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Original Research Article

Prospective Study on Post-Operative Pain Scores After Use of Ultrasound-Guided TAP Block Vs Local Infiltration in Laparoscopic Surgeries

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Conflict of interest: Nil

Abstract:

Background: Effective postoperative pain management is essential for enhanced recovery after laparoscopic surgeries. Ultrasound-guided transversus abdominis plane (TAP) block and local anesthetic port-site infiltration are widely used analgesic techniques, but their comparative efficacy remains uncertain