Original Article

Comparison of Analgesic Effects of Levobupivacaine (0.25%) *versus* Bupivacaine (0.25%) using Ultrasound Guided Transversus Abdominis Plane Block in Total Abdominal Hysterectomy under General Anesthesia — An Interventional Study

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Background : Transversus Abdominis Plane (TAP) block is recently being used for effective pain relief following Total Abdominal Hysterectomy (TAH). Ultrasound guided block helps in correct localization of the plane and proper deposition of drugs. This study was done to compare the efficacy of Levobupivacaine and Bupivacaine in TAP block in TAH.

Materials and Method : Seventy patients (ASA 1 and 2) prepared for TAH under General Anesthesia were randomly allocated into two groups. Ultrasound guided TAP block was performed bilaterally with 20ml of Levobupivacaine (0.25%) in Group A (n=35) and Bupivacaine (0.25%) in Group B (n=35) on each side of abdomen after skin closure at the end of operation. Intensity of pain was evaluated by 10cm Visual Analogue Scale (VAS) score at 0, 2, 6, 12,24 hours. If VAS >3, 1gram paracetamol infusion was given as rescue analgesic. Duration of analgesia, total rescue analgesic requirement and hemodynamic changes by measuring MAP and PR were noted.

Results : VAS at 12 hours was significantly lower in Group A (mean 3.2±1) than Group B (mean 4.1±0.7, p<0.0001). Time of first rescue analgesic requirement was longer in Group A (mean 12.0±1.1h) compared to Group B (mean 11.2±1.1h, p=0.0059). Total analgesic requirement(paracetamol) in 24 hours was lower in Group A (mean 1.7±0.7g) compared to Group B (mean 2.2±0.7g, p=0.007). Hemodynamic changes were comparable in both groups.

Conclusion : Levobupivacaine provided better postoperative analgesia than Bupivacaine with stable hemodynamic condition in TAP block.

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***Key words* : TAP block, Levobupivacaine, Bupivacaine, Postoperative analgesia.**

Moderate to severe pain is experienced by the patients after lower abdominal surgery. Anterolateral abdominal wall is innervated by the Ventral Rami of the spinal nerve T_7 to L_1. Intercostal Nerves (T_7 toT_{11}) exit the intercostal space and run in the neurovascular plane between the internal oblique and transversus abdominis muscle[1]. Local anaesthetic injection in this plane will provide good postoperative analgesia in lower abdominal surgery. Presently TAP block is used for postoperative analgesia in various kind of surgical procedures namely open/ laparoscopic cholecystectomy and appendectomy[2], Cesarean section, Total Abdominal Hysterectomy (TAH), open Prostatectomy and Hernia repair. Hebbard *et al*[3]. described Ultrasound guided TAP block in 2007. Ultrasound imaging helps in accurate localization of the plane and proper deposition of drug, thereby leading to increased success and reduced complication rate. Anterolateral abdominal wall block depends on the spread of local anesthetic agents through the Musculo-facial Plane to Anaesthetize Multiple Small Nerve and plexuses[1]. Reliable blockade of dermatomes can be accomplished with good volume of local anesthetic agents (20-30ml). With use of large volume of Local anaesthetic, there is markedly higher chance of Systemic Toxicity[4]. An alternative newer local anesthetic (eg, levobupivacaine) with less systemic toxicity in the same dose will be more safe and effective. Sommer M, de Rijke JM, van kleef M, *et al*[5] found in their study that prevalence of moderate to severe pain in abdominal surgery was high in first 24 hours. So,

Editor's Comment :

- Transversus Abdominis Plane block is one of the important method of pain management in abdominal surgery. As the total drug requirement of Local Anaesthetic Agent is very high, so our aim was to find out one important local anesthetic agent with less side effects. We have used Laevobupivacaine, (a safe drug with less side effects) compared with commonly used drug Bupivacaine and observed better analgesic effects with high safety profile.

