

Analgesic Efficacy of Transversus Abdominis Plane Block with Levobupivacaine Alone Versus Levobupivacaine with Fentanyl in Lower Abdominal Surgeries

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Abstract

Background: Transversus abdominis plane (TAP) block is relatively new regional anesthesia technique that provides analgesia to parietal peritoneum as well as skin and muscles of lower abdominal wall. The aim of TAP block is to deposit local anesthetic agent in a plane between internal oblique and transversus abdominis muscle targeting the spinal nerves in this plane.

Setting and Design: A prospective, randomized, double-blinded study was conducted on 60 patients of the American Society of Anesthesiologists Grade I and II undergoing lower abdominal surgery at Guru Nanak Dev Hospital attached to Government Medical College, Amritsar.

Materials and Methods: Patients were randomly divided into two groups of 30 each. Group L received 30 ml of 0.5% levobupivacaine and Group levobupivacaine fentanyl (LF) received 29 ml of 0.5% levobupivacaine + 1 ml of fentanyl. Duration of post-operative analgesia and visual analog scale (VAS) score were recorded.

Results: Mean duration of analgesia was prolonged in Group LF as compared to Group L ($P < 0.05$). The VAS score was lower in Group LF as compared to Group L. Thus, the addition of adjuvant fentanyl leads to the prolongation of duration of post-operative analgesia and also lowering of VAS scores.

Conclusion: TAP block in Group LF leads to prolonged postoperative analgesia. It encourages early ambulation and less hospital stay without significant side effects. VAS score was lower in Group LF. The number of rescue analgesic doses was less in Group LF as compared to Group L.

Key words: Fentanyl, Levobupivacaine, Transversus abdominis plane block, Visual analog scale score

INTRODUCTION

Pain is highly unpleasant physical sensation caused by illness or injury. Acute post-operative pain is the result of complex physiological reaction to tissue injury. Pain

relief is not only a humanitarian consideration but also an important means for reduction of morbidity and mortality.^[1] Pain causes patient to remain immobile, causing deep vein thrombosis, muscle wasting, and urinary retention. The patient is unable to cough leading to pulmonary atelectasis. An important component of pain is expected from abdominal wall incision.^[2] Regional block techniques provide adequate postoperative pain relief by preventing neuroendocrine responses to surgery and reducing the post-operative analgesia requirements.^[3] Transversus abdominis plane (TAP) block is a regional analgesic technique and it blocks T6-L1 nerve branches. TAP block provides analgesia to the parietal peritoneum,

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as well as skin and muscles of lower abdominal wall. The aim of TAP block is to deposit the local anesthetic agent in a plane between the internal oblique and transversus abdominis muscle targeting the spinal nerves in this plane. The primary objective of our study was to compare the duration of post-operative analgesia and visual analog scale (VAS) scores after TAP block with drug levobupivacaine alone and levobupivacaine with adjuvant fentanyl.

MATERIALS AND METHODS

After obtaining clearance from the Institutional Ethics Committee, we carried out randomized prospective study in 60 patients of the American Society of Anesthesiologists (ASA) Grade I and II in the age group of 18–65 years posted for elective lower abdominal surgeries under spinal anesthesia. Two groups of 30 each were made. Group L received 30 ml of 0.5% levobupivacaine and Group levobupivacaine fentanyl (LF) received 29 ml of 0.5% levobupivacaine + 1 ml (60 µg) of fentanyl. Patients were kept NPO 8 hourly preoperatively after thorough pre-anesthetic checkup and laboratory investigations.

On arrival of patient in operation theatre, routine monitoring (ECG, pulse oximetry, and NIBP) was done and baseline vitals were recorded. Eighteen G i/v cannula was used to preload the patient with crystalloids. With the patient in the lateral decubitus position, under all aseptic conditions, L3-L4 or L4-L5 space was located and Quincke's needle number 25 or 26 G introduced into subarachnoid space through midline approach. After free flow of cerebrospinal fluid (CSF), 2.5–3 ml of 0.5% bupivacaine was injected into CSF. Surgery started under adequate anesthesia. Oxygen started through simple oxygen mask.

