

COMPARISON OF ANALGESIC EFFICACY OF TRANSVERSUS ABDOMINIS PLANE BLOCK VERSUS INFILTRATION OF LOCAL ANAESTHETIC INTO SURGICAL WOUND IN EMERGENCY LAPAROTOMIES

NASEEM M*, QURESHI F

Department of Anesthesiology, Hayatabad Medical Complex, Peshawar, Pakistan

*Corresponding author email address: madynaseem@gmail.com

(Received, 05th May 2025, Revised 05th June 2025, Accepted 06th July, Published 14th July 2025)

ABSTRACT

Background: Effective postoperative pain management is critical in improving patient recovery and outcomes after emergency laparotomies. While both transversus abdominis plane (TAP) block and local anaesthetic infiltration (LAI) are used for analgesia, their comparative efficacy in this setting remains under-evaluated. **Objective:** To compare the analgesic efficacy of TAP block versus LAI into the surgical wound for postoperative pain management in emergency laparotomies. **Study Design:** Randomized controlled trial. **Setting:** The Department of Anaesthesia at Hayatabad Medical Complex, Peshawar, Pakistan. **Duration of Study:** 13-09-2024 to 13-03-2025. **Methods:** Sixty patients aged 20–60 years undergoing emergency laparotomies were randomly assigned into two equal groups ($n = 30$ each). Group T received the TAP block, while Group L received the LAI at wound closure. Postoperative pain was assessed at predefined intervals using the visual analogue scale (VAS). Data were analyzed using SPSS version [Insert Version]. Independent samples t -test was applied for continuous variables and chi-square test for categorical variables. A P value ≤ 0.05 was considered statistically significant. **Results:** The mean age was 37.73 ± 11.61 years in Group T and 39.77 ± 10.98 years in Group L. Group T patients reported a significantly lower mean VAS score (4.03 ± 1.61) compared to Group L (5.73 ± 2.08) ($P = 0.001$). **Conclusion:** TAP block was significantly more effective than LAI in reducing postoperative pain in emergency laparotomy patients, as demonstrated by notably lower VAS pain scores.

Keywords: Transversus Abdominis Plane Block, Local Anesthesia Infiltration, Pain

INTRODUCTION

Emergency laparotomies involve an array of urgent surgical procedures performed on a wide range of patient demographic data. Laparotomies can be categorized into two main types: trauma and non-trauma. The majority of non-trauma surgical procedures consist of laparotomies performed for intestinal perforation as well as obstruction. In contrast, trauma laparotomies are conducted primarily for hemorrhage control along with managing peritoneal spillage following bowel injury. The mortality rate associated with emergency laparotomies varies between 10% and 18% across various studies, significantly exceeding that of elective surgeries (1). A study assessing the impact of emergency general surgery services found a 46.8% decrease in complications and a 53% decrease in mortality rates compared to the pre-EGS period. Additionally, there was a reduction in emergency department time and a decrease in length of hospital stay (2). Postoperative pain frequently originates from both the surgical incision site and visceral structures (3, 4). The transversus abdominis plane (TAP) block provides effective analgesia by targeting the sensory innervations (T6 to L1 nerves) of the anterior abdominal wall. This regional anesthesia technique involves depositing local anesthetic agents in the fascial plane between the internal oblique and transversus abdominis muscle layers, effectively blocking pain transmission from these regions (5). The TAP block has demonstrated effective pain relief after abdominal surgery (6, 7). The local anaesthetic infiltration (LAI) into surgical incision acts to alleviate pain at the wound site post-surgery, functioning as an aspect of a multimodal analgesic strategy (8, 9). This technique, characterized by its simplicity, safety, minimal invasiveness, as well as cost-effectiveness, is routinely performed by surgeons in numerous centers for the aim of postoperative analgesia (10, 11). A study on 78 patients who underwent emergency abdominal surgeries found that the pain score in the TAP group was 6.80 ± 2.000 and the WI group was 8.92 ± 1.256 (12).

