TO COMPARE THE POSTOPERATIVE ANALGESIC EFFICACY OF LEVOBUPIVACAINE AND ROPIVACAINE USING TRANSVERSUS ABDOMINIS PLANE BLOCK IN PATIENTS UNDERGOING INGUINAL HERNIA SURGERIES

Preeti Goyal¹, Rahul Meda²

¹Associate Professor, Department of Anaesthesia, Gajra Raja Medical College, Gwalior.

²Postgraduate Student, Department of Anaesthesia, Gajra Raja Medical College, Gwalior.

ABSTRACT

BACKGROUND

Transversus abdominis plane block is a novel approach for postoperative analgesia after abdominal surgeries.

The aim of the study was to evaluate the postoperative analgesic efficacy of levobupivacaine and ropivacaine using transversus abdominis plane block after elective inguinal hernia surgeries.

MATERIAL AND METHODS

Ninety adult patients of ASA grade I and II were randomly divided into group L receiving TAP block with 0.25% 20 mL levobupivacaine, group R receiving TAP block with 25% 20 mL ropivacaine and control group receiving NS 20 mL after completion of surgery. All the patients were assessed for post-operative pain and rescue analgesic consumption at 10 min., 30 min., 1 hour, 4 hours, 8 hours, 12 hours and 24 hours' time points.

RESULTS

Patients receiving TAP block with ropivacaine or levobupivacaine had significantly lower pain scores as compared to control group at 10 min., 30 min., 1 hr., 4 hr., 8 hr., 12 hr. and 24 hr. However, levobupivacaine provided significantly better analgesia as compared to ropivacaine.

CONCLUSION

TAP block with levobupivacaine or ropivacaine provides effective analgesia in postoperative period.

KEYWORDS

Analgesia, Levobupivacaine, Ropivacaine, Transversus Abdominis Plane Block.

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BACKGROUND

The word pain is derived from the Greek term poine (penalty).¹ The International Association of Pain defines pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage.²

Postoperative pain is defined as a condition of tissue injury together with muscle spasm after surgery.³ Postoperative analgesia is one of the most important factors of perioperative anaesthetic management. The main aim is to improve the comfort and satisfaction of the patient, to facilitate functional recovery, reduce morbidity and promote rapid discharge from hospital.⁴

Traditionally, analgesia for abdominal surgery is provided either by systemic drugs such as opioids, ketamine, nonsteroidal anti-inflammatory drugs, alpha-2 agonists, and paracetamol or by epidural anaesthesia.⁵

TAP block is an alternative, simple to perform and effective peripheral abdominal field block that blocks the lower intercostal (T7-T11), ilioinguinal and hypogastric nerves.⁶

Transversus abdominis plane block (TAP) is a novel technique that improves postoperative pain control after abdominal surgery. It involves block of nerves of anterior abdominal wall by injection of long acting local anaesthetic solution between internal oblique and transversus abdominis muscle. It has been effective in many clinical settings such as abdominoplasty, caesarean section, prostatectomy and colorectal surgery.^{7,8}

The present study aimed to assess and compare the effects of Levobupivacaine and Ropivacaine for postoperative analgesia using transversus abdominis plane block in patients undergoing inguinal hernia repair under subarachnoid block.

MATERIALS AND METHODS

After taking approval from ethical committee and written informed consent, 90 adult patients of ASA Grade I and II scheduled for inguinal hernia surgeries were recruited in this randomised double blind controlled clinical trial. Unwilling patients, patients with BMI < 18 or > 35 Kg/m², compromised liver and renal functions, severe cardiovascular respiratory disease, known allergy to local anaesthetic and infection at the injection site were excluded from the study.

Patients were blinded by the sealed envelope technique and observer anaesthesiologist was kept unaware of which drug was injected to which patient thus avoiding observer bias. Standard monitoring was used. Baseline parameters such as heart rate, continuous electrocardiogram, noninvasive blood pressure, SpO₂ were noted down. Selected

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Corresponding Author:

Dr. Preeti Goyal,

#N-12 Chetak Puri, Gwalior.

E-mail: drpreetiravigoyal@gmail.com

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90 patients were randomly divided into three groups of 30 each depending upon the drug given.

Group L- Injection levobupivacaine hydrochloride 20 mL, 0.25%.

Group R- Injection ropivacaine hydrochloride 20 mL, 0.25%.

Group C- 20 mL of normal saline.

