Original Research Article

Evaluating the analgesic efficacy of 0.25% bupivacaine and 0.25% ropivacaine in TAP block as a part of a multimodal analgesia regimen for post caesarean delivery pain management - A prospective observational study

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Abstract

Background: The transversus abdominis plane (TAP) block is a regional anesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall. TAP blocks have been described as an effective component of multimodal postoperative analgesia for a wide variety of abdominal procedures. We chose to use it as a part of post caesarean delivery pain management **Materials and methods**: This Prospective Observational study was done in Department of Anesthesiology, Tagore Medical College and Hospital during the year January 2018 to December 2019.A group of 60 parturient were included in the study. They were randomized into two groups by computer sampling technique. **Group A:** TAP Block with 0.25% Bupivacaine 20 ml each side **Group B:** TAP Block with 0.25% Ropivacaine 20 ml each side **Results:** Result s were analyzed using Statistical Package Mini-Tab version 17.0. Mean comparison between the groups was done using student unpaired 't' test Both the groups were comparable in demographic data, diagnosis and surgeries. The reduction of VAS score was comparable in both the groups. (P>0.05). The requirement of rescue analgesia in the postoperative period was also similar in both the groups. **Conclusion:** We conclude that both Bupivacaine and Ropivacaine provide comparable analgesia in Transversus Abdominis Plane Block as apart of multimodal approach in post operative analgesia following lower segment caesarean section.
Key words: TAP block, LSCS, Multimodal.

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INTRODUCTION

The transversus abdominis plane (TAP) block is a regional anesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall[1]. First described just a decade ago, it has undergone several modifications, which have highlighted its potential utility for an increasing array of surgical procedures[2]. Despite a relatively low risk of complications and a high success rate using modern techniques, TAP blocks remain overwhelmingly under utilized[3]. Although the block is technically straightforward, there is inertia regarding its adoption into clinical practice. The

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ultrasound-guided technique has improved the performance and success rate. There are several alternatives and the best technique is not clear. The ultrasound guidance has made this block more attractive. Rafi first described the TAP block in 2001.[2] He portrayed it as a refined abdominal field block, with a targeted single shot anesthetic delivery into the TAP, a site traversed by relevant nerve branches. This was a significant advance from earlier strategies that required multiple injections.[4] In 2004, McDonnell *et al.* presented preliminary work on TAP blocks in cadavers and in healthy volunteers at the scientific meeting of the American Society of Anesthesiologists[5]. Although referred to as the regional abdominal field infiltration (RAFI) technique, the authors brought forward preliminary evidence to support the anatomical basis for TAP blocks and demonstrated Sensory loss spanning the xiphoid to the pubic symphysis following delivery of local anaesthetic to the TAP via the triangle of Petit. In 2007, McDonnell and his colleagues had already adopted the term TAP block and had demonstrated its analgesic utility in patients undergoing open retro pubic prostatectomy.[6–8]

MATERIALS AND METHODS

This prospective observational study was conducted in Department of Anaesthesiology, Tagore Medical College and Hospital affiliated to The Tamil nadu Dr MGR medical University.After approval from the institutional ethical committee and written informed consent, 60 Parturient more than 18 years old posted for elective/emergency caesarean section were included in the study. The study was done from January 2018 to December 2019 (24 months).

Inclusion criteria

- Pregnant women undergoing caesarean section under spinal anaesthesia both elective and emergency .
- ASA grade I and II parturient

Exclusion criteria

- Patient's refusal
- Allergy to opioids, amide group of local anaesthetic and nonsteroidal anti- inflammatory drugs.
- Coagulation derangement or bleeding disorders
- Infection at the site of block.
- Patients with cardiovascular, pulmonary or neurological diseases.
- Patients converted to general anaesthesia after giving sub arachnoid block.

Using Randomised computer sampling technique, patients were randomized into two groups. **Group A:** TAP Block with 0.25% Bupivacaine 20 ml each side. **Group B:** TAP Block with 0.25% Ropivacaine 20 ml each side. All Patients received subarachnoid block by 25 G Quinckie's needle at L 3-4/L2-3 inter-space with a total combined volume of 1.8 ml to 2 ml (depending on the height and weight of the patient) in the same syringe using a standard midline approach. Both Group received 10 mg of 0.5% of hyperbaric bupivacaine 1.8 to 2 ml (depending on the height and weight of the patient). Supplemental O_2 was delivered by face mask at 5L/min throughout surgery and during their stay in the post anaesthetic care unit. Monitoring was done for all patients using the following: ECG, Pulse oximetry, Non Invasive blood pressure monitoring. Surgery was allowed to proceed after T4 to T6 sensory blockade to pin prick sensation was been 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 is administered intraoperatively if nausea and vomiting was not corrected by vasopressor for treatment of hypotension or occurred unrelated to hypotension. At end of surgery, Petit's triangle was identified on both side above the iliac crest between the fibres of external oblique and latissimus dorsi muscles. Under all aseptic precautions the block was given through Petit' triangle with 22 G hypodermic needle attached to a 20 ml syringe containing the drug as per the group allocation. Needle was introduced perpendicular to skin and advanced until two "POPS" or "give way" were felt. Then the drug was deposited in the fascial plane after aspiration, check aspiration was done every 3 ml to rule out intravascular injection. The patient was observed for 15 minutes and then shifted to post-anaesthesia care unit.