A review of existing literature reveals a notable gap in research regarding the application of transversus abdominis plane (TAP) blocks in emergency laparotomy procedures. This study was undertaken to expand the currently limited body of evidence concerning the comparative effectiveness of TAP blocks versus local anesthetic infiltration (LAI) in such emergency surgical cases. A key objective of this investigation was to identify optimal approaches for reducing opioid dependence while maintaining effective pain management in this specific patient demographic.

METHODOLOGY

We conducted this study in the Department of Anaesthesia at Hayatabad Medical Complex, Peshawar, using a randomized controlled trial design from 13-09-2024 to 13-03-2025 after obtaining ethical clearance from the hospital. We selected 60 patients for this study, the sample of 60 patients was calculated by taking 5% significance level, 90% power, previous mean postoperative pain score of 6.80 in the TAP block group while mean pain score 8.92 in the wound infiltration group, and a population standard deviation of 1.28 (12), we divided 30 patients in each group using the principle of large sample property. Participants were enrolled via consecutive non-probability sampling. Patients having age 20 to 60 years were enrolled for emergency laparotomy due to conditions like gastrointestinal perforation, intestinal obstruction, or blunt abdominal trauma with hemodynamic instability, while those with allergies to the study drug, having history of opioid use or its intolerance, obesity (body mass index above 40), bleeding disorders, renal or hepatic disease, psychiatric conditions, or infection at the injection site were not enrolled for the study. Patients were allotted to either the TAP block group (Group T) or the local wound anesthetic infiltration group (Group L) using blocked randomization. On transfer to the operating table, standard monitoring devices were applied, and baseline vital signs were recorded. Two large-bore intravenous lines were made for

each patient. General anesthesia was induced with propofol 1 to 2.5mg/kg, atracurium 0.5mg/kg, and analgesia was provided by an injection of nalbuphine 0.14 to 0.28mg/kg IV administered just before the surgical incision. Anesthesia was maintained using isoflurane and 50% nitrous oxide in oxygen, which was adjusted according to patient requirements. In Group T, bilateral transversus abdominis plane blocks were performed just before extubation. A blunted 21-gauge needle was then inserted in the midaxillary plane at the umbilical level, penetrating the skin and subcutaneous tissue at a right angle until resistance was observed. The needle was advanced slightly to pierce the external oblique aponeurosis, followed by a second loss of resistance as it passed through the internal oblique aponeurosis. After aspiration, about 1 milliliter of the drug was injected to confirm the correct plane, followed by 20 milliliters of 0.25% bupivacaine on each side. In Group L, the surgical incision site was infiltrated with 20 milliliters of 0.5% bupivacaine by the surgeon before skin closure. All patients were extubated and transferred to the postoperative ward for recovery.

Six hours postoperatively, the patients were assessed for pain intensity on Visual Analog Scale in both groups; if the score exceeded 5, a 50-milligram dose of tramadol was administered as rescue analgesia.

We used SPSS 20 for data analysis. Age, weight, BMI, height, and duration of surgery were used with mean and SD. For gender, we used frequencies and percentages. We compared the VAS pain score between the two groups using an independent t-test. For stratification by age, gender, BMI, and surgery duration, the same test was employed. P value was kept significant at ≤ 0.05 .

RESULTS

Mean age in Group T was 37.73 ± 11.61 years, while in Group L it was 39.77 ± 10.98 years. The mean weight was 71.27 ± 3.46 kg in Group T and 71.13 ± 3.53 kg in Group L. Height measurements were similar,

averaging 1.6793 ± 0.0187 meters in Group T and 1.6753 ± 0.0178 meters in Group L. The mean BMI was comparable between the groups, with Group T at 25.28 ± 1.37 kg/m² and Group L at 25.36 ± 1.43 kg/m².

Gender distribution showed that Group T consisted of 18 (60.0%) males and 12 (40.0%) females, while Group L had 16 (53.3%) males and 14 (46.7%) females (Figure 1).

