Original Research Article

A Comparative study of 0.25% bupivacaine and 0.25% ropivacaine in transversus abdominis plane block for post-operative analgesia patient undergoing below umblical surgery

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Abstract

Background: The transversus abdominis plane (TAP) blockinvolves the injection of a local anesthetic solution into a plane between the internal oblique muscle and transversus abdominis muscle. **Aim:** In this study we have aimed to compare the analgesic efficacy of 0.25% Bupivacaine and 0.25% Ropivacaine20ml each side in bilateral TAP block for post-operativepain management in patients undergoing below umblicalsurgery. **Methodology:** A sample of 60 patients were taken for this study. And divided into two groups, each group consisting of 30 patients and they received post-operative ultra sound guided bilateral TAP block. **Results:** The post-operative pain score in the Ropivacaine group was significantly less when compared to the Bupivacaine group. The time of rescue analgesia in the Ropivacaine group was significantly longer compared to the Bupivacaine group. The patients given 0.25% Bupivacaine had 4.5 times risk of having nausea within 24 hours of onset when compared to those given 0.25% Ropivacaine. **Conclusion:** The conclusion of our study is that 0.25%Ropivacaine and 0.25% Bupivacaine are almost equally effective in TAP block and provides effective postoperative analgesia. Although, 0.25% Ropivacaine has an edge over 0.25% Bupivacaine in post-operative analgesia, significantly longer time of rescue analgesia and lesser complications like nausea and vomiting.
Key Word: Bupivacaine, Ropivacaine, Transversus Abdominis Plane.

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INTRODUCTION

The transversusabdominis plane (TAP) block is an anesthesia technique that provides analgesia to the parietal peritoneum as well as the skin and muscles of the anterior abdominal wall[1] Since the thoracolumbar nerves originating from the T6 to L1 spinal roots run into this plane and supply sensory nerves to the anterolateral abdominal wall[2], the local anesthetic spread in this plane can block the neural afferents and provide analgesia to the anterolateral abdominal wall. The transversus abdominis plane (TAP) block was first introduced by Rafi[3] in 2001 as a landmark-guided technique via the triangle of Petit to achieve a field block. In this study we had compared the efficacy of 0.25% Bupivacaine and 0.25% Ropivacaine 20ml each side in bilateral TAP block for post-operativepain management in patients undergoing below umblical surgery.

MATERIALS AND METHODS

Adults more than 18 years old and below 60 years posted for elective/emergency, Patient under going both elective and emergency, ASA grade I and II below umblical surgery under spinal anaesthesia in Meenakshi Medical

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College Hospital and Research Institute, Enathur, Kanchipuram, Tamil Nadu. After approval from the institutional human ethical committee and written informed patients consent, 60patients posted for below umblical surgery were included in the study. Randomised computer sampling technique.

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, ASA grade 3 and 4. Intra operatively all patients who received subarachnoid block by 25 G Quinckie's needle at L3-4/L2-3 inter-space with a total combined volume of 3.2 ml to 3.4 ml (depending on the height and weight of the patient) drug were taken up for study.Supplemental O_2 was delivered by face mask at 6L/min throughout surgery and during their stay in the post anaesthetic care unit. Following parameters were monitored for all patients: ECG, Pulse oximetry, Non Invasive blood pressure monitoring. Surgery was allowed to proceed after T4 to T6 sensory blockade to pin prick sensation was established. At the end of surgery, under all aseptic precautions, using ultrasound high frequency linear probeafter identification of the TAP between the internal oblique and transversusabdominis muscles, the probe was moved posterolaterally to lie across the midaxillary line just superior to the iliac crest (over the triangle of Petit). The block needle was then introduced anteriorly and advanced in an in-plane approach. Ultra sonography facilitates easy needle visualization as it approaches and reaches the target facial plane. Then the drug was deposited in the facial plane after aspiration. Check aspiration was done for 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 2hours and at[4, 6, 12,] 24 hrs postoperatively in the Surgical Intensive Care Unit.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 request for analgesia during the first 24 hrs were noted. Antiemetics were given to patient who complained of nausea or vomiting. Any signs of adverse effects of the technique like local site infection, hematoma formation, and local anesthetic toxicity were looked for.

RESULTS

The age distribution of the patients in both the drug groups.The mean age of the participants was 46 (±11.3) years. Majority (55%) belonged the age group of 40-60 years followed by 20-40 years (20%), more than 60 years (15%) and <20 years (10%) respectively.

Table 1: Distribution and association of age, gender and ASA class in both drug groups (Chi-square test)

Variables	Group A, n(%)	Group B, n(%)	Total, n(%)	Chi-square (p value)
Age				
<20 years	4 (13.3%)	2 (6.7%)	6 (10%)	0.808 (0.880)
20-40 years	6 (20%)	6 (20%)	12 (20%)	
40 -60 years	16 (53.3%)	17 (56.7%)	33 (55%)	
>60 years	4 (13.4%)	5 (16.6%)	9 (15%)	
Gender				
Male	18 (60%)	18 (60%)	36 (60%)	0.007 (0.998)
Female	12 (40%)	12 (40%)	24 (40%)	
ASA class				
	21 (70%)	20 (66.7%)	41 (68.3%)	0.077 (0.781)
2	9 (30%)	10 (33.3%)	19 (31.7%)	

The distribution of the patients according to the American Society of Anaesthesiologists (ASA) five-category physical status classification system. In the present study, only class 1 and 2 were included. More than two-third of the patients (68.3%) belonged to class 1 while 31.7% belonged to class 2.

