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ULTRASOUND GUIDED TRANSVERSE ABDOMINIS PLANE BLOCK USING BUPIVACAINE VERSUS LEVOBUPIVACAINE IN LOWER ABDOMINAL SURGERY IN PAEDIATRIC AGE GROUP

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ABSTRACT

The use of transversus abdominis plane block with different local anesthetics is considered as a part of multimodal analgesia regimen in lower abdominal surgeries. How ever no studies have been published comparing bupivacaine and levobupivacaine for transversus abdominis plane block in a pediatric age group. We aimed to compare bupivacaine and levobupivacaine in ultrasound-guided transversus abdominis plane block in patients undergoing lower abdominal surgeries. Its a Randomised double-blind control study with 50 patients with ASA physical status I – II having patients of either sex, of age between 2-10

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years with normal liver and renal functions, scheduled for lower abdominal surgery.25 patients in each group. e.g. group B and Group L On comparing the FLACC between the two group, no significant differences were found at 0 min (p=0.631), 1 hr (p=0.937), 2 hr (p=0.317), 4 hr (p=0.317), 6 hr (p=0.371) and 24 hr (0.572). But this difference was found to be significant at 15 min (p=0.016), 30 min (p<0.001), 12 hr (p<0.001) and 18 hr (p=0.028) where the mean FLACC of group B was much more than the group L.The mean time of Post Op analgesia started in group B was 8.44±1.56 hr while in group L the mean Post-op analgesia started was 9.44±1.04 hr. The significant difference in the meantime of Post Op analgesia started was found between the groups (p=0.010). This study concludes that 0.25% Levobupivacaine provided a longer duration of analgesia compared to 0.25% Bupivacaine when used in TAPB for providing postoperative analgesia after lower abdominal surgeries.

KEYWORDS: Transversus Abdominus, Bupivacaine, Levobupivacaine, Post-Operative Analgesia, Lower Abdominal Surgeries

INTRODUCTION

Pain in the pediatric age group for any surgery is much more severe than an adult. As they are unable to express the severity and type of pain so morbidity in this age group is high and this also affects the outcome of surgery so new nerve block studies are needed to overcome these problems. Regional anaesthesia is an essential aspect of modern pediatric anaesthesia which provides superior and long-lasting analgesia without the risk of respiratory depression (1).

The TAP block was first described by McDonnell et al. in 2004, (2) and a ultrasonography (USG)-guided technique was subsequently described by Hebbard et al (3).USG-guided TAP block provides excellent pain relief in lower abdominal surgeries.⁴The transversus abdominis plane (TAP) block was first introduced by Rafi in 2001 as a landmark guided technique via the triangle of Petit to achieve a field block (5). It involves the injection of a local anaesthetic solution into a plane between internal oblique muscle and transversus abdominis muscle. 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 (6), the local anaesthetic spread in this plane can block the neural afferents and provide analgesia to the anterolateral abdominal wall.It is perfectly suited for use after abdominal and gynecological surgeries (7).

With the help of ultrasound imaging techniques, we are now able to accurately position the needle and determine the distribution of a local anaesthetic in real time, which can improve the quality of nerve block, shorten its latency, and reduce the volume required to secure its success (8-10). Tap block using bupivacaine shows, TAP block is superior to local infiltration for intra- and immediate postoperative analgesia in pediatric laparoscopic surgeries (11). Levobupivacaine is a safe and efficacious multimodal analgesic regimen for postoperative pain after open gynecological surgery (12). In this study, we will try to find out the best outcome among the two drugs for the TAP block.

MATERIAL & METHODS

This Double Blind Randomized control trial over a period of one year (August 2018 to July 2019) at the Department of Anesthesiology, cases done in Department of Pediatrics Surgery, King George's Medical University, Lucknow, Uttar Pradesh, India. To compare the effect of USG guided TAP using Bupivacaine Vs Levobupivacaine in lower abdominal surgery in the pediatric age group. After getting approval from the institutional ethical committee (Ref.code-92nd ECM IIB Thesis/P4), patients in ASA grade I and II and the 2-10yr age group were included in the study. All patients were informed and written consent was obtained regarding the procedure and drugs being used in the study and were allowed to raise questions regarding the same.

Procedure: All procedures performed under aseptic conditions. The linear ultrasound transducer was used to visualize the Transverse abdominis plane. After completion of the surgical procedure, we put ultrasound-guided Transversus abdominis plane block by the lateral approach. Patients were awakened and extubated after the reversal of muscle relaxants and transferred to the post-anesthesia care unit.

