ISSN 2515-8260 Volume 09, Issue 06, 2022

Original Research Article

Comparative Study of Efficacy of 0.5% Ropivacaine and 0.25% Levobupivacaine When Used in Transversus Abdominis Plane Block for Post-Operative Analgesia in Lower Abdominal Surgeries

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ABSTRACT

Background: Transversus abdominis plane block (TAPB) is a regional anaesthesia technique. Analgesia is given following lower abdomen surgery, especially if parietal wall pain is a significant cause of suffering. Local anaesthetic deposition can be used to visually block the skin of the lower abdominal wall and the muscles over the Transversus Abdominis muscle. The goal of the investigation was to determine the efficacy of 0.25 percent Levobupivacaine and 0.5 percent Ropivacaine as analgesics in the Transversus Abdominis Plane Block for Post-Surgical Analgesia after Lower Abdominal Surgery.

Material and Methods: 60 patients between the ages of 18 and 60 who underwent elective lower abdominal surgery and had an ASA grade I or II were included in the study. The TAP block was given using a double pop technique with an 18 gauge hypodermic needle. Rescue analgesia was provided postoperatively for a VAS of greater than 4. The drug of choice for treating pain was injection Tramadol. The criteria for rescue analgesia were also examined.

Results: Both categories were equal in the demographic information. The diagnosis and the procedures carried out were the same in both courses. The drop in VAS score was equivalent in both classes. ($P > 0.05$). In the postoperative stage, rescue analgesia was required in both classes.

Conclusion: Following lower abdominal surgery, Levobupivacaine and Ropivacaine produce comparable analgesia in the Transversus Abdominis Plane Block for Post-Surgical Analgesia.

Keywords
Operative Analgesia, Transversus Abdominis Plane Block, general anesthesia.

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INTRODUCTION

In order to obtain a field block around the Petit triangle, Rafiin 2001 was the first to adopt a transverse abdominis plane (TAP) block as a landmark-guided approach. The plane that connects the internal oblique and transverse abdominis muscles needs to be injected with the local anaesthetic solution. Local anaesthetic application in this plane can disrupt neural afferents and deliver analgesia to the anterolateral abdominal wall because the thoracolumbar nerves from T6 to L1 enter this plane and supply sensory nerves to it.

TAP blocks are applied during numerous abdominal operations, such as hysterectomy, cholecystectomy, colectomy, prostatectomy, and hernia repair, among others. Multimodal analgesia is crucial because a single-shot TAP block only protects against somatic pain. TAP blocks may be able to solve the immediate issue with continuous infusion or prolonged-release liposomal local anaesthetics. For surgery on the extremities, a peripheral nerve block is used as regional anaesthesia to improve the alleviation of extreme intraoperative and postoperative pain.[1] Other advantages over general anaesthesia include avoiding respiratory tract administration, reducing healing time and expense, and raising patient satisfaction. It has sympathetic blocking effects, dose-saving opioid effects, improved perioperative analgesia, and other advantages over general anaesthesia.

MATERIAL AND METHODS

The randomised sample of 60 patients visiting Nalanda Medical College and Hospital in Patna, Bihar, from December 2021 to May 2022, who are electively scheduled for lower abdominal surgeries under general anaesthesia and who meet the inclusion criteria are split into two groups of 30 patients each using computer-generated randomization.

Group A: TAP Block with 0.25% Levobupivacaine 20ml on each side.
Group B: TAP Block with 0.5% Ropivacaine 20 ml each side.

Inclusion Criteria

Sixty patients between the ages of 18 and 60, who fall into ASA categories I and II and are under 20% of their optimal body weight, will be accepted for the study after taking informed and written agreement.

Exclusion Criteria

- Patient's dismissal
- Allergy of some of the medications in the sample that were used
- Coagulation Conditions / Disorders of bleeding
- Infection at the blocking site
- Cardiovascular, neurologic, and respiratory disease patients

Intraoperative

Among the common tests utilised are electrocardiography, non-invasive blood pressure, oxygen saturation, and capnography.