Surgical duration revealed that Group T had a mean duration of 95.20 ± 14.63 minutes and Group L averaged 86.03 ± 15.89 minutes.

Pain assessment using the VAS score revealed a notable difference between the groups ($p=0.001$). Patients in Group T reported a lower mean VAS score, 4.03 ± 1.61 , while those in Group L had a mean score of 5.73 ± 2.08 , indicating better analgesic efficacy in the TAP block group (Table 1). Stratification of VAS score by age, gender, BMI, and duration of surgery is presented in Tables 2 through 5.

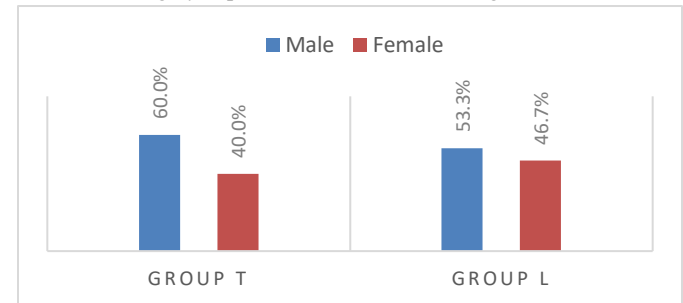


Figure 1: Gender distribution

Table 1: Comparison of VAS score between both groups

Groups	N	Mean	Std. Deviation	P Value
Group T	30	4.03	1.608	0.001
Group L	30	5.73	2.083	

Table 2: Stratification of VAS score in both groups with age

Age distribution (Years)	Groups	N	Mean	Std. Deviation	P value
20 to 35	Group T	13	4.00	1.732	0.14
	Group L	13	5.31	2.594	
36 to 50	Group T	13	3.92	1.656	0.009
	Group L	11	6.00	1.897	
> 50	Group T	4	4.50	1.291	0.04
	Group L	6	6.17	.983	

Table 3: Stratification of VAS score in both groups by gender

Gender	Groups	N	Mean	Std. Deviation	P value
Male	Group T	18	3.83	1.543	0.003
	Group L	16	5.88	2.156	
Female	Group T	12	4.33	1.723	0.11
	Group L	14	5.57	2.065	

Table 4: Stratification of VAS score in both groups with BMI

BMI (Kg/m2)	Groups	N	Mean	Std. Deviation	Std. Error Mean
18 to 24.9	Group T	9	4.00	1.581	0.003
	Group L	15	6.00	1.363	
> 24.9	Group T	21	4.05	1.658	0.05
	Group L	15	5.47	2.642	

Table 5: Stratification of VAS score in both groups with duration of surgery

Duration of surgery (Mins)	Groups	N	Mean	Std. Deviation	P value
60 to 90	Group T	12	4.25	1.658	0.06
	Group L	18	5.78	2.365	
91 to 120	Group T	18	3.89	1.605	0.007
	Group L	12	5.67	1.670	

DISCUSSION

Our demographics revealed that patients in both groups had a mean age of around 37 years in group T and 39 years in group L. These demographics align well with Ismail et al., where the mean age was 40 years in the TAP block group and 37 years in the LAI group. The uniformity in demographic variables across studies strengthens the validity of the findings and suggests that the TAP block is effective across different age groups (13).

Our results exhibited a notable reduction in mean pain scores in the TAP block group (3.00 ± 0.717) compared to the LAI group (6.08 ± 1.171), indicating superior pain relief with TAP block. This finding aligns with Guo et al., who reviewed nine randomized controlled trials (RCTs) and found that TAP block was linked with significantly lower pain scores at 8 and 24 hours postoperatively compared to LAI, although no difference was observed at 1 hour (14).

Similarly, Sivapurapu et al. presented that TAP block had a longer time to first rescue analgesic request and lower 24-hour morphine consumption when compared to those receiving LAI, which further supports the efficacy of TAP block in postoperative pain management, affirming our findings (15).