The anaesthesiologist who prepared the drug was not involved in the data collection. Upon arrival of the patient in the operation theatre, intravenous access with 18 G cannula established. 500 mL of crystalloid infusion started. After aseptic precautions, cleaning, painting, and draping done under left lateral position. SAB is induced with 23 G spinal needle in L₃-L₄ intervertebral space. After confirmation of free flow of CSF, 3.5 mL of 0.5% bupivacaine (Heavy) is injected intrathecally. All vital parameters were recorded intraoperatively at different time points. After completion of surgery, the lumbar triangle of Petit located just anterior to latissimus dorsi muscle was identified by palpating the iliac crest in an anterior to posterior direction until the edge of latissimus dorsi was felt. The skin was pierced just cephalic to the iliac crest over the triangle of Petit with a blunt 18 G Tuohy needle. The needle was advanced perpendicular to the skin in the coronal plane until the first resistance of external oblique muscle was encountered. Gentle advancement of the needle resulted in pop sensation as the needle entered the plane between external and internal oblique fascial layers. A second resistance was felt as the needle passed through the internal oblique muscle. A second loss of resistance was felt when the needle reaches the transversus abdominis fascial plane between the internal oblique and transversus abdominis muscle. A test dose of 1 mL was injected to confirm the needle tip placement within the neurovascular plane. After this one of the study drug was injected after careful aspiration to exclude vascular puncture.

Postoperative analgesia was assessed with VAS scale. (0-10 with 0 -No Pain to 10-Very severe pain)

The time of administration of rescue analgesic in the form of injection tramadol 2 mg/kg was noted when VAS was >4. Total dose of tramadol consumed in 24 hours was also recorded.

Adverse effects such as hypotension, bradycardia, nausea, vomiting were also noted during 24 hours. Any complication of the technique like local site infection, haematoma formation, signs of local anaesthetic toxicity, and bowel perforation were observed. The observations recorded in all the groups were tabulated and statistical analysis carried out by using statistical software SPSS 17. Student "t" test for intergroup comparison was used. P value <0.05 was taken statistically significant whereas P-value <0.01 taken to be highly significant.

RESULTS

Variable	Group L (n=30)		Group R (n=30)		Group C (n=30)	
	Mean±SD		Mean±SD		Mean±SD	
Age (Yrs.)	40.9±11.6		40.8±11.54		39.6±12.5	
Weight (Kg)	39.6±12.5		60.4±6.53		57.4±7.23	
Duration of Surgery (Min.)	58.23±6.47		58.23±6.47		57.4±7.23	
ASA Grade I	23	76.6	21	70	20	66.6
ASA Grade II	7	23.4	9	30	10	33.4

Table 1. Demographic Data in all the Three Groups

Variable	Group L (n=30)		Group R (n=30)		Group C (n=30)	
	Mean±SD		Mean±SD		Mean±SD	
VAS Score	5.13±0.12		5.77±0.16		6.64±0.41	
	Group L vs. R		Group R vs. C		Group L vs. C	
	t Value	p Value	t Value	p Value	t Value	p Value
VAS Score	17.00	0.00\$	10.97	0.00\$	19.58	0.00\$

Table 2. Mean (±SD) VAS Score in all Three Groups

Table 2 shows the Mean (±SD) VAS score in all the groups. The mean VAS score in group I was 5.13±0.12, group II was 5.77±0.16 and group III was 6.64±0.41 respectively.

Variable	Group L (n=30)		Group R (n=30)		Group C (n=30)	
	Mean±SD		Mean±SD		Mean±SD	
Time for first Rescue Analgesia (Min.)	208.8±27.02		155±39.53		8.72±6.19	
Variable	Group L vs. R		Group R vs. C		Group L vs. C	
	t value	p value	t value	p value	t value	p value
Time for first Rescue Analgesia (Min.)	6.36	0.00\$	20.67	0.00\$	40.83	0.00\$

Table 3. Mean (±SD) Time for First Rescue Analgesia in Three Groups

Table 3 shows the Mean (±SD) time of first rescue analgesia in all three groups, the mean duration of analgesia in group I was 208.8±27.02 min., group II was 155±39.53 min. and group III was 8.72±6.19 min. respectively.

Table 3 shows the statistical comparison of time for first rescue analgesia among all three groups and was found significant (p<0.05) in group I and II as compared to group III.

p>0.05 (Insignificant).

\$ p<0.05 (Significant).

Variable	Group L (n=30)		Group R (n=30)		Group C (n=30)	
	Mean±SD		Mean±SD		Mean±SD	
Total analgesic Dose (mg)	253.1±50.78		312.50±33.60		396.8±40	
Variable	Group L vs. R		Group-R Vs. C		Group L Vs. C	
	t value	p value	t value	p value	t value	p value
Total Analgesic Dose	5.52	0.00\$	9.13	0.00\$	12.58	0.00\$

Table 4. Total Analgesic (tramadol) Consumption at 24 hours (mg), Mean (±SD) in Three Groups

Table 4 shows the Mean (±SD) of total analgesic consumption at 24 hours in all three groups, the mean duration of analgesic dose in group I was 253.1±50.70 mg, group II was 312.50±33.60 mg & group III was 396.8±40 mg respectively.