Standard testing is used, such as capnography, non-invasive blood pressure measurement, oxygen saturation, and electrocardiography. Patients are pre-medicated with intravenous ranitidine and intravenous ondansetron, midazolam, and glycopyrrolate in accordance with their body weight. Three minutes of pre-oxygenation with 100% oxygen are given to the patients. Fentanyl

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1mcg/kg was administered to both individuals. Each patient receives 2 mg/kg of propofol. Patients are intubated after receiving 1.5mg/kg of succinylcholine. Both groups are subsequently given 0.5mg/kg of atracurium for muscle relaxation. One hour following the start of operation, I.V. paracetamol 15 mg/kg was administered to all patients. At regular intervals, data on the onset and duration of analgesia, pain ratings, the need for further analgesia, and any side effects were recorded. The patient was evaluated for 15 minutes before being taken to the post-anesthesia care unit. In Group A, 20 ml of 0.25 percent Levobupivacaine and 20 ml of 0.5 percent Ropivacaine were each administered on both sides.

Postoperative

The occurrence and intensity of pain, exhaustion, vomiting, and other adverse effects were assessed in both patient groups. These tests were conducted in the PACU for 30 minutes as well as in the Post Surgical Ward at 2, 4, 6, 12, and 24 hours following surgery. Each time, both groups were asked to rate their level of discomfort and dizziness. A visual analogue scale (VAS; 0 = no pain, 10 = the worst pain possible) was used to gauge the severity of the discomfort. In order to provide rescue analgesia, IV tramadol 2 mg/kg was administered with a VAS of 4.

The timing of initial onset and the time of initial analgesia request criteria were specified during the first 24 hours. Antiemetics were provided to both individuals who reported experiencing nausea or vomiting. The procedure's side effects, such as local site inflammation, hematoma development, or local anaesthetic toxicity from intravascular anaesthetic injection, were not present in any signs or symptoms (such as dizziness, tinnitus, perioral numbness and tingling, lethargy, seizures, signs of cardiac toxicity such as an atrioventricular block of conduction, arrhythmias, myocardial depression, and cardiac arrest).

Visual analogue scale

The scale consists of a 10-centimeter (100-millimeter) line with the labels "no pain" and "worst pain possible" or "pain as bad as can be" at either end. The patient draws a line on his or her side that indicates how much pain they are experiencing using a slide-rule-like approach. And the obverse's numerical score helps with the clinical diagnosis. The most often used tool for evaluating discomfort and pain alleviation in clinical practise is the VAS.

RESULTS

Sixty patients made up the sample, and they were split into one of two groups at random. For postoperative analgesia, TAP block was 0.25 percent Levobupivacaine in group A and 0.5 percent Ropivacaine in group B.

Table 1: VAS scores in both groups at different time interval

VAS (Mean +SD)	30 mins	120 mins	240 mins	360 mins	12 hrs	24 hrs
Group-A	0.31±0.82	0.59±1.1	0.88±1.3	1.2±1.5	0.9±1.3	0.31±0.8
Group-B	0.34±0.79	0.89±1.1	1.39±1.4	1.9±1.5	1.3±1.3	0.6±0.89
P-Value	0.91	0.43	0.13	0.05	0.26	0.41

At all time intervals, group A had a smaller mean VAS score differential, but it did not matter. (with a p-value of 0.05 or lower). The TAP block provided the same analgesic effects as

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Levobupivacaine and Ropivacaine in both groups, according to a study of VAS ratings at various points. Six patients in the Levobupivacaine group and eight individuals in the Ropivacaine group require rescue analgesia during the first 12 hours.

Table 2: Percentage of Patients with Postoperative Nausea And Vomiting

Nausea/vomiting	30 mins		120 mins		240mins		360 mins		12 hours		24hours	
	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%

For patients in Group A and Group B, the incidence of nausea was 17%, 7%, and 7% at 30 minutes, 2 hours, and 4 hours, respectively. At 6, 12, and 24 hours, there was no nausea in any of the patients in either group.