On completion of surgery and after the block had receded to T10 level, TAP block was applied in Groups L and LF by landmark technique and study drugs were administered as per study protocol. Bilateral TAP block was applied in the lumbar triangle of Petit. The triangle of Petit is located just anterior to latissimus dorsi muscle. Skin was pierced by Tuohy needle just cephalad to iliac crest over the triangle of Petit and needle was advanced at right angle to the skin in a coronal plane. The first pop was felt when needle entered external oblique muscle and the second pop felt when needle entered transversus abdominis fascial plane. After careful aspiration to exclude vascular puncture, study drugs were injected in both Group L and Group LF. Pulse, blood pressure, and oxygen saturation were assessed for 24 h from the time of administration of block at 0, 2, 4, 6, 8, 12, and 24 h interval. Pain was assessed by VAS and the duration of post-operative analgesia was recorded in both the groups.

Statistical Analysis

The data from the present study were systematically collected, compiled, and statistically analyzed to draw relevant conclusions. Sample size was calculated in consultation with statistician taking mainly the duration of post-operative analgesia and VAS score and based on the previous studies to get the power of study more than 85%. The continuous data were represented as standard deviation (mean \pm SD). Number of patients and percentage of cases expressed discrete categorical data. Categorical variables were analyzed using independent Chi-square test. P-value was calculated finally to evaluate the level of significance. $P > 0.05$ was considered non-significant, $P = 0.01$ – 0.05 was considered statistically significant and $P < 0.001$ was highly statistically significant. The results were then analyzed and compared to the previous studies.

RESULTS

While comparing the distribution of age, sex, and ASA grade between the two groups was statistically non-significant, heart rate, blood pressure, and oxygen saturation were statistically non-significant in both the groups.

The mean duration of analgesia was prolonged in Group LF as compared to Group L. It was 8.93 ± 3.63 h in Group L and 11.20 ± 2.86 h in Group LF. The difference between the two groups was significant ($P < 0.05$). The VAS score was significantly lower in Group LF as compared to Group L ($P < 0.05$).

Parameter	Group L	Group LF	Mean	p value
Mean age (in years)	40.73 ± 14.55	39.56 ± 14.22	40.15 ± 14.28	0.755
ASA grading				
Grade 1	27 (90%)	26 (86.67%)	88.33%	0.687
Grade 2	3 (10%)	4 (13.33%)	11.67%	
Sex				
Male	26 (86.67%)	28 (93.33%)	54 (90%)	0.389
Female	4 (13.33%)	2 (6.67%)	6 (10%)	

Mean VAS score after TAP block

Time interval (hours)	Group L		Group LF		t-value	P-value
	Mean	SD	Mean	SD		
0	1.99	0.33	1.18	0.46	0.25	0.03
0.5	2.33	0.80	1.12	0.73	-4.38	0.00
2	2.20	0.66	1.32	0.72	-4.12	0.00
4	2.50	0.57	1.51	0.90	-5.81	0.00
6	2.92	1.22	1.92	0.87	-2.10	0.02
12	4.02	1.41	3.13	1.03	-2.79	0.00
24	5.11	0.63	4.72	0.52	-0.15	0.01

NS: Non-significant ($P > 0.05$); S: Significant ($P < 0.05$); HS: Highly significant ($P < 0.001$)

Mean duration of analgesia (in h)		
Group	Analgesia duration (hours)	
	Mean	SD
L	8.93	3.63
LF	11.20	2.86
t-value		1.46
P-value		0.03

NS: Non-significant ($P>0.05$); S: Significant ($P<0.05$); HS: Highly significant ($P<0.001$)

DISCUSSION

Effective pain control is essential for optimal care of the patients in the post-operative patients. TAP block, which can be easily performed under ultrasound guidance^[4] or using landmark-based approach,^[5] is becoming popular in lower abdominal surgeries to decrease in post-operative pain. There are several benefits of post-operative analgesia and it includes reduction in post-operative stress response, reduction in post-operative morbidity, and improved surgical outcome in certain surgeries. Local anesthetics have been used in TAP block and they are advantageous as they do not have the adverse effects of systemically administered opioids such as post-operative sedation, nausea, gastrointestinal paralysis, respiratory depression, and pruritis. The present study was conducted to compare the analgesic efficacy of TAP block with levobupivacaine alone or levobupivacaine with adjuvant fentanyl in lower abdominal surgeries. Many studies have approved the efficacy of TAP block with levobupivacaine for providing post-operative analgesia. Hence, we decided to do our study with 0.5% levobupivacaine. We studied the duration of post-operative analgesia and the VAS score after administering TAP block with levobupivacaine alone in one group (Group L) and levobupivacaine with adjuvant fentanyl in other group (Group LF). On comparison, the duration of post-operative analgesia was prolonged in Group LF as compared to Group L. VAS score was significantly lower in Group LF as compared to Group L. The result of our study is supported by a similar study done by Akkaya *et al.*^[6] in 2014 who compared the analgesic efficacy of TAP block using levobupivacaine (30 ml of 0.25%) with adjuvant dexamethasone in one group and 0.25% levobupivacaine alone in another group. The time needed for first rescue analgesic in post-operative period was recorded. The total score for tramadol consumption was lower in dexamethasone group ($P=0.04$). The duration of analgesia was prolonged in dexamethasone group (13 ± 7.7 h) as compared to levobupivacaine alone (6.1 ± 4.8 h) ($P=0.001$).