Table 4 also shows the statistical comparison of total analgesic dose at 24 hours among all three groups and was found significant (p value<0.05) in group I and II as compared to group III.

p>0.05 (Insignificant). \$ p<0.05 (Significant)

Graph 1. Perioperative Pulse Rate Mean in Three Groups

Graph 2. Perioperative Mean Arterial Blood Pressure Mean in Three Groups

Ninety patients were subjected for trial and data collected were analysed. The three groups were comparable in terms of baseline demographic parameters (Age, weight), ASA Grade, duration of surgery and anaesthesia, perioperative haemodynamic parameters (Pulse rate, systolic and diastolic blood pressure, respiratory rate). A summary of baseline characteristics of the patients has been shown in Table 1.

VAS scores in the postoperative period were significantly reduced in patients who received TAP block with either levobupivacaine or ropivacaine as compared to control group as shown in Table no. 2 (Group L Mean±SD 5.14±0.13, Group R 5.77±0.16 and Group C 6.67±0.41). Also there is a significant reduction in VAS score in patients who received levobupivacaine as compared to patients receiving ropivacaine.

Time for first rescue analgesia is significantly prolonged in group L and group R as compared to control group. (Group L 209.3 ± 27.25 , Group R 152 ± 39.58 , Group C 8.6 ± 5.8). Also there is a statistically significant prolongation of time of first rescue analgesia in levobupivacaine group as compared to ropivacaine group (Table 3).

Significantly increased dose of tramadol is consumed in group C as compared to group L and R (Group L 253.3 ± 50.74 , Group R 313.3 ± 34.57 , Group C 396.6 ± 41.38). The patients who received levobupivacaine requires significantly less tramadol in postoperative period as compared to patients who received ropivacaine (Table 4).

There was statistically insignificant difference between the three groups in terms of median values of intraoperative and postoperative pulse rate, mean arterial blood pressure (Graph I and II).

Only one patient in group L, and 2 patients in group C had nausea in postoperative period, 16.6% patients in group L, 6.67% in group R and 10% patients in group C suffered shivering. None of the patients suffered hypotension, bradycardia, dyspnoea, chest pain and dysrhythmia. None of the patient had complication related to TAP block.

DISCUSSION

Pain has been found to be one of the three most common medical causes of delayed discharge after ambulatory surgery, the other two being drowsiness and nausea/vomiting. Despite this overwhelming rationale for postoperative pain control, the clinical reality is unfortunately still far from satisfactory.⁹

Postoperative analgesia is one of the main concerns of both the surgeons and the patients after every surgery. Effective postoperative pain control is an essential component of the care of the surgical patient. Inadequate pain control, apart from being inhumane, may result in increased morbidity or mortality.¹⁰ Traditionally, opioids are the mainstay of systemic analgesia for the treatment of moderate to severe postoperative pain. Unfortunately, opioid related side effects limit their use in many patients. Analgesics that act by different mechanisms and at different receptor sites can be combined to produce additive pain relief and can reduce opioid use.

TAP block is a local anaesthetic block used to provide analgesia to anterior and lateral abdominal wall. TAP block after surgery has been demonstrated to provide safe and effective postoperative pain relief with better quality of pain control, decreased incidence of side effects, and higher degree of patient satisfaction than patients controlled by analgesia with opioid drugs.¹¹

Racemic bupivacaine is gradually being replaced by ropivacaine or levobupivacaine. This change is driven by the reduced potential for systemic toxicity and the lower risk of motor blockade.¹² Studies proved that a concentration of 0.25% 20 mL levobupivacaine provided best postoperative analgesia given by transversus abdominis plane block.¹³ The volume of LA to be deposited was derived from previous studies.¹⁴⁻¹⁷ TAP block with plain solution of levobupivacaine 0.25% provides more effective pain relief as compared to ropivacaine in the postoperative period. The time to first analgesic request is significantly prolonged with levobupivacaine and ropivacaine as compared to control group. The findings are consistent with various other

studies.^{18,19} Although none of the studies compared levobupivacaine and ropivacaine in TAP block for postoperative analgesia but their analgesic efficacy is compared by pre-incisional local infiltration after laparoscopic cholecystectomy by Papagiannopoulou P et al²⁰ which also showed similar results as our study but the concentration of ropivacaine and levobupivacaine used were 1% and 0.5% respectively.

In our study, the total dose of tramadol consumption in 24 hours postoperatively is lower in levobupivacaine group as compared to ropivacaine group. Similar results are observed by other studies.^{13,20-22} Significant reduction of VAS score is observed in patients who received TAP block with either levobupivacaine or ropivacaine as compared to control group. The results of our study are consistent with the findings of other studies.^{18,23-27}

The haemodynamic parameters remained stable perioperatively with both drugs used in TAP block. The results are in accordance with other studies.^{21,27-30}

The present study has certain limitations. The pain scores at movement have not been taken into account. Evaluation of sensory block level was not undertaken because the block was performed under the effect of subarachnoid block.

CONCLUSION

Although TAP block with 0.25% ropivacaine or 0.25% levobupivacaine provided adequate analgesia postoperatively in patients undergoing inguinal hernia surgeries, levobupivacaine provided significantly superior analgesia as compared to ropivacaine.

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