in the treatment of postoperative pain. TAP blocks/catheters may also give equivalent analgesia and patient satisfaction when compared to epidural treatment. According to studies, the usage of this block has been demonstrated to lower intravenous opioid use, resulting in fewer opioid-mediated adverse effects.

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