Similar results were reported by Metwally *et al.*^[7] in 2017 to evaluate the effect of adding fentanyl or epinephrine to bupivacaine in TAP block for lower abdominal surgeries.

The quality and duration of analgesia were recorded in patients undergoing lower abdominal surgeries, receiving TAP block with 20 ml bupivacaine bilaterally with adjuvant fentanyl in one group (BF) and epinephrine in other group (BE). VAS score was recorded postoperatively. Time to rescue analgesia was recorded. The time to rescue analgesia was longer in Group BF (325.1 ± 90.09 min) as compared to Group BE (235.26 ± 50.8 min). Post-operative VAS score was lower in Group BF at 4 h ($P=0.001$). The lipid solubility is thought to have had perineural effect in this study.

Our results are thus in concordance with the study mentioned above. Post-operative duration of analgesia was prolonged in Group LF as compared to Group L. The VAS score was lower in Group LF as compared to Group L. Our results were similar to the study conducted by Rajasekhar *et al.*^[8] and Thomas Koshy *et al.*^[9]

CONCLUSION

We concluded that TAP block with levobupivacaine along with adjuvant fentanyl leads to prolonged duration of post-operative analgesia. Furthermore, it leads to decreased number of rescue analgesic doses when combined with levobupivacaine. It is due to the adjuvant fentanyl that leads to prolongation of postoperative analgesia. It encourages early ambulation and less hospital stay without significant side effects.

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REFERENCES

1. Cohen FL. Postsurgical pain relief: Patients' status and nurses' medication choices. Pain 1980;9:265-74.
2. McDonnell JG, Curley G, Carney J, Benton A, Costello J, Maharaj CH, *et al.* The analgesic efficacy of transversus abdominis plane block after cesarean

- delivery: A randomized controlled trial. Anesth Analg 2008;106:186-91.
3. Desborough JP. The stress response to trauma and surgery. Br J Anaesth 2000;85:109-17.
 4. El-Dawlatly AA, Turkistani A, Kettner SC, Machata AM, Delvi MB, Thallaj A, et al. Ultrasound-guided transversus abdominis plane block: Description of a new technique and comparison with conventional systemic analgesia during laparoscopic cholecystectomy. Br J Anaesth 2009;102:763-7.
 5. Salman AE, Yetisir F, Yurekli B, Aksoy M, Yildirim M, Kilic M. The efficacy of the semi-blind approach of transversus abdominis plane block on postoperative analgesia in patients undergoing inguinal hernia repair: A prospective randomized double-blind study. Local Reg Anesth 2013;6:1-7.
 6. Akkaya A, Yildiz I, Tekelioglu UY, Demirhan A, Bayir H, Ozlu T, et al. Dexamethasone added to levobupivacaine in ultrasound-guided transversus abdominis plain block increased the duration of postoperative analgesia after caesarean section: A randomized, double blind, controlled trial. Eur Rev Med Pharmacol Sci 2014;18:717-22.
 7. Metwally AA, Abo-El-Enin KM, Abd Allah SI, Soliman NM, Abo-Omar WA. Ultrasound-guided transversus abdominis plane block for lower abdominal surgeries: Bupivacaine alone or combined with fentanyl or epinephrine. Menoufia Med J 2017;30:538.
 8. Rajasekhar D, Maharaj TM. Evaluation of fentanyl as an adjuvant to bupivacaine in ultra sound guided transversus abdominis plane block for postoperative analgesia in patients undergoing abdominal hysterectomy. J Evol Med Dent Sci 2019;8:2407-12.
 9. Thomas K, Nair RR, Joseph J. Evaluation of fentanyl as adjuvant in transversus abdominis block in abdominal hysterectomy for post-operative analgesia. Ind J Anesth Analg 2019;6:1954-8.

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