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our aim was to alleviate pain effectively in first 24 hours postoperative period. Primary outcome of this study was to compare the analgesic efficacy of levobupivacaine 0.25% *versus* bupivacaine 0.25% in terms of duration of analgesia, from time of injection upto requirement of rescue analgesia. Secondary outcomes were postoperative VAS score, total analgesic requirement in 24 hours following surgery, hemodynamic changes and other side effects.

Materials and Methods

After approval of Institutional Ethics Committee, 70 ASA (1 and 2) patients posted for TAH were included in the study and written informed consent taken. Patients with BMI >30 or<20, known allergy to drug used, Cardiac and Neurological Diseases, Chronic Opioid users were excluded. Patients were randomly divided into two equal Groups (Group A and Group B) with Sealed Envelope System. Inside the operating room, patients were attached with standard ASA monitors. All patients received standardized anaesthetic technique. Premedication (midazolam 0.05-0.15mg/kg, fentanyl 2mcg/kg) were administered before induction. All patients were induced with propofol (2-3mg/kg) and atracurium (0.5mg/kg) dose was used for intubation. Maintenance of anaesthesia achieved with O_2/N_2O (40:60) ratio, isoflurane (0.6-1%) and atracurium (0.1mg/kg) at interval. Infusion paracetamol 1gram was given for required analgesia.

At the end of operation, after skin closure, while maintaining the patient under General anaesthesia, antiseptic dressing and draping was done keeping the patient in supine position. Using sterile jelly and sterile cover, high frequency linear ultrasound transducer was placed in mid-axillary line at midpoint between lower costal margin and highest point of iliac crest and pointer directed medially. After proper visualization of Muscle layers of Antero-lateral Abdominal Wall, ultrasound compatible needle was introduced in plane (medial to lateral) at Anterior Axillary Line. The needle was introduced further and placed at transversus abdominis plane between internal oblique and transversus abdominis muscle. After confirming needle position with 2ml of 0.9% normal Saline and negative aspiration of blood, 20ml of Levobupivacaine 0.25% was injected bilaterally in group A. In group B 20ml of Bupivacaine 0.25% was injected bilaterally following the same procedure. After extubation, intensity of pain was assessed by VAS Score at 0, 2, 6, 12, 24 hours. Duration of analgesia was calculated from the time of injection upto the requirement of first rescue analgesic. When VAS score>3, infusion paracetamol 1gram was given IV. Total analgesic requirement was calculated at 24 hours. Baseline pulse rate and Mean Arterial Pressure (MAP) were noted and then followed up at 0, 2, 6, 12, 24 hours (Figs A & B).

Fig A — Sonoanatomy of anterior abdominal wall

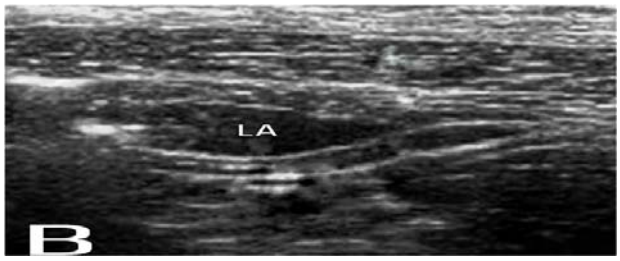

Fig B — Local anaesthetic agent splitting the transversus abdominis plane

Power analysis was done based on previous studies to measure the mean difference of duration of analgesia (1 hour) in between two groups. The sample size was calculated to be 33 in each group with 95% confidence level and power of the study 80%. Considering possible dropouts, we included 35 patients in each group.

For statistical analysis, data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSSInc, Chicago, IL, USA) and graph pad prism version 5. Data has been summarized as mean and standard deviation for numerical variables and count and percentage for categorical variables. P value <0.05 was considered as statistically significant.