Postoperative pain assessment: Figure 1 shows the distribution and association between the pain assessed by Visual Analogue Scale (VAS) at different time intervals postoperatively and the drug groups (A and B). The mean VAS score in Group A at 2, 4,6,12 and 24 hours were 1.510 (±0.344), 2.50 (±0.409), 3.77 (±0.458), 5.47 (±0.527) and 6.23 (±0.971) respectively. The mean VAS score in Group B at[2,4,6,12] and 24 hours were 1.144 (±0.211) 2.05 (±0.310), 3.10 (±0.389), 4.80 (±0.513) and 6.20 (±1.324) respectively.

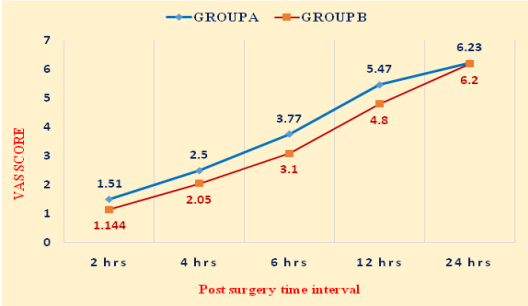

Figure 1: Distribution of VAS scores at various time intervals in both the groups (N=60)

The average time to first rescue analgesic in the two drug groups B and R. The mean time to first rescue analgesic in Group A was 401 (±57.532) minutes while the mean time to first rescue analgesic in Group B was 487 (±53.250) minutes respectively. There was significant difference ($p<0.001$) in first rescue analgesic time among the two drug groups. The rescue time in Drug B was significantly longer when compared to Drug A. Independent samples t test was used to compare the rescue time in the two drug groups. There was significant association between both adverse effects-nausea and vomiting and two drug groups A and B. The patients given drug A (0.25% Bupivacaine) had 4.5 times risk of having nausea within 24 hours of onset when compared to those given drug B (0.25% Ropivacaine). Similarly, participants given drug A had 5.45 times of having vomiting within 24 hours when compared to drug B.The distribution of the surgical procedure among the two drug groups (A and B). Majority of the participants underwent Meshplasty in both the drug groups (43.3% in drug A and 40% in drug B) Figure 2.

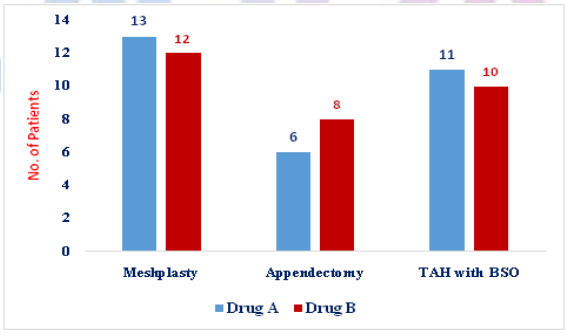

Figure 2: Distribution of the surgical procedure among the two drug groups

Table 2: 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 hrs
McDonnell (2008)	Ropivacaine 7.5 mg/ml (15-20ml) bilaterally	6-12 hrs
Carney (2008)	Ropivacaine 7.5 mg/ml (15-20ml) bilaterally	48 hrs
El-Dawlatly (2009)	Bupivacaine 5mg/ml (15 ml) bilaterally	24 hrs
Niraj (2009)	Bupivacaine 5mg/ml (20 ml)	24 hrs
Belavy (2009)	Ropivacaine 5 mg/ml (20ml) bilaterally	24 hrs

DISCUSSION

The benefit of adequate postoperative analgesia are clear and include a reduction in the postoperative stress response, postoperative morbidity, financial burden and improved surgical outcome. Effective pain control also facilitates early rehabilitation and accelerates recovery from surgery. 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 mentioneTABLE 2. 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 below umblical surgeries under Spinal Anaesthesia.Our study data were comparable in both the groups in terms of demographic data, hemodynamic parameters, Post op analgesia, VAS score , incidence 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. To our knowledge 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. Petersen *et al.*[9] in 2013 found that TAP block does not provide superior analgesia in comparison to placebo after inguinal hernia repair. A previous Cochrane review[64] 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 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 401 mins in Group A and 487 mins in Group B 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 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 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. 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[6]. 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. To our knowledge there is no enough literature comparing the efficacy of 0.25% Ropivacaine and 0.25% Bupivacaine in Transversus Abdominis Plane Block for below umblicalsurgery. 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. [6] 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. [12] 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 distressing side effects likepruritis, nausea-vomiting, and respiratory depression. Moreover, some patients who are morbidly obese or having obstructive sleep apnea will be maximally benefited from

TAP block as it provides opioid sparing effects. As respiratory depression in these patients may be detrimental. 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, in these study we used USG TAP block.

CONCLUSION

The conclusion of our study is that 0.25% bupivacaine and 0.25% ropivacaine are equally effective in TAP block and provides effective postoperative analgesia.Ropivacaine group had anegde over bupivacaine as it has lesser side effects and longer duration of action compared to bupivacaine which was staticially significant without causing any increased adverse effects.

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