- Group A 20 ml of 0.25% of Bupivacaine injected on either side,
- Group B 20 ml of 0.25% of Ropivacaine injected on either side .

Maximum allowable concentration of local anesthetic solution was not crossed in this study.

The presence and severity of pain, nausea, vomiting and any other side effects were assessed for all patients in both groups.These assessments were performed in the PACU for 30 mins and at 2, 4, 6, 12, 24 hours postoperatively in the labour ICU.All patients were asked to give scores for their pain and for the degree of nausea at each time. Pain severity was measured using visual analog scale (VAS, 0 = no pain and 10 =worst pain imaginable).Rescue analgesia was given for visual analogue scale (VAS) ≥ 4 with IV tramadol 2mg / kg. The time of first onset and the time of first request for analgesia requirements during the first 24 hours were noted. Antiemetics were given to any patient who complained of nausea or vomiting.Any signs of adverse effects of the technique like local site infection, hematoma formation, local anesthetic toxicity due to

intravascular injection of anesthetic (like dizziness, tinnitus, perioral numbness and tingling, lethargy, seizures, signs of cardiac toxicity like atrioventricular conduction block, arrhythmias, myocardial depression and cardiac arrest) were noted.

Primary objective is to measure

1. Pain scores during the first 24 hours
2. Analgesic requirements during the first 24 hours.

Secondary objective is to measure

1. The time of first onset and the time of first request for analgesia.
2. Side effects during first 24 hours

RESULTS

60 patients were included in the study and were randomly allocated in two groups. In group A patients were to undergo TAP block with 0.25% Bupivacaine and in group B were to undergo TAP block with 0.25% Ropivacaine for postoperative analgesia.

STATISTICAL ANALYSIS:

Demographic Profile

The mean age (mean ± S.D.) in Group A was 25.7 ± 3.03 yrs and in group B was 25.2 ± 4.373 yrs . The groups were comparable in terms of age (p =0.60).The mean height was 158.33 ± 5.005 cm in group A and 157.60 ± 5.506 cm in group B. The groups were comparable in temrs of height. (p=0.591). The mean weight was 62.40 ± 5.15 kg and 62.13 ± 5.17 kg respectively in group A and group B which was not statistically significant (p=0.842).Therefore both groups were comparable in terms of their demographic profile .

Table 1: Demographic profile in two groups

Group	Age in yrs (Mean ± S.D.)	Height in cm (Mean ± S.D.)	Weight in kg (Mean ± S.D.)
Group A	25.7 ± 3.030	158.33 ± 5.005	62.40 ± 5.15
Group B	25.2 ± 4.373	157.60 ± 5.506	62.13 ± 5.17
P value	0.60	0.591	0.842

Postoperative Pain

The mean VAS score in group A at 30 minutes , 2,4,6,12 and 24 hours were 0.33±0.88 , 0.66±1.09 , 0.86±1.27 , 1.1±1.47 , 0.9±1.29 and 0.3±0.74 respectively .The mean VAS score in group B at 30 minutes , 2,4,6,12 and 24 hours were 0.36±0.88 , 0.93±1.08 , 1.40±1.35 , 1.83±1.44 , 1.26±1.22 and 0.7±0.91 respectively .The difference in mean VAS score was less at all time interval in group A but was not significant . (p>0.05)

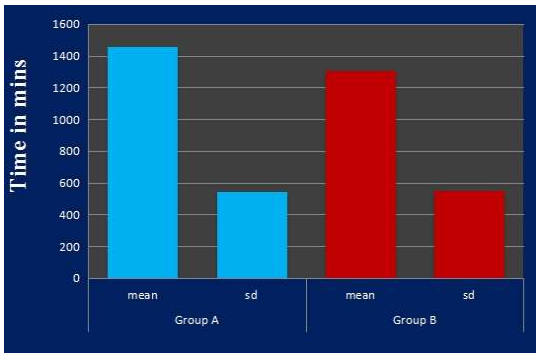
Table 2: VAS scores in both groups at different time interval

