

Comparison of transversus abdominis plane block versus local anesthetic wound infiltration for postoperative analgesia in lower abdominal surgery

✉ Shakya S¹, Rana RB¹, Shakya A³

1. Department of Anesthesiology and Critical Care, Nepalgunj Medical College Teaching Hospital, Kohalpur, Nepal
2. Department of Community Medicine, Kathmandu Medical College, Sinamangal, Nepal

ABSTRACT

Introduction: Postoperative pain control following laparotomy is vital for faster recovery, reduced opioid use and better patient comfort. The Transversus Abdominis Plane (TAP) block, which anesthetizes T6–L1 nerves between the internal oblique and transversus abdominis muscles, provides more consistent and longer-lasting analgesia of the anterior abdominal wall than Local Anesthetic Wound Infiltration (LAWI). Although LAWI is simple and widely available, its analgesic effect is less reliable, making the TAP block a more effective option in multimodal pain management. To compare Postoperative pain scores, Opioid consumption, analgesia duration and incidence of postoperative nausea and vomiting (PONV) between TAP and LAWI groups following laparotomy.

Methods: This double-blinded comparative study was conducted at Nepalgunj Medical College, Nepal (Aug–Dec 2024) after ethical approval. Adults aged 18–65 years with ASA physical status I or II undergoing elective or emergency lower-abdominal surgery under general anesthesia were randomized (N=62) into two equal groups using sealed envelopes. Group A received LAWI with 20mL 0.25% bupivacaine before closure, while Group B received an ultrasound-guided bilateral TAP block with 10mL 0.25% bupivacaine on each side. Postoperative pain (Visual Analogue Scale, 0–10) was assessed at 0, 4, 8, 12, and 24 hours by a blinded investigator. Rescue analgesia (tramadol 50mg IV) was given for VAS > 4. Total 24-hour tramadol use and adverse events were recorded. Data were analyzed using chi-square, unpaired t-test and Mann–Whitney U-test; $p < 0.05$ was significant.

Results: Both groups were comparable in age, gender, physical status and surgery duration. TAP block patients had statistically significant lower VAS scores at all time points. The mean time for first rescue analgesia was 348.39 ± 121.40 minutes in Group A while 461.54 ± 66.56 minutes in Group B ($p < 0.001$). Total 24-hr tramadol requirement was higher in Group A (82.26 ± 35.47 mg) than Group B (50 ± 00 mg) ($p < 0.001$). Eight patients in Group A and five in Group B developed postoperative nausea (PONV) with no significant difference ($p > 0.05$).

Conclusion: Ultrasound-guided TAP block with 0.25% bupivacaine is safe and highly effective for postoperative abdominal surgery analgesia, offering longer pain relief, reduced analgesic use and fewer side effects.

Keywords: Bupivacaine, postoperative analgesia, transversus abdominis plane block, visual analog scale.

INTRODUCTION

Postoperative pain management is crucial in improving recovery, reducing opioid consumption, and enhancing patient satisfaction

following abdominal surgeries. Effective regional analgesic techniques include Local Anesthetic Wound Infiltration (LAWI) and the Transversus Abdominis Plane (TAP) Block. LAWI is a simple and widely available technique involving local anesthetic infiltration at the surgical site, whereas the TAP block provides sensory blockade of T6–L1 nerves, reducing postoperative pain more effectively in some cases.¹

Corresponding author

Dr. Shailendra Shakya
Dept of Anesthesiology and Critical Care
Nepalgunj Medical College Teaching Hospital
Email: drshailenshakya@gmail.com

DOI: <https://doi.org/10.3126/dmj.v8i1>

Pain experienced after abdominal surgery is primarily contributed by the incision made in the abdominal wall.² TAP block anaesthetises somatic supply of the anterior abdominal wall, which arises from the anterior rami of spinal nerves and runs along the plane between internal oblique muscle and transversus abdominis muscle. Local infiltration around the wound site has also been widely used, but its efficacy as a potent and useful adjunct in multimodal analgesia has been controversial.³

The rationale for comparing these two techniques, there is limited data from Nepal evaluating their effectiveness in lower abdominal surgeries. This study aims to compare the efficacy, opioid-sparing effect of LAWI vs. TAP block in postoperative pain management.