Lateral TAP Block: Identified the typical three muscles layers at the midaxillary line between the costal margin and iliac crest. After measuring the depth of the TAP, a needle is inserted away from the transducer at the same distance according to the principle to make the needle in plane for deep regional blocks. The needle is advanced into the transversus abdominis and pulled back incrementally with regular aspiration and then the plane is hydro dissected until the eye sign, an elliptical, hypoechoic spread of local anesthetic is seen.

The transversus abdominis plane is a triangular fascial plane over the abdomen in between the internal oblique and transversus abdominis muscle. Its anterior border is formed by linea semilunaris (13). The superior border of the TAP plane is formed by the subcostal margin, from 9th to 12th costal cartilage continued into the border of the latissimus dorsi muscle and the lumbar triangle of Petit. The inferior border of the TAP is the inguinal ligament, iliac crest and posterior border of the lumbar triangle of Petit (14). (Figure 1) The intercostal, subcostal, iliohypogastric and ilioinguinal nerves course through the lateral abdominal wall within the TAP before they pierce the musculature to innervate the abdomen (15-16). There is an extensive branching and communication between nerves within the TAP (17).



Fig 1: Anatomy of Transversus Abdominis Plane

RESULTS Sample Size = 50 equally divided into two groups Group-B: Bupivacaine -25 subjects Group-L: Levobupivacaine- 25 subjects The study revealed the following results:

Variable	Group B		Group L		t-value	p-value
	Mean	SD	Mean	SD		
Age (in yrs)	5.16	1.97	5.22	1.93	109	.914
weight (kg)	18.60	6.25	19.04	6.86	237	.814

 Table 1: Distribution of Cases According to Age & Weight

Sex	Group B		Group L		chi sq	p-value
	No.	%	No.	%		
Female	12	48.0	10	40.0	0.33	0.569
Male	13	52.0	15	60.0		
Total	25	100.0	25	100.0		

Table 2: Gender Distribution of Cases

The mean age and weight of the included patients for group-B was 5.16 ± 1.97 years and 18.60 ± 6.25 kg while for the patients of group-L was 5.22 ± 1.93 years and 19.04 ± 6.86 kg respectively.No significant difference was found in mean ages of the two groups (p=0.914) and in mean weights of the two groups (p=0.814).

In the group-B males were 52.0% while the proportion of females was 48.0%. In the group-L males were 60.0% while the proportion of females was 40.0%. No significant difference was found in the proportion of males & females between the two groups (p=0.569).

Rescue Analgesia		Gro	up B	Group L				
		No.	%	No.	%	chi sq	p-value	
0 min after TAP block	No	25	100.0	25	100.0	NA	NA	
15 min	No	25	100.0	25	100.0	NA	NA	
30 min	No	25	100.0	25	100.0	NA	NA	
1 hr	No	25	100.0	25	100.0	NA	NA	
2 hr	No	25	100.0	25	100.0	NA	NA	
4 hr	No	25	100.0	25	100.0	NA	NA	
	No	24	96.0	23	92.0	0.26	0.550	
6 hr	Yes	1	4.0	2	8.0	0.36	0.552	
12.1.	No	6	24.0	18	72.0	11.54		
12 nr	Yes	19	76.0	7	28.0	11.54	0.001	
18 hr	Yes	25	100.0	25	100.0	NA	NA	
24 hr	Yes	25	100.0	25	100.0	NA	NA	
Intra Op.	Yes	25	100.0	25	100.0	NA	NA	
Total		25	100.0	25	100.0			

Table 3: Distribution of Cases According to Analgesia Given After TAP Block at Various Interval

Rescue analgesia was required at 6 hr and onwards. At 6 hr and 12 hr the required proportion in group B was more than the group L and the difference in proportion at 12 hr was found to be significant (p=0.001).

НР	Group B		Grou	ıp L	t-value	p-value
TIK	Mean	SD	Mean	SD		
Pre Op	92.32	7.78	92.56	4.94	130	.897
0 min after TAP block	124.88	11.32	123.56	9.09	.455	.651
15 min	111.20	9.05	103.88	10.33	2.665	.010
30 min	101.60	7.59	98.04	7.21	1.700	.096
1 hrs	99.24	7.29	94.56	16.10	1.324	.192
2 hrs	97.04	7.63	95.20	7.38	.867	.390
4hrs	96.40	7.88	95.04	7.10	.641	.525

Table 4: Comparison of Heart Rate Between the Groups

6 hrs	92.80	18.04	95.72	8.69	729	.469
12 hrs	101.52	8.05	99.80	7.68	.773	.443
18 hrs	105.16	7.47	102.72	8.56	1.074	.288
24 hrs	106.64	7.49	104.64	8.77	.867	.390

Cont. Table 4: Comparison of Heart Rate Between the Groups

On comparing the heart rate between the groups, significant differences were found at 15 min (p=0.010) where the mean heart rate of group B was much more than the group L.