Results

Table 1 — *Demographic data and ASA distribution*

	Group A Levobupivacaine N=35	Group B Bupivacaine N=35	P-value
Age (years) Mean±SD	41.6±4.5	43.1±4.8	0.1850
Weight (kg) Mean±SD	57.7±2.8	57.9±2.8	0.7677
Height (cm) Mean±SD	151.1±0.1	149.1±0.0.1	0.1599
BMI (kg/m2) Mean±SD	25.3±1.5	26.1±1.8	0.0689
ASA I	19	22	0.4666
(no) II	16	13	

Both groups were similar for age, weight, height, BMI and ASA distributions.

Differences in VAS score at 0, 2, 6 hours were not statistically significant.

In group A, the mean VAS score at 12 hours (mean±SD) was 3.2±1.In Group B it was4.1±0.7.

Difference of mean VAS score at 12 hours with both group was statistically significant (p<0.0001) (Fig 1).

In Group A, the mean VAS score at 24 hours was 2.8±0.6.

In Group B it was 3.3±0.7.

Difference of mean VAS score at 24 hours with both Group was statistically significant (p=0.005).

In Group A, first dose of rescue analgesic was given at 12.0±1.1hour. In Group- B, it was at 11.2±1.1h. Difference of mean first dose of rescue analgesic in both groups was statistically significant (p=0.0059)(Fig 2).

In Group A, mean analgesic requirement at 12 hours was 0.6±0.5gram. In Group B, mean analgesic requirement at 12 hours was 0.9±0.3 gram. Difference of mean analgesic requirement at 12 hours in both group was statistically significant (p=0.012)(Fig 3).

In Group A, mean total analgesic requirement at 24 hours was 1.7±0.7gram.

In Group B, mean total analgesic requirement at 24 hours was 2.2±0.8gram.

Difference of mean analgesic requirement at 24 hours in both group was statistically significant (p=0.007)(Fig 4).

Pulse rate at 0,2,6,12,24 hours in both group were not statistically significant (Fig 5).

MAP at 0,2,6,12,24 hours in both group were not statistically significant

No patient experienced any complication related to TAP block in 24 hours (Fig 6).