Aims and Objectives:

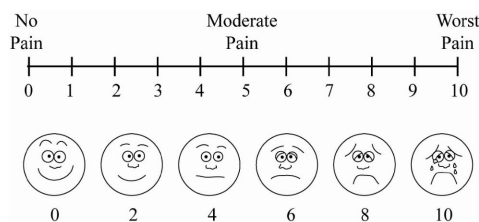
1. To evaluate Postoperative pain scores.
2. To compare Opioid consumption, analgesia duration (Time to first rescue analgesic given(mins)).
3. To assess the incidence of postoperative nausea vomiting (PONV).

METHODS

This hospital based prospective, double-blinded comparative study was carried out in the Department of Anesthesiology, Nepalgunj Medical College and Teaching Hospital, Kohalpur, Nepal, from August 2024 to December 2024 after approval from the Institutional Review Committee. Patients aged 18–65 years of any gender, classified as American Society of Anesthesiologists (ASA) I or II, and patients requiring general anesthesia for Elective or emergency lower abdominal surgery (e.g., hollow viscus perforation, umbilical hernia repair, incisional hernia repair, colorectal surgery, gastrectomy hysterectomy, appendicular perforation) under general anesthesia were included after obtaining written informed consent. Exclusion criteria included: known allergy to lignocaine and Bupivacaine, hypertension, diabetes mellitus, COPD, cardiovascular, renal, hepatic, or neurological diseases, or an abnormal coagulation profile.

The sample size was calculated with an α error of 5% and β error of 20%⁴ resulting in 62 patients. Patients (N=62) were randomly assigned to one of two groups (n = 31 per group) using a sealed opaque envelope method.

In the preoperative visit, written consent was taken and the Visual Analogue Scale for Pain (VAS score) was explained to the patient.



Note: A 10 cm baseline is recommended for VAS score.

0: No pain 1-3: Mild Pain 4-6: Moderate Pain 7-9: Severe pain. 10: Worst possible pain

On arrival of the patients in operation theater, IV line was initiated with 18-G cannula; all patients were given general anesthesia. All patients were preoxygenated with 100% oxygen for 3 minutes and midazolam in the dose of 2mg and fentanyl 2mcg/kg was given as well. Anaesthesia was induced using Propofol injection in the dose of 1 mg/kg. Endotracheal intubation was facilitated using vecuronium in the dose of 0.08mg/kg iv. Laryngoscopy and endotracheal intubation was done with Machintosh laryngoscope. Anesthesia was maintained with 100% oxygen, Isoflurane (1-2%), and intermittent doses of vecuronium. Study procedures were done accordingly

Patients (N = 62) were randomly assigned to one of two groups (n = 31 per group) using a sealed opaque envelope method:

Group A (LAWI – Local Anesthetic Wound Infiltration):

Patients received 20 mL of 0.25% bupivacaine infiltrated into the surgical wound site before closure on each side(10ml). The infiltration was performed by the surgical team at the end of surgery using a 10 mL syringe with the local anesthetic injected in and around the wound margins.

Group B (Transversus Abdominis Plane (TAP) block):

Patients received an ultrasound-guided bilateral Transversus Abdominis Plane (TAP) block immediately after abdominal closure. Each side was administered 10 ml of 0.25% bupivacaine. The TAP block was performed using a portable Sonosite machine with a linear probe (6–13 MHz), positioned transversely on the anterolateral abdominal wall where the three muscle layers are most clearly visualized.

The probe was then moved posterolaterally towards the midaxillary line, just above the iliac crest (triangle of Petit), to identify the fascial plane between the internal oblique and transversus abdominis muscles. A 25G spinal needle was used for the block and inserted via an in-plane anterior approach, with advancement visualized in real time under ultrasound.

Following needle placement, the drug was injected, and correct deposition was confirmed by observing a hypoechoic spread of the injectate with hydrodissection of the transversus abdominis plane. Procedure similarly replicated on the contralateral side.

On admission to the Post Anaesthetic Care Unit (PACU), a postoperative pain was assessed as soon as the subject becomes alert and able to answer questions and recorded (baseline or 0 hour). A level of pain was assessed using a 0 to 10 Verbal Analogue Scale (VAS), and recorded at 0, 4, 8, 12 and 24 hours(hrs) postoperatively by the blind investigator. The blinded investigator was post operative nurse, anesthesia resident who didn't participate in the operation. At the same time, nausea, vomiting, hypertension, hypotension,

shivering was assessed and recorded. In PACU, 30mg of the ketorolac was given 8 hourly for the first 24 hrs to keep the VAS score <7. If the patient still complained of pain, rescue analgesia 50mg of tramadol IV was given to maintain VAS score ≤4. The total amount of postoperative Tramadol used over 24 hours was recorded.