FLACC	Group B		Group L		t-value	p-value
TLACE	Mean	SD	Mean	SD		
0 min after TAP block	4.64	1.08	4.76	0.93	480	.631
15 min	3.04	0.61	2.60	0.65	-2.408	.016
30 min	1.48	0.77	0.56	0.51	-4.136	<0.001
1 hrs	0.24	0.44	0.28	0.54	078	.937
2 hrs	0.04	0.20	0.00	0.00	-1.000	.317
4hr	0.04	0.20	0.00	0.00	-1.000	.317
6 hrs	0.24	0.66	0.08	0.28	895	.371
12 hrs	1.76	1.05	0.72	0.61	-3.751	< 0.001
18 hrs	2.32	0.99	1.76	0.60	-2.200	.028
24 hrs	2.36	0.86	2.48	0.51	565	.572

Table 5: Comparison of FLACC Between the Groups

On comparing the FLACC between the groups significant differences were found at 15 min (p=0.016), 30 min (p<0.001), 12 hr(p<0.001) and 18 hr(p=0.028) where the mean FLACC of group B was much more than the group L.

Variable	Group B		Group L		t-value	p-value
	Mean	SD	Mean	SD		
Post Op Analgesia	8.44	1.56	9.44	1.04	-2.668	.010
Started (hr)						

Table 6: Comparison of Time of Post Op Analgesia Started Between the Groups

The mean time of Post Op analgesia started in group B was 8.44 ± 1.56 hr while in group L the mean Post Op analgesia started was 9.44 ± 1.04 hr. The significant difference in mean time of Post Op analgesia started was found between the groups (p=0.010).

DISCUSSION

In the present study, authors have compared the reduction in post Operative pain between bupivacaine and Levobupivacaine group; also compare the reduction in the use of rescue analgesia in the postoperative period and to compare the hemodynamic parameters in paediatric age group(2-10yr). Although general anaesthesia is the commonly used technique in children, regional anaesthesia is used as an adjuvant for intraoperative and postoperative pain relief.² In Present study, FLACC score being used with its 0-10 score range to access the post operative pain, (18) by a blinded observation at the time of discharge from the post anaesthesia care unit and then at 0 min, 1 hr, 2 hr, 4 hr, 6 hr and 24 hr for the first 24 h after operation. Sandra et al, found that FLACC provide simple framework for quatifying pain behavior in children who may not be able to verbalize the presence or severity of pain (19). Gozen et al also used the FLACC score for assessing the pain at postoperative 30-minute and 1-, 2-, 4-, 6-, 12-, and 24-hour to compare the quadratus lumborum block versus transversus abdominis plane block in children undergoing low abdominal surgery^{28.} Sola C et al conducted a study in which Patients were assessed using the FLACC (face, legs, activity, cry and consolability) pain scale, the rescue analgesic consumption in the PACU and day-case unit and the postoperative pain measure for parents score at home and found satisfactory (20).

In present study on comparing the FLACC between the groups, no significant differences were found at 0 min (p=0.631),1 hr (p=0.937), 2 hr (p=0.317), 4 hr (p=0.317),6 hr (p=0.371) and 24 hr (0.572). But this difference was found to be significant at 15 min (p=0.016), 30 min (p<0.001), 12 hr (p<0.001) and 18 hr (p=0.028) where the mean FLACC of group B was much more than the group L Which clearly define that Levobupivacaine had better reduction of pain than bupivacaine. This also gives an idea about its onset of action as in study the difference was significant at 15min, means levobupivacaine had a quite early effect than Bupivacaine. There were some studies who supports the present study. Sola c et al, used ultrasound guided administration of 0.2 ml/ kg of 0.2% levobupivacaine in the TAP provided efficient perioperative analgesia in 95% of children who underwent herniorrhaphy. Armando j Lorenzo et al, revealed that no significant advantage of TAP block using bupivacaine in terms of better FLACC pain scores post operatively, as they found FLACC pain score was high in Bupivacaine group. so this study also supports my present study (21). As there is no study conducted to compare Bupivacaine and Levobupivacaine for TAP block so further studies are necessary to specify it.

In present study, If FLACC pain scale score at any time to

be more than 3, IV acetaminophen 15 mg/kg/dose was administered as rescue analgesia to achieve FLACC scale score of 3 or less, with maximum daily dose of 75 mg/kg/day. Patients were observed for 20 min after IV acetaminophen; if FLACC pain scale score remained more than 3, i.v. diclofenac sodium 1 mg/kg/dose was given with maximum daily dose of 120 mg/day. Armando j Lorenzo et al, also uses the same scale for pain management which support present study.