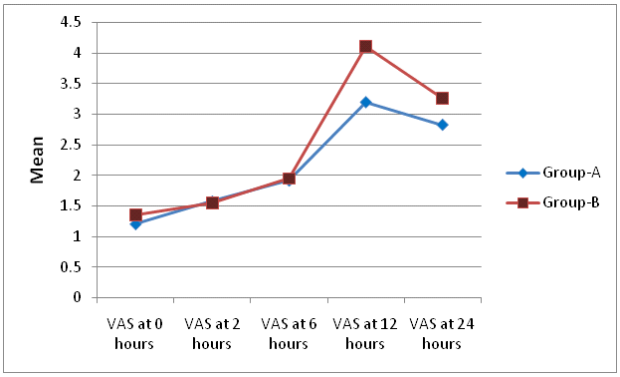

Fig 1 — Distribution of mean VAS score at 0, 2, 6, 12 and 24hours

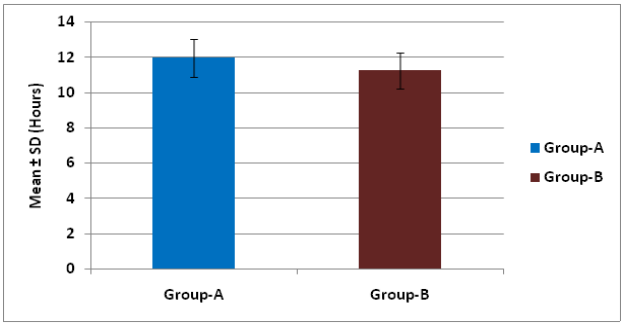

Fig 2 — Distribution of mean first dose of rescue analgesic

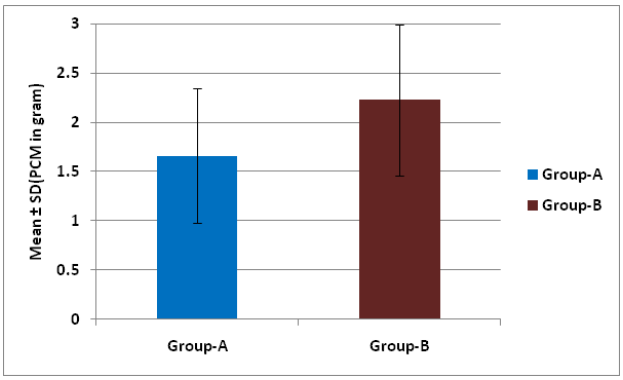

Fig 3 — Distribution of mean analgesic requirement at 12 hours(paracetamol in gram)

Discussion

In this study, we compared postoperative analgesic

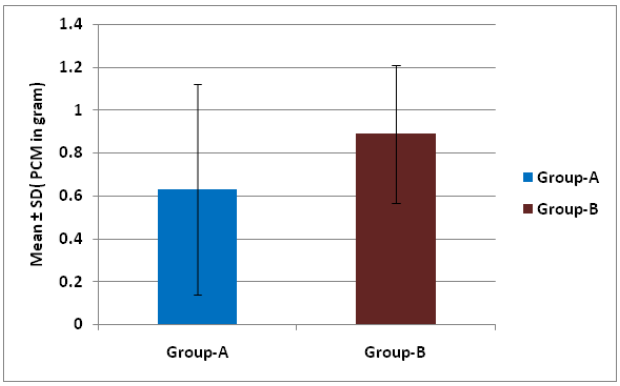

Fig 4 — Distribution of mean total analgesic requirement in 24 hours(paracetamol in gram)

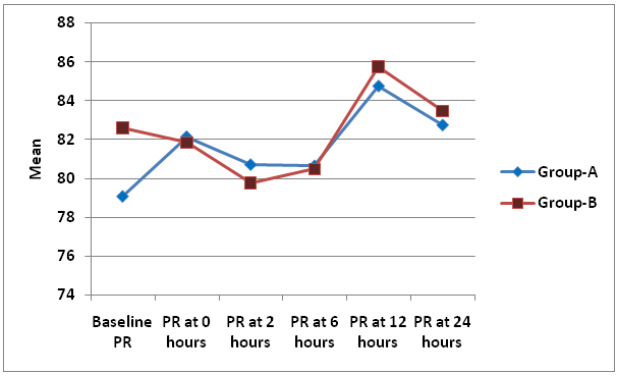

Fig 5 — Distribution of mean baseline PR , PR at 0, 2, 6, 12, 24hours

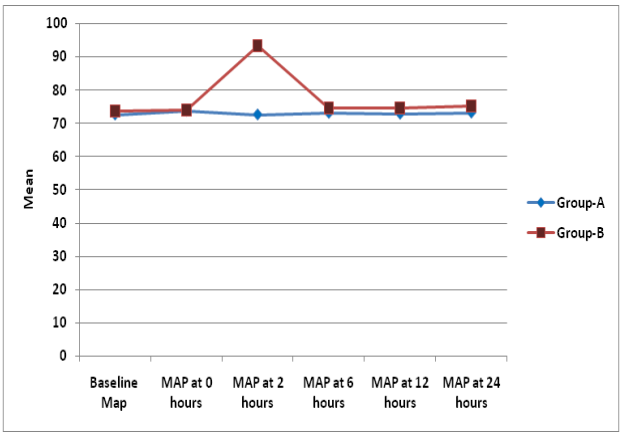

Fig 6 — Distribution of mean baseline MAP, MAP at 0, 2, 6, 12, 24hours

efficacy of Levobupivacaine and Bupivacaine in ultrasound guided bilateral TAP block following TAH under General Anesthesia. Group A and B received 20 ml of (0.25%) Levobupivacaine and Bupivacaine respectively on each side.