Statistical Analysis

Data thus recorded and collected were analyzed by standard statistical tests such as Chi square test and Students unpaired t-test with SPSS version 20. For comparisons of VAS score between groups were analyzed using the Mann–Whitney U-test. The p value < 0.05 were considered statistically significant.

RESULTS

Both groups were comparable with regards to age, gender, ASA physical status, mean duration of surgery. There was no statistically significant difference between groups (p > 0.05). (Table 1)

Table 2: Comparison of postoperative VAS Scores between two groups

In the present study, the first rescue analgesia was given when the VAS score was >4. The mean time for first rescue analgesia during postoperative period in patients of Group A was 348.39 ± 121.40 minutes while in patients of Group B, was 461.54 ± 66.56 minutes with statistically significant difference between the groups (p<0.001). Fig.1

The mean total postoperative intravenous tramadol requirement of the patients to maintain

Table 1: Study population demographic data

Variables	Group A	Group B	p-value
Age(yrs)	40.10 ± 16	37.32 ± 15.50	0.81
Gender			
Male	17(34)	12(24)	0.378
Female	33(66)	38(76)	
Weight(Kg)	59 ± 7.5	60.77 ± 8.00	0.95
Physical Status			
ASA I	23(74.2)	20(64.5)	0.5
ASA II	8(25.8)	11(35.5)	
Duration of Surgery(min)	108.06 ±17.014	102.58±21.60	0.07

Table 2: Comparison of postoperative VAS Scores between two groups

VAS(Hoturs)		Groups		Mean Rank		Mann-Whitney Test	
		Group A	Group B	Group A	Group B	Z	p-value
@0hr	Range	1-3	1-3	36.34	26.66	-2.43	<0.015
	Medi-an(IQR)	2(1)	2(1)				
@4hr	Range	3-7	2-5	43.24	19.76	-5.37	<0.001
	Medi-an(IQR)	5(1)	3(1)				
@8hr	Range	4-7	3-6	42.40	20.60	-5.02	<0.001
	Medi-an(IQR)	5(1)	4(1)				
@12hr	Range	3-5	1-6	40.50	22.50	-4.12	<0.001
	Medi-an(IQR)	4(1)	3(1)				
@24hr	Range	1-4	1-4	40.05	22.95	-3.87	<0.001
	Medi-an(IQR)	3(2)	2(1)				

VAS score <4 was more in the patients of Group A is (82.26 ± 35.47mg) compare to Group B (50 ± 00mg) with statistically highly significant difference (p<0.001). Fig.2

Eight(25.8%) patients in Group A developed PONV while 5(16.1%) patients in Group B. However, there wasn't any statistical difference between two groups (p=0.35). Fig.3

Fig.1: Comparison of first rescue analgesia between two groups.

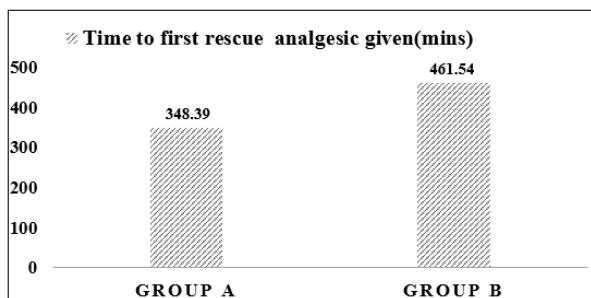


Fig.2: Comparison of Total Tramadol(mg) given in 24hrs between two groups.

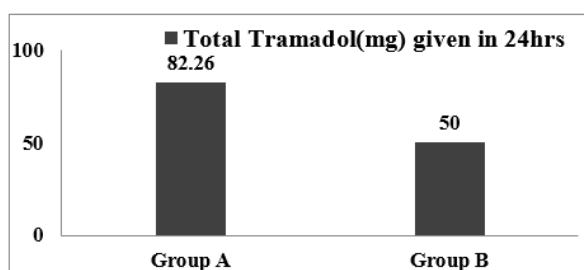
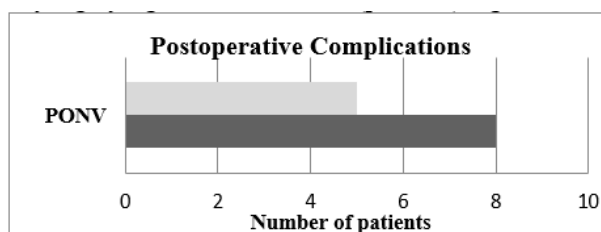


Fig.3: Comparison of the postoperative complications between two groups.