In present study, found that the time since rescue analgesia was required in 24 hr and found that at 6 hr and 12 hr the required proportion in group B (Bupivacaine) was more than the group L (Levobupivacaine) and the difference in proportion at 12 hr was found to be significant (p=0.001). Raghunath P et al conducted the study using 0.25% levobupivacaine used for TAP block which provides analgesia for 8 hours postoperatively and also lesser requirement for IV analgesic medication. Faiz SHR et al and Imani F et al TAP block is an effective method for pain relief after surgery and in reducing the use of narcotic analgesics, which can reduce the length of hospital stay, nosocomial infection and health care costs (22). Raghunath P et al found that levobupivacaine in the place of bupivacine with half the concentration of bupivcaine used in the 0.5% bupivacaine with a TAP block in an open appendectomy, and the morphine requirement and pain scores decreased in the first 24hours (23). Armando j Lorenzo et al, also found that ultrasound guided TAP block using bupivacaine revealed no significant advantage in terms of decreased opioid consumption. These studies `supports my present study as in present study Levobupivacaine had used and found significant analgesia required in bupivacaine group at 6hr and 12hr. Yildirim A, et al also compare the same drugs in adults undergoing laparoscopic cholecystectomy and found that analgesic requirement was similar in both groups (24). Time to first analgesic requirement was shorter in Group L (4.35±6.92min vs. 34.91±86.26min, p=0.013). Visual analogue scale levels showed no difference, and they concluded that Bupivacaine and levobupivacaine showed similar efficacy at TAP block in patients undergoing laparoscopic cholecystectomy. There study neither oppose my study nor supports in terms of final result as they found no difference in efficacy in both the drugs. Dalia M E et al, (2) there study demonstrated that NSAID and paracetamol requirements were decreased in patients who benefited from a TAP block.

In present study the mean time of Post Op analgesia started in group B was 8.44 ± 1.56 hr while in group L the mean Post Op analgesia started was 9.44 ± 1.04 hr. The significant difference in mean time of Post Op analgesia started was found between the groups (p=0.010). Seyedhejazi M et al found that the mean time of need for the first analgesia after surgery intervention and control group was 9.81 ± 8.89 and 8.81 ± 6.75 hours respectively which supports our study (25). ArzuYildinmAr et al performed study using Bupivacaine and levobupivacaine in patients undergoing laparoscopic cholecystectomy and found the results bupivacaine and levobupivacaine shows Time to first analgesia (tenoxicam) requirement and time to first tramadol requirement were shorter in Group L compared to Group B (p < 0.05) which is oppose my study (26).

On comparing the heart rate between the groups, significant differences were found at 15 min (p=0.010) where the mean heart rate of group B was much more than the group L. The raised heart rate in Bupivacaine group could be becouse of pain which was not yet decrease after giving TAP block using bupivacaine as it would have take more to for its action that Levobupivacaine. Seyedhejazi M et al found that the mean heart rate of the patients showed no statically significant in the two groups before and after surgery and recovery this study neither support or oppose present study.

On comparing the SPO2 between the groups, significant differences were found at 0 min (p=0.002), 12 hr (p=0.012), 18 hr (p=0.002) and 24 hr (p=0.028) where the mean SPO2 of group B was much less than the group L. this could be because of pain that cause decrease in SPO2 in group B.Further studies also needed for the same.

No significant difference in Respiratory rate was found between the groups at any time of follow up (p>0.05).

This present study done under ultrasound guided which also added safety in our study. As blind TAP block is having so may complications G McDermott et al, suggested that any landmark-based regional anaesthetic technique raises two important issues (27-28). The first is the accuracy of placement of the needle and thus the local anaesthetic in a 'blind' technique and the second is the potential for damage to adjacent structures. After study, they conclude that the needle and local anaesthetic placement using the standard landmark-based approach to the TAP block is inaccurate, and the incidence of peritoneal placement is unacceptably high. So ultrasound guided TAP block is safer technique.

CONCLUSION

In present study, author found that

- 1. Levobupivacaine had more reduction of post operative pain than bupivacaine.
- 2. Levobupivacaine had early onset of effect than bupivacaine.
- 3. Effect of levobupivacaine was longer duration than bupivacaine.
- 4. Levobupivacaine had taken more time for first analgesia require postoperatively.

From above points author concluded that ,ultrasound guided transversus abdominus plane block using levobupivacaine in lower abdominal surgery in Paediatric age group serves a good alternative to bupivacaine in TAP block in longer effect, early onset of effect and longer duration of effect.

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