VAS (Mean ± S.D.)	30 mins	2 hours	4 hours	6 hours	12 hours	24 hours
Group A	0.33±0.88	0.66±1.09	0.86±1.27	1.1±1.47	0.9±1.29	0.3±0.74
Group B	0.36±0.88	0.93±1.08	1.40±1.35	1.83±1.44	1.26±1.22	0.7±0.91
P value	0.88	0.34	0.12	0.055	0.26	0.06

The comparison of VAS scores at different time interval in both groups showed that TAP block has equal analgesic effects with Bupivacaine and Ropivacaine. 6 patients in Bupivacaine group and 8 patients in Ropivacaine group required rescue analgesia during first 12 hours.

Duration of Analgesia

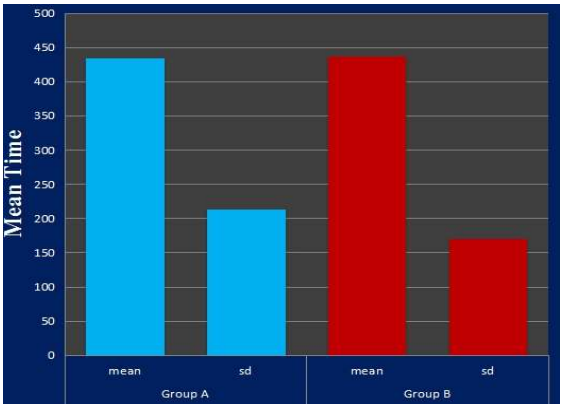
The mean duration of analgesia was 1454.266 (24 hours) minutes with standard deviation of ± 542.798 (9 hours) in Group A and 1303.833 (22 hours) minutes with a standard deviation of ± 552.447 (9 hours 20 minutes) in Group B. which was insignificant. P value was >0.05.



Graph 1: Mean duration of analgesia(minutes) in both groups

Mean Time to First Rescue Analgesia

The mean time to first rescue analgesia in Group A was 434.166 ± 213.035 min and in Group B it was 436.875 ± 170.229 min which was not significant statistically (p>0.05).



Graph 2

Postoperative Nausea And Vomiting

The incidence of nausea at 30 mins, 2 and 4 hours were found in 17% , 7% and 7% of patients in Group A and 27%, 17% and 10% of patients in Group B respectively . There was no nausea in any patient of either group at 6, 12 and 24 hours. The incidence of nausea was found to be comparable (p>0.05) between two groups at all time interval . There was no incidence of vomiting in any patient in 24 hours period. None of the patient in either group required rescue antiemetic.

Table 3: Percentage of Patients with Postoperative Nausea And Vomiting

N/V Score	30 mins		2 hours		4hours		6hours		12 hours		24 hours	
	A	B	A	B	A	B	A	B	A	B	A	B
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							

DICUSSION

The benefit of adequate postoperative analgesia are clear and include a reduction in the postoperative stress response, reduction in postoperative morbidity, and in certain types of surgery, improved surgical outcome. Effective pain control also facilitates rehabilitation and accelerates recovery from surgery. Other benefits of effective regional analgesic techniques include reduced pain intensity, decreased incidence of side effects from analgesics and improved patient comfort. Using local anaesthetic agents in TAP Block is a simple and effective analgesic technique, appropriate for surgical procedures where parietal pain is a significant component of postoperative pain. The local anaesthetic agents in TAP block have been demonstrated to provide excellent analgesia to the skin and musculature of the anterior abdominal wall in patients undergoing colonic resection surgery involving a midline abdominal wall incision, patients undergoing caesarean delivery, and patients undergoing radical prostatectomy. Findings of similar studies have been mentioned

Table 8: Comparison of analgesia with TAPB in different studies

Study	Local anaesthetic Solution	Duration of analgesia by TAPB
McDonnell (2007)	Levobupivacaine 3.75 mg/ml (20ml) bilaterally	24 hours
McDonnell (2008)	Ropivacaine 7.5 mg/ml (15-20ml) bilaterally	6-12 hours
Carney (2008)	Ropivacaine 7.5 mg/ml (15-20ml) bilaterally	48 hours
El-Dawlatly (2009)	Bupivacaine 5mg/ml (15 ml) bilaterally	24 hours
Niraj (2009)	Bupivacaine 5mg/ml (20 ml)	24 hours
Belavy (2009)	Ropivacaine 5 mg/ml (20ml) bilaterally	24 hours

In the published studies investigating the use of the TAP block for post-operative analgesia, either ropivacaine in concentrations of 0.5% or bupivacaine 0.5% was utilized. The principal finding of our study is that 0.25%

bupivacaine and 0.25% ropivacaine are equally effective in TAP block and provides effective postoperative analgesia in patients undergoing Lower Segment Caesarean Section. Our study data were comparable in both the groups in terms of demographic data, Post op analgesia, vas score, 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. The current literature on TAP block is not unanimous in the matter that whether it improves postoperative pain score or not.

Post Operative Analgesia

Our finding is consistent with those of McDonnell *et al.*[9] in abdominal surgery and Carney *et al.*.[59] in open appendicectomy. In 2008, Carney *et al.*[10] found that anatomical TAP block in total abdominal hysterectomy patients significantly reduces postoperative pain scores up to 48 h period. Postoperative morphine consumption also decreased at 12 h, 36 h and 48 h time period. However, the authors did not address intraoperative opioid requirement. Recently, Sharma *et al.* [11] also found that TAP block by landmark technique improves VAS score in first 24 h in patients undergoing major abdominal surgery. Petersen *et al.*[12] in 2012 also found that US guided bilateral TAP block in patients undergoing laparoscopic cholecystectomy provides superior postoperative pain scores. Petersen *et al.*.[13] in 2013 found that TAP block does not provide superior analgesia in comparison to placebo after inguinal hernia repair. A previous Cochrane review [14] and a meta-analysis[15] in 2012 failed to demonstrate the beneficial effect of TAP block on postoperative pain scores. In this context, it is worth mentioning that the meta-analysis found that TAP block decreases postoperative opioid consumption, which may be a more important parameter to decide an analgesic regimen. The median duration of effective postoperative analgesia from our study was 290 min in patients receiving TAP block, and we did not use any additive in TAP block. A. Kocum, A. Turkoz *et al.*[16] Compared efficacy of Ropivacaine 0.25% and Bupivacaine 0.25% in Providing Surgical Anaesthesia for Lumbar Plexus and Sciatic Nerve Block and the result were comparable as in our study. They found that Roivacaine 0.25% and Bupivacaine 0.25% are equally efficacious in providing analgesia as well as surgical anesthesia. Further, the blockade achieved by either drug was of similar quality and provided similar duration of postoperative analgesiaThis was the first clinical study to have demonstrated that 0.25% ropivacaine and 0.25% bupivacaine provide comparable quality of surgical anaesthesia for hip or femur repair in high-risk patients. Like in our study Hickey R[1], Hoffman J, Ramamurthy S *et al.* in 1991 studied the effectiveness of 0.5% ropivacaine and 0.5% bupivacaine for brachial plexus block in 48 patients and found that the mean time for anesthesia and analgesia did not differ significantly and concluded that Ropivacaine 0.5% and bupivacaine 0.5% appeared equally effective in providing brachial plexus anesthesia[17.] In another similar study McGlade DP[1], Kalpokas MV, *et al.* in 1998 compared the use of 0.5% ropivacaine with 0.5% bupivacaine for axillary brachial plexus anaesthesia in 66 patients and concluded that Ropivacaine 0.5% and bupivacaine 0.5% appeared equally efficacious as long-acting local anaesthetics for axillary brachial plexus block. So far no one has compared the efficacy of 0.25% Ropivacaine and 0.25% Bupivacaine in Transversus Abdominis Plane Block [18] . The cause of prolonged duration of analgesic effect following single shot TAP block is not entirely clear. This may be explained by the fact that the TAP is relatively poorly vascularized, and therefore drug clearance may be slowed.[10] Inadequate analgesia even after TAP block may be either due to technical failure or due to visceral pain component, which is not addressed by TAP block. As such, until now, all local anesthetic techniques carry an inherent failure rate of 5-20%, depending on the skill of the operator.[19] The most important clinical implication of our findings is the significant opioid sparing effects of TAP block in the postoperative period. Opioids, though very effective in perioperative pain management, may be associated with nausea-vomiting, pruritus and respiratory depression. Moreover, some patients who are morbidly obese or having obstructive sleep apnea will be maximally benefitted from TAP block as it provides opioid sparing effects. It may be a relatively safer alternative to neuraxial block for intra and postoperative analgesia in patients having coagulopathy. These days the use of real time USG for TAP block is increasing; we used a landmark based anatomical approach. However, as real time US guidance may increase the efficacy of TAP block, it won't change the primary finding of our study.

CONCLUSION

From this study, we conclude that 0.25% bupivacaine and 0.25% ropivacaine are equally effective in TAP block and provides effective postoperative analgesia. Transversus abdominis plane blocks are a relatively new technique used in a multimodal approach to provide postoperative analgesia following abdominal surgery.

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