DISCUSSION

One of the key concerns for patients is postoperative pain control. TAP block is a regional analgesic technique to provide postoperative analgesia after abdominal surgeries. The effective pain relief lies in deposition of local anesthetic into the relatively avascular fascial plane, ensuring longer drug retention and consistent blockade of T6-L1 intercostal nerves and ilio-inguinal nerve with ilio-hypogastric nerve compared to rapid

absorption and short-lived analgesia with wound infiltration.⁵ The use of ultrasound has overcome the limitations of blind landmark techniques by enabling direct visualization of the target plane.

In our study, postoperative VAS pain scores at 0, 4, 8, 12 and 24 hours were significantly higher in group A compared to group B ($p < 0.05$). The first rescue analgesia was administered when the VAS score exceeded 4. The median time to first rescue analgesia was significantly longer in Group B (461.54 ± 66.56 minutes) than in Group A (348.39 ± 121.40 min, $p < 0.001$). The mean total postoperative tramadol requirement was also significantly higher in Group A (82.26 ± 35.47 mg) compared to Group B (50 ± 00 mg, $p < 0.001$), demonstrating clear opioid-sparing effect in Group B.

Sanad et al. (2018)⁵ conducted a randomized study on 70 patients undergoing inguinal or infra-umbilical incisional hernia repair under general anesthesia. Patients received either ultrasound-guided TAP block with 20 mL of 0.25% bupivacaine on each side or local wound infiltration with the same drug and volume. They reported that the TAP block group had significantly lower mean VAS scores at 2 hours (2.1 ± 0.8 vs 4.6 ± 0.9), 4 hours (2.8 ± 0.7 vs 5.2 ± 0.8), 6 hours (3.1 ± 0.6 vs 5.7 ± 0.7), and 12 hours (3.5 ± 0.9 vs 6.1 ± 0.8 , all $p < 0.001$) compared to LAWI. These findings were consistent with our study although we used lower volume.

Similarly, Shokri & Elsaed et al. (2019)⁶ conducted a randomized trial in 60 urological surgery patients comparing ultrasound-guided transversus abdominis plane (TAP) block with deep wound infiltration. TAP block produced significantly lower postoperative VAS pain scores as shown by Mann-Whitney U analysis. Likewise, Jamil et al. (2021)⁷ demonstrated that TAP block resulted in significantly lower VAS scores both at rest and during movement in infra-umbilical hernia repairs, corroborating our results.

Arik et al. (2020)⁸ observed that patients receiving TAP block experienced much lower pain scores one hour postoperatively, with no statistically significant difference in pain levels between the

two groups until six hours. Their results align with our findings regarding early postoperative pain control.

Another study by Jamil et al. (2021)⁷ reported prolonged analgesia duration (413.2 ± 63.8 min vs 274.1 ± 41.3 min, $p < 0.001$) and lower VAS scores with TAP block.

Kaushik et al. (2024)⁹ compared TAP block with wound infiltration in laparoscopic cholecystectomy and found significantly longer time to first rescue analgesia (7.8 ± 1.2 h vs 4.3 ± 0.9 h, $p < 0.001$) and reduced 24-hour analgesic consumption in the TAP group, reinforcing our findings.

The lower tramadol requirement in Group B further demonstrates the opioid-sparing benefit of TAP block, reducing opioid-related side effects such as postoperative nausea, vomiting, sedation, and delayed recovery. In our study, postoperative nausea and vomiting (PONV) occurred in eight patients of Group A versus five in Group B. The reduced incidence of PONV in Group B may be attributed to lower opioid consumption, consistent with previous studies showing reduced 24-hour opioid requirement and PONV with TAP block.⁹⁻¹⁴

CONCLUSION

We concluded that ultrasound guided TAP block with 0.25% bupivacaine is clinically highly effective and safe in providing postoperative analgesia along with reduction in lesser opioids requirements after abdominal surgeries, if expertise for ultrasound guided TAP blocks are available. It provides longer duration of analgesia and lesser incidence of PONV in postoperative period.

Limitations: Limitations of our study include smaller sample size and the single-center design, which may restrict generalizability. Furthermore, we did not assess long-term outcomes such as chronic postoperative pain. Future randomized controlled trials with larger cohorts are recommended.