Anwar et al. reported that patients who received TAP block exhibited lower pain scores when compared with patients receiving LAI in surgical wounds undergoing emergency laparotomies. They also reported that patients receiving TAP block require less opioids than patients receiving LAI (16).

Our findings are further supported by Bava et al., who compared TAP block and LAI in laparoscopic cholecystectomy and reported that TAP block provided better pain relief and reduced opioid consumption, especially in the early hours of the surgery. The study noted that the difference was more noticeable in the early postoperative period (17). This advocates that while the TAP block is highly effective for incisional pain, its benefits may fade away over time, particularly if visceral pain becomes predominant. Therefore, combining the TAP block with other analgesic modalities such as epidural analgesia or systemic opioids may be necessary for complete pain management in major abdominal procedures.

However, the results of the current study contrast with some findings in the literature. For example, Ismail et al. reported no notable difference in tramadol consumption or pain scores between TAP block and LAI groups in major gynecological surgeries except in the immediate postoperative hours (13). This discrepancy may be due to differences in surgical procedures, as gynecological surgeries often involve visceral pain, which TAP block does not address properly. We also infer that the use of multimodal analgesia in Ismail et al.'s study, such as paracetamol and NSAIDs, may have mitigated the differences between the two techniques.

We did not assess the opioid consumption and side effects such as nausea and vomiting, which are important outcomes in postoperative pain management. We recommend that future studies include these variables to provide a complete evaluation of TAP block versus LAI.

CONCLUSION

In conclusion, our findings showed that the TAP block was more effective than LAI in reducing postoperative pain, particularly in emergency laparotomies, which was evidenced by significantly lower pain scores. Based on the evidence, we recommend that TAP block should be considered the favored procedure for postoperative analgesia in emergency laparotomies where feasible.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (IRB-1668)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTION

MADIHA NASEEM (Postgraduate Resident)

Data Collection, Data Entry, Data Analysis, Study Design, Manuscript drafting, Review of manuscript.

FIYYAZ QURESHI (Professor)

Critical Input, Conception of Study, and Final approval of manuscript.

REFERENCES

- Barazanchi AW, Xia W, MacFater W, Bhat S, MacFater H, Taneja A, et al. Risk factors for mortality after emergency laparotomy: scoping systematic review. *ANZ J Surg.* 2020;90(10):1895-902. <https://doi.org/10.1111/ans.16082>
- Shakerian R, Thomson BN, Gorelik A, Hayes IP, Skandarajah AR. Outcomes in emergency general surgery following the introduction of a consultant-led unit. *Br J Surg.* 2015;102(13):1726-32. <https://doi.org/10.1002/bjs.9954>
- Carney J, McDonnell JG, Ochana A, Bhinder R, Laffey JG. The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. *Anesth Analg.* 2008;107(6):2056-60. <https://doi.org/10.1213/ane.0b013e3181871313>
- Sandeman DJ, Bennett M, Dilley AV, Perczuk A, Lim S, Kelly KJ. Ultrasound-guided transversus abdominis plane blocks for laparoscopic appendectomy in children: a prospective randomized trial. *Br J Anaesth.* 2011;106(6):882-6. <https://doi.org/10.1093/bja/aer069>
- Rafi AN. Abdominal field block: a new approach via the lumbar triangle. *Anaesthesia.* 2001;56(10):1024-6. <https://doi.org/10.1111/j.1365-2044.2001.2279-40.x>
- Johns N, O'Neill S, Ventham NT, Barron F, Brady RR, Daniel T. Clinical effectiveness of transversus abdominis plane (TAP) block in abdominal surgery: a systematic review and meta-analysis. *Colorectal Dis.* 2012;14(10):e635-42. <https://doi.org/10.1111/j.1463-1318.2012.03104.x>
- Siddiqui MR, Sajid MS, Uncles DR, Cheek L, Baig MK. A meta-analysis on the clinical effectiveness of transversus abdominis plane block. *J Clin Anesth.* 2011;23(1):7-14. <https://doi.org/10.1016/j.jclinane.2010.05.008>
- Feroci F, Kröning KC, Scatizzi M. Effectiveness for pain after laparoscopic cholecystectomy of 0.5% bupivacaine-soaked Tabotamp® placed in the gallbladder bed: a prospective, randomized,

clinical trial. *Surg Endosc.* 2009;23:2214-20.