We found that durations of analgesia was more in Levobupivacaine group. Mean VAS at 12 hours and 24 hours postoperatively were significantly lower in Group A than Group B (p value<0.0001 and p value=0.005 respectively). We also found that mean requirement of first dose of rescue analgesic was delayed in Group A than Group B (p=0.005). Analgesic requirement at 12 hours and total requirement at 24 hours were significantly lower in Group A than Group B (p value=0.012 and p=0.007 respectively). There was no significant changes in hemodynamic status in both groups.

Atim *et al*[6], Bhattacharjee *et al*[7], Carney *et al*[8], Hyun-Jung Shin *et al*[9], Heidi Chang *et al*[10]stated in their study that TAP block provided better postoperative analgesia at 6, 24 hours in patients undergoing TAH.

Hebbard *et al*[3] described ultrasound guided TAP block in 2007. Use of ultrasound imaging helps in correct localization of plane, proper deposition of drug and thus improved efficacy of the block which was similar to our observation.

Bilateral TAP block was used in various types of lower abdominal surgery apart from Hysterectomy and showed better postoperative pain control.

Yahia A. Hemimi *et al*[11], Belavy D *et al*[12] showed in their study that ultra sound guided continuous TAP block decreased systemic analgesic requirement and better pain control in first 24hours of Caesarean Section.

Essam Mahran *et al*[13] Ghisi D *et al*[14] in their study stated that ultra sound guided TAP block by subcostal approach was an effective method for postoperative analgesia and reduced morphine consumption in robot-assisted Laparoscopic Abdominal Cancer Surgery.

Hoda Shokri, Karim O Elsaeed[15] found in their study that ultrasound guided TAP block was more effective comparing VAS score and less pethidine requirement in Urological Surgery.

Ra *et al*[16] compared TAP block with two different concentration of Levobupivacaine (0.5% and 0.25%) and they found similar efficacy in two group. Lower local Anaesthetic concentration with similar efficacy is always desirable to prevent toxicity. So we have used 0.25% of both the drugs.

Preeti Goyal, Rahul Meda[17] compared the postoperative analgesic efficacy of Levobupivacaine (0.25%) and ropivacaine (0.25%) in TAP block, for Inguinal Hernia Surgery in adults and found levobupivacaine provided significantly better analgesia compared to Ropivacaine.

Sharma *et al*[18]compared levobupivacaine (0.25%) and Bupivacaine (0.25%) for caudal analgesia in children undergoing herniotomy and they found that both drugs were similarly effective.

Compagna *et al*[19] conducted Inguinal Hernioplasty under Local Anaesthesia comparing Bupivacaine and levobupivacaine in elderly patients. They found that both drugs were similarly effective in intra and postoperative analgesia.

ArzuYildirim Ar *et al*[20] compared the potency of Bupivacaine and Levobupivacaine in ultrasound guided TAP block for postoperative analgesia in patients undergoing Laparoscopic Cholecystectomy. TAP block under Ultrasound guidance was performed bilaterally with Levobupivacaine 0.25% 30ml2(n=25) and bupivacaine 0.25% 30ml (n=25). VAS score was significantly lower in Levobupivacaine group (p=0.049) postoperative 1, 2, 4, 6 hours similar to our study. There was no significant different in VAS score at 12 hours and 24 hours postoperatively. But in our study, we found significantly low VAS score in Levobupivacaine group (p<0.0001 and 0.0076 respectively) throughout 24 hours. ArzuYildirim Ar *et al* found no difference in rescue analgesic requirement between two groups. But in our study, we found that total rescue analgesic requirement in 24 hourswas less in group A than group B (p<0.05). Less VAS score at 12h, 24h and increased total rescue analgesic requirement in our study may be due to racial difference in height, weight, drug dose and other factors which provided superior analgesic property of Levobupivacaine in our study. Therefore we conclude that Levobupivacaine is a better alternative to Bupivacaine for ultrasound guided TAP block for

postoperative analgesia following Total Abdominal Hysterectomy.

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