REFERENCES

1. Abdallah FW, Halpern SH, Margarido CB. Transversus abdominis plane block for postoperative analgesia after Caesarean delivery performed under spinal anaesthesia: a systematic review and meta-analysis. *Br J Anaesth.* 2012;109(5):679-87. doi:10.1093/bja/aes279.
2. Wall PD, Melzack R. Pain measurements in persons in pain. In: Wall PD, Melzack R, editors. *Textbook of Pain.* 4th ed. Edinburgh: Churchill Livingstone; 1999.
3. Dahl JB, Moïniche S. Relief of postoperative pain by local anaesthetic infiltration: efficacy for major abdominal and orthopedic surgery. *Pain.* 2009;143:7-11. doi:10.1016/j.pain.2009.02.020.
4. El-Boghdadly K, Amer AF, Kassim D, Badawy A. Transversus abdominis plane block versus wound infiltration for postoperative analgesia after abdominal surgery: A systematic review and meta-analysis. *Br J Anaesth.* 2018;120(4):666-75. doi: 10.1016/j.bja.2018.01.002.
5. Sanad ZAAM, El-Ansary AMM, Ali MMM, Ismael MSAB. Comparison of ultrasound-guided transversus abdominis plane block versus local wound infiltration for post-operative analgesia in patients undergoing inguinal hernia or infra-umbilical incisional hernia. *Egypt J Hosp Med.* 2018;72(11):567987. doi:10.21608/ejhm.2018.12228Shokri H, Elsaed KO. Preemptive analgesia of ultrasound-guided transversus abdominis plane block compared with deep wound infiltration in patients undergoing urological surgery. *Journal of Anesthesia & Clinical Research.* 2019;10(2):1000878. doi:10.4172/2155-6148.1000878.
6. Shokri H, Elsaed KO. Preemptive analgesia of ultrasound-guided transversus abdominis plane block compared with deep wound infiltration in patients undergoing urological surgery. *Journal of Anesthesia & Clinical Research.* 2019;10(2):1000878. doi:10.4172/2155-6148.1000878.
7. Jamil A, Ahmad Z, Farooq F, Khan HA, Ansari R, Zahoor N. Comparison of transversus abdominis plane block versus local wound infiltration in reducing postoperative pain in patients undergoing infraumbilical hernia repair. *Pak J Med Health Sci.* 2021;15(5):1130-2. doi:10.53350/pjmhs211551130.
8. Arık E, Akkaya T, Ozciftci S, Alptekin A, Balas Ş. Unilateral transversus abdominis plane block and port-site infiltration: comparison of postoperative analgesic efficacy in laparoscopic cholecystectomy. *Anesthesist.* 2020;69(4):270-6. doi:10.1007/s00101-020-00746-1.
9. Kaushik R, Kumar R, Bafila NS, Verma R, Gautam SD. A comparative study to assess the impact of TAP block with wound infiltration in laparoscopic cholecystectomy. *Asian J Med Sci.* 2024;15(10):34-9. doi:10.71152/ajms.v15i10.4214.
10. Charlton S, Cyna AM, Middleton P, Griffiths JD. Perioperative transversus abdominis plane (TAP) blocks for analgesia after abdominal surgery. *Cochrane Database Syst Rev.* 2010;(12):CD007705. doi:10.1002/14651858.CD007705.pub2.
11. Wang Y, Wu T, Terry MJ, Eldridge JS, Tong Q, Erwin PJ, et al. Improved perioperative analgesia with ultrasound-guided ilioinguinal/iliohypogastric nerve or transversus abdominis plane block for open inguinal surgery: a systematic review and meta-analysis of randomized controlled trials. *Phys Med Rehabil Int.* 2015;2(6):1055.
12. Johns N, O'Neill S, Ventham NT, Barron F, Brady RR, Daniel T. Clinical effectiveness of transversus abdominis plane block in abdominal surgery: a systematic review and meta-analysis. *Colorectal Dis.* 2012;14(10):e635-42. doi:10.1111/j.1463-1318.2012.03104.x
13. Talib MT, Sikander RI, Ahsan MF. Ultrasound-guided transversus abdominis plane block is better than local wound infiltration for postoperative pain management in inguinal hernia repair. *Anaesth Pain Intensive Care.* 2015;19(4):457-62.
14. Petersen PL, Mathiesen O, Torup H, Dahl JB. The transversus abdominis plane block: a valuable option for postoperative analgesia? *Acta Anaesthesiol Scand.* 2010;54(5):529-35. doi:10.1111/j.1399-6576.2010.02174.x