<https://doi.org/10.1007/s00464-008-0301-6>

9. Rosaeg OP, Bell M, Cicutti NJ, Dennehy KC, Lui AC, Krepski B. Pre-incision infiltration with lidocaine reduces pain and opioid consumption after reduction mammoplasty. *Reg Anesth Pain Med.* 1998;23(6):575-9. [https://doi.org/10.1016/S1098-7339\(98\)90084-0](https://doi.org/10.1016/S1098-7339(98)90084-0)

10. Lorenzo AJ, Lynch J, Matava C, El-Beheiry H, Hayes J. Ultrasound guided transversus abdominis plane vs surgeon administered intraoperative regional field infiltration with bupivacaine for early postoperative pain control in children undergoing open pyeloplasty. *J Urol.* 2014;192(1):207-13. <https://doi.org/10.1016/j.juro.2014.01.026>

11. Dingemann J, Kuebler JF, Wolters M, von Kampen M, Osthaus WA, Ure BM, et al. Perioperative analgesia strategies in fast-track pediatric surgery of the kidney and renal pelvis: lessons learned. *World J Urol.* 2010;28:215-9. <https://doi.org/10.1007/s00345-009-0442-9>

12. Mishra M, Mishra SP, Singh SP. Transversus abdominis plane block versus wound infiltration of local anesthesia for postoperative analgesia. *J Med Sci Clin Res.* 2016;4:9916-22

13. Ismail S, Mistry AA, Siddiqui AS, Aziz A, Zuberi NF. The analgesic efficacy of ultrasound-guided transversus abdominis plane block vs. local anesthetic infiltration technique in major gynecologic surgery: A randomized controlled trial. *J Anaesthesiol Clin Pharmacol.* 2023;39(4):557-64. https://doi.org/10.4103/joacp.joacp_78_22

14. Guo Q, Li R, Wang L, Zhang D, Ma Y. Transversus abdominis plane block versus local anaesthetic wound infiltration for postoperative analgesia: a systematic review and meta-analysis. *Int J Clin Exp Med.* 2015;8(10):17343-52. <https://pmc.ncbi.nlm.nih.gov/articles/PMC4694226/>

15. Sivapurapu V, Vasudevan A, Gupta S, Badhe AS. Comparison of analgesic efficacy of transversus abdominis plane block with direct infiltration of local anesthetic into surgical incision in lower abdominal gynecological surgeries. *J Anaesthesiol Clin Pharmacol.* 2013;29(1):71-75. <https://doi.org/10.4103/0970-9185.105807>

16. Anwar A, Ahmed HN, Bangash LR, Arshad F, Nawaz S, Sohail F. Comparison of analgesic efficacy of transversus abdominis plane block versus infiltration of local anaesthetic into surgical wound in emergency laparotomies: a randomized control trial. *Esculapio.* 2020;16(4):8-13. <https://doi.org/10.51273/esc20.251642>

17. Bava EP, Ramachandran R, Rewari V, Chandralekha, Bansal VK, Trikha A. Analgesic efficacy of ultrasound guided transversus abdominis plane block versus local anesthetic infiltration in adult patients undergoing single incision laparoscopic cholecystectomy: a randomized controlled trial. *Anesth Essays Res.* 2016;10(3):561-567. <https://doi.org/10.4103/0259-1162.186620>



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third-party material in this article are included in the article's Creative Commons license unless indicated otherwise in a credit line to the material. Suppose material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use. In that case, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>. © The Author(s) 2025