The frequency of nausea between two groups at all periods is similar ($p>0.05$). No incident of vomiting was found in any patient within 24 hours. None of the patients needed antiemetic rescue in either category.

DISCUSSION

Proper postoperative analgesia has many benefits, including improved surgical results in particular types of surgery, a reduction in postoperative discomfort, and a reduction in postoperative morbidity. Effective pain management aids regeneration in addition to accelerating surgical recovery and healing. Successful geographic analgesic treatments have a number of benefits, including decreased pain intensity, less analgesic side effects, and higher patient satisfaction.

The published trials examining the utility of the TAP block for postoperative analgesia employed ropivacaine at 0.5 percent or levobupivacaine at 0.5 percent doses. The main finding of our study is that, in patients undergoing lower abdominal surgery, 0.25 percent Levobupivacaine and 0.5 percent ropivacaine are equally efficient in TAP block and have good postoperative analgesia.

Our findings in both groups are comparable with regard to post-operative analgesia, vas ratings, nausea/vomiting, and a few other side effects. A lower VAS score revealed that the TAP block was superior at delivering quick postoperative analgesia. On whether the most recent TAP block trial increases the likelihood of postoperative pain, there is disagreement.

The average VAS score for group A in our sample was 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, during the 30-minute, 2, 4, 6, 12 and 24-hour time periods. At 30 minutes, 2, 4, 6, 12 and 24 hours, group B's mean VAS score was 0.36±0.88, 0.93±1.08, 1.40±1.35, 1.83±1.44, and 0.7±0.91 respectively. The mean VAS score fluctuation in group A was less overall but unimportant at all times. Near ($p>0.05$).

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Our findings in abdominal surgery are comparable to open appendicectomy findings by McDonnell et al. and Carney et al. In 2008, he discovered that anatomical TAP block significantly reduces postoperative pain scores in patients having full abdominal hysterectomy for up to 48 hours.[2,3,4]

McDonnell et al.[3] conducted a randomised, double-blind clinical experiment to examine the analgesic efficacy of TAP block in patients within the first 24 hours after abdominal surgery. At 2, 4, 6, and 24 hours following the induction of anaesthesia with 20 mL of 0.375 percent levobupivacaine injected into the transversus abdominis neuro-fascial plane through the longitudinal lumbar triangles of Petit, a blind researcher examined the patient in the post-anesthesia treatment unit and post-operatively. TAP block decreased the pain scores on the visual analogue scale (TAP vs control, mean±SD) upon emergence (1±1.4 vs 6.6±2.8, $P<0.05$), as well as at all postoperative time points, including 24 h (1.7±1.7 vs 3.1± 1.5, $P<0.05$). [5,6,7]

According to Sharma et al., TAP block via landmark operation raises VAS score in the first 24 hours in patients after major abdominal surgery.[8] A US-guided bilateral TAP block is beneficial for patients having laparoscopic cholecystectomy, according to Petersen et al2012 .'s research[9]. According to Petersen et al., the TAP block did not provide significantly more analgesia than a placebo during inguinal hernia repair. [9]

A Cochrane research and meta-analysis conducted in 2012 found no evidence that TAP block reduces postoperative pain. It's important to note in this context that a meta-analysis discovered that the TAP block lowers postoperative opioid usage, which may be a more crucial factor in selecting an analgesic technique. [10,11]

Twelve studies including 556 participants compared different dosages of levobupivacaine with ropivacaine for various peripheral nerve blocks in a meta-analysis. Uncertainty surrounds the cause of the prolonged analgesic effect that follows a single-shot TAP block. This is attributed to the lack of vascularization in the TAP, which slows drug clearance. [12] Insufficient analgesia following TAP block may also be caused by a technological shortcoming or a visceral pain component that is not alleviated by TAP block. As a result, depending on the operator's ability, all local anaesthetic operations have an intrinsic failure risk of 5 to 20 percent. The most significant therapeutic ramifications of our findings are the significant opioid-saving effects of TAP block in the postoperative phase. Opioids can cause nausea and vomiting, pruritus, and respiratory depression even though they are quite effective at reducing perioperative pain. Since TAP block has an opioid-sparing effect, it may also benefit individuals who are morbidly obese and have obstructive sleep apnea. It may be a more effective option to neuraxial block for intraoperative and postoperative analgesia in individuals with coagulopathy.

Surgical anaesthesia in the distribution of nerves and the ensuing immobility of the limbs were used to define a sufficient loss of pinprick sensation. In this meta-analysis, the surgical anaesthetic onset times of five trials were compared. However, there were no differences between studies that were statistically significant (WMD 0.65; 95 percent CI: 1.25-2.56; heterogeneity: $2 = 12.02$, $P = 0.02$, $I2 = 67\%$). The sensory block's onset time was recorded in six trials. There was no discernible difference between ropivacaine and levobupivacaine in the commencement time of an adequate sensory block across the included tests (WMD 3.57; 95 percent CI: 8.11–0.98). In five tests, the beginning time of sensory block was determined using the pinprick method.

M. Pacheco, J. Roige, S. Gonzalez-Suarez, et al.[13] 0.5 percent ropivacaine and 0.33 percent levobupivacaine were contrasted in the axillary brachial plexus block. The study came to the conclusion that ropivacaine users experienced faster anaesthetic onset.

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Comparison of 0.5 percent ropivacaine and 0.5 percent levobupivacaine for infraclavicular brachial plexus block was the focus of a study by Mageswaran R. and Choy Y.C.[14]. According to this article, the mean time of onset (SD) for ropivacaine sensory block was 13.5 2.9 minutes as opposed to 11.12.6 minutes for levobupivacaine (p = 0.003).

In a prospective, randomised experiment, Messina M, Magrin S, Bignami E, et al.[15] evaluated ropivacaine and levobupivacaine for superficial plexus anaesthesia during carotid endarterectomy. They came to the conclusion that with 0.75 percent ropivacaine, the sensory block onset period was 20 minutes, whereas with 0.5 percent levobupivacaine, it was 29 minutes (P=0.003).

A total of 6 investigations contrasting levobupivacaine and ropivacaine reported the block length. The meta-analysis revealed that levobupivacaine provided longer-lasting anaesthetic than ropivacaine, with a pooled WMD of 2.94 (95 percent CI 5.56 to 0.32). To investigate the interstudy dosage concentration deviation with the large statistical variability that the I2 value was 93%, subgroup investigations were conducted. In the 0.75 percent grouping of concentrations, the effects did not significantly differ between the two drugs. Levobupivacaine, which is close to the entire pooled impact size, favoured the length of the block even if concentrations were 0.5 percent.

In the levobupivacaine community, there was a tendency towards greater sensory block length (WMD, −1.16; 95% CI −1.89 to −0.43; P = 0.002; heterogeneity: χ^2 = 2.32, P = 0.31, I2 = 14%), while the mean motor block duration occurred without any clinically significant differences (WMD, 0.09; 95% CI −0.51–0.69; P = 0.76; heterogeneity: χ^2 = 0.08, P = 0.96, I2 = 0%)

In a study comparing the analgesia and effectiveness of levobupivacaine and ropivacaine in the axillary brachial plexus block, Cline E, Franz D, Polley RD, et al.[16] discovered that the duration of sensory analgesia was marginally longer in the levobupivacaine group (831 minutes) than in the ropivacaine group (642 minutes, P =.013).

In foot and ankle surgery, Fournier R, Faust A, Chassot O, et al.[17] found that utilising 0.5 percent Levobupivacaine instead of ropivacaine results in prolonged analgesia after sciatic nerve block using the Labat protocol.

When bupivacaine, levobupivacaine, and ropivacaine were used at large doses to block the axillary brachial plexus, Liisanantti O, Luukkonen J, and Rosenberg PH[18] discovered that ropivacaine delivered a substantially higher sensory and motor block pressure than levobupivacaine.

Piangatelli C, De Angelis C, Pecora L, et al. investigated the clinical characteristics of psoas block and sciatic nerve block with 0.5 percent levobupivacaine or 0.75 percent ropivacaine.[19] Group L higher motor onset time and longer interval between motor and receptive resolution set it apart from Group R's peculiarities.

The number of patients who needed postoperative rescue analgesia was compared in four studies. The OR-based models revealed that the rate of postoperative rescue analgesia in the ropivacaine group was somewhat higher than in the levobupivacaine group (OR, 2.11; 95 percent CI 1.18-3.74; P = 0.01; heterogeneity: χ2 = 3.82, P = 0.28, I2 = 21%; heterogeneity: χ2 = 3.82, P = 0.28, I2 = 21%). In three studies, analgesic rescue was used when the visual analog scale was greater than 30 mm, and in one study, it was greater than 40 mm.

Levobupivacaine and ropivacaine were both used at the same concentrations, 0.5 percent, in the analysis performed by Roxane Fournier, Alexandre Faust, Olivier Chassot, and Zdravko Gamulin et al.[17]. The average time for the first order of pain relief provided by 20 mL of levobupivacaine 0.5 percent for sciatic nerve block using the labels procedure was marginally longer than for ropi (1605 minutes [577 minutes]). In the ropivacaine population, more people

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required postoperative rescue analgesia (37 of 40 [92.5 percent] versus 30 of 40 [75 percent], P <0.034).

There have been complications related to peripheral anaesthesia documented in a total of 8 investigations contrasting the two drugs to date. Only 2 reports, on the other hand, showed that there were legitimate hazards. Only one instance of intraoperative bradycardia and nausea and vomiting were recorded as adverse events. There were somewhat more issues in the ropivacaine group than in the levobupivacaine group, but not significantly more. It is widely acknowledged that anaemia, hypotension, and nausea are the most common side responses. (all with a 10% frequency). Since they are frequently caused by surgical procedures or other underlying illnesses, these problems are not simply brought on by LAs. When the CNS and cardiovascular effects of two medicines were examined under similar conditions, there were no differences in the mean percentage increases for associated metrics such the stroke index, cardiac index, PR duration, and convulsive threshold dose. When compared to animals given levobupivacaine, ropivacaine-induced cardiac arrest required significantly less adrenaline (epinephrine). Both LAs were well tolerated in clinical practise. With the exception of two trials, all investigations that compared the two medications to date used the same concentrations.

Comparing the two medicines found by Fournier et al. requires taking into account differences in molarity due to the clear differences in molecular weight and existence as a hydrochloride salt or a base.[17] Levobupivacaine was found to be more efficacious than ropivacaine (225 mg) (150 mg).

In patient-controlled continuous interscalene analgesia, Borghi et al.[20] discovered that 0.25 percent levobupivacaine produced better anaesthesia than equivalent (0.25 percent) concentration in a similar clinical setting, but comparable anaesthesia to that induced by equipotent (0.4 percent) ropivacaine concentration.

It was found that equimolar dosages of two LAs have identical effects on the beginning and length of the nerve block on isolated nerves. Ropivacaine and levobupivacaine can therefore be utilised in this situation, although other factors should be taken into account given the complexity and unpredictability of clinical practise.

CONCLUSION

Our research indicates that 0.25 percent Levobupivacaine and 0.5 percent Ropivacaine are equally effective in the TAP block and provide sufficient postoperative analgesia. For post-operative analgesia, ropivacaine is preferred to levobupivacaine due to its superior sensory blockage via TAP block. Ropivacaine results in less motor blockage because it is less lipophilic than bupivacaine and has a lesser propensity to enter big myelinated motor fibres. Since motor blockage is not intended, ropivacaine's higher level of motor-sensory independence may be advantageous. Reduced lipophilicity has also been linked to a lower risk of cardiotoxicity and inflammation of the central nervous system.

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Received:13-08-2022 Revised:26-08-2022. Accepted:15-09-2022