Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 05, 2023

Compare the Analgesic Efficacy Of 0.25% Bupivacaine And 0.25% Ropivacaine in TAP Block in Caesarean Patients Along with Pain Measurement in First 24 Hours

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Received Date: 20/03/2023 Acceptance Date: 28/05/2023

Abstract

Background: The transversus abdominis plane (TAP) block is a regional anesthesia technique which provides analgesia to the parietal peritoneum and also the skin and muscles of the anterior abdominal wall. It has high potential utility for various surgical procedures. **Methodology:** The study was conducted on pregnant women who were posted for elective/emergency caesarean section in hospital. 60 patients were included in the study based on the inclusion and exclusion criteria. Patients were divided into two groups. Group A received TAP Block with 0.25% Bupivacaine 20 ml each side whereas Group B received TAP Block with 0.25% Ropivacaine 20 ml each side. The TAP block was given using an 18 Gauge Tuohy needle and identifying the double "pop" technique. Postoperatively, rescue analgesia provided for a VAS >4. The rescue analgesic used was Inj.Tramadol. Requirement of rescue analgesia was also studied. **Result:** The reduction of VAS score was comparable in both the groups. (P>0.05). The requirement of rescue analgesia in the postoperative period was similar in both the groups. **Conclusion**-0.25% Bupivacaine and 0.25% Ropivacaine are equally effective in TAP block and provides effective postoperative analgesia

Keywords: Bupivacaine, Ropivacaine, TAP block, Pain, Analgesia

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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]. 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 underutilized. [3] Ropivacaine is a newer long acting local anaesthetic drug belonging to the amino amide group. Most local anaesthetics block the unmyelinated C and myelinated A δ fibers that transmit pain impulses at the same rate. However, the rate of blockade of Aα and Aβ (that carry motor impulses) depends on the physicochemical properties such as PKa and lipid solubility. As Ropivacaine is less lipid soluble when compared to bupivacaine, the blockade of Aα and Aβ fiber is slow and hence produce less motor blockade than

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 05, 2023

Bupivacaine. Blocking of potassium channels contributes to the cardio toxic effect of local anaesthetics by promoting a lengthening of cardiac action potential. Ropivacaine has been shown to block open human potassium channels in a concentration dependent manner in vitro. When used in epidural neuroaxial blockade, the cardiovascular effect of Ropivacaine is similar to that of Bupivacaine. Both drugs significantly decrease mean arterial blood pressure and significantly increase heart rate, stroke volume,and cardiac output and ejection fraction.
Bupivacaine is 3-4 times more potent than Lignocaine and Mepivacaine and 8 times more potent then procaine. The onset of action is slower than that of Lignocaine or Mepivacaine but longer duration of action makes it suitable for prolong surgeries. It blocks the pain receptors of free nerve endings and abolishes pain. Blocking a nerve with local anaesthetic produces loss of pain, temperature, touch, motor and vasomotor tone in the region supplied by that nerve. Low plasma concentration produces circumoral numbness and twitching. A toxic level of Bupivacaine initially stimulates CNS which is characterized by dizziness, light-headedness, visual and auditory disturbances, twitching, convulsion and shivering. The plasma concentration of Bupivacaine associated with seizures is 4.5 to 5.5 µg/Kg. Seizures are classically followed by CNS depression which may be accompanied by hypotension and apnea.
This study was conducted to compare the analgesic efficacy of 0.25% Bupivacaine and 0.25% Ropivacaine in TAP block in caesarean patients along with pain measurement in first 24 hours.

Materials And Methods
Study place: The study was conducted at hospital.
Study design: The study utilized prospective controlled trial study design. Randomised computer sampling technique was used.
Inclusion criteria: Pregnant women undergoing caesarean section under spinal anaesthesia both elective and emergency, ASA grade I and II parturient and those who were ready to give consent were included.
Exclusion criteria: Patients with cardiovascular, pulmonary or neurological diseases, Patients converted to general anaesthesia after giving sub arachnoid block, having infection at the site of block, Coagulation derangement or bleeding disorders, allergic to opioids, amide group of local anaesthetic and nonsteroidal anti-inflammatory drugs, and those who denied the consent were excluded.
Sample size: 60 parturient were taken into consideration for the study.
Data analysis: All the data obtained were entered in the proforma. Data were analysed using SPSS package.
Ethical considerations: All the necessary permissions were taken from the institutional ethical committee.
Patients were selected on the basis of randomised computer sampling technique.
Further, they were divided into two groups, i.e.,
Group A received TAP Block with 0.25% Bupivacaine 20 ml each side
Group B received 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 interspace with a total combined volume of 2.25 ml in the same syringe using a standard midline approach. Both Group received 10 mg of 0.5% of hyperbaric Bupivacaine (2 ml) and 25 mcg of Fentanyl (0.25 ml). Supplemental O_2 was delivered by face mask at 5L/min throughout surgery and during their stay in the post anaesthetic care unit. Monitoring of all the patients was done. Surgery was allowed to proceed after T4 to T6 sensory blockade to pin prick

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sensation was being established. All patients received an IV infusion of Oxytocin 10 IU after delivery. IV Ondansetron 4 mg is administered intraoperatively if nausea and vomiting persisted. At end of surgery, Petit's triangle was identified on both sides. Under all aseptic precautions the block was given. 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 Group A 20 ml of 0.25% of Bupivacaine injected on either side and Group B 20 ml of 0.25% of Ropivacaine injected on either side. 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 SICU. 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). Rescue analgesia was given for visual analogue scale (VAS) ≥ 4 with IV tramadol 2mg / kg. Signs of adverse effects of the technique if any were noted.

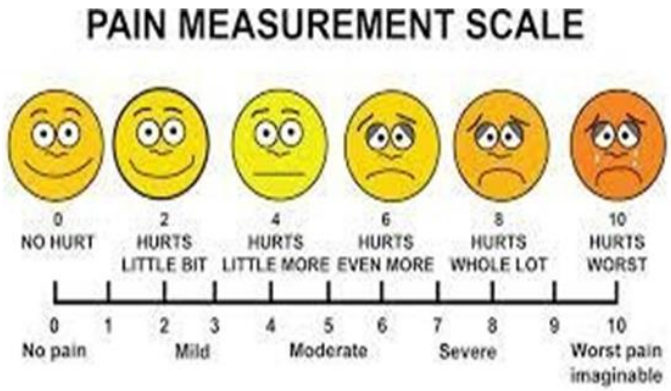

Figure 1: Visual Analogue Scale

1-2=no pain
3-4=mild pain,
5-6= moderate pain
7-8=severe pain
9-10= intolerable pain

Results

Table 1: Demographic profile in two groups

Group	Age in years (Mean ± S.D.)	Weight in kg (Mean ± S.D.)
Group A	25.7 ± 3.030	62.40 ± 5.15
Group B	25.2 ± 4.373	62.13 ± 5.17
P value	0.60	0.842

The mean age (mean ± S.D.) in Group A was 25.7 ± 3.03 years and in group B was 25.2 ± 4.373 years. The groups were comparable in terms of age (p =0.60). 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)

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

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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) 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.

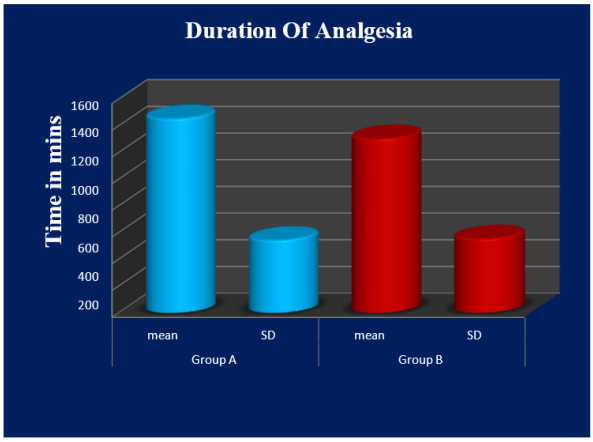

Figure 2: Duration of Analgesia

The mean duration of analgesia was 1454.266 (24 hrs) minutes with standard deviation of ± 542.798 (9 hrs) in Group A and 1303.833 (22 hrs) minutes with a standard deviation of ± 552 447 (9 hrs 20 minutes) in Group B. which was insignificant. P value was >0.05.

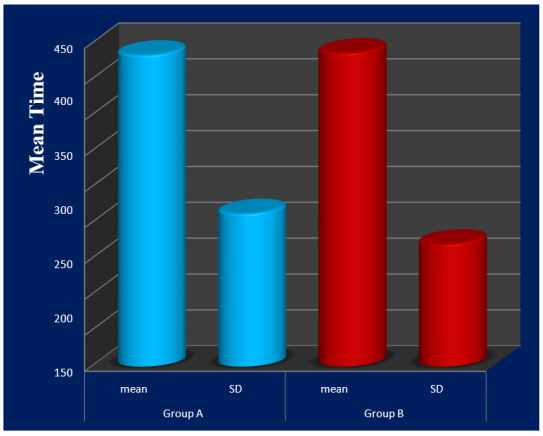

Figure 3: Mean Time to First Rescue Analgesia

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).

Table 3: Percentage of Patients with Postoperative Nausea and Vomiting

N/V Score	30 mins		2 hours		4hours		6hours		12 hours		24 hours	
	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B	Group A	Group B
0	83	73	83	83	93	90	100	100	100	100	100	100

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	%	%	%	%	%	%	%	%	%	%	%	%
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			

The incidence of nausea at 30 mins, 2 & 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.

Discussion

Our study data were comparable in both the groups in terms of demographic data, Post op analgesia, vas score. Using local anaesthetic agents in TAP 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 in table.

Table 4: 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

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.

Our finding is consistent with those of **McDonnell *et al***. [4] in abdominal surgery and **Carney *et al***. [5] in open appendicectomy. In 2008, **Carney *et al***. [6] 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*** (7) also found that TAP block by landmark technique improves VAS score in first 24 h in patients undergoing major abdominal surgery. **Petersen *et al***. [8] in 2012 also found that US guided bilateral TAP block in patients undergoing laparoscopic cholecystectomy provides superior postoperative pain scores. Cochrane review [9] and a meta-analysis [10] 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

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 05, 2023

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.* [11] 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 Ropivacaine 0.25% and Bupivacaine 0.25% are equally efficacious in providing analgesia as well as surgical anaesthesia. Further, the blockade achieved by either drug was of similar quality and provided similar duration of postoperative analgesia. This 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. 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. [12] 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.

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. [6] 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.[13]

These days the use of real time USG for TAP block is increasing; we used as landmark based anatomical approach. However, as real time USG guidance may increase the efficacy of TAP block, it won't change the primary finding of our study.

Conclusion

From the above study we can 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. It is considered a technically simple block to perform, with a high margin of safety. The TAP block is an effective and safe adjunct to multimodal postoperative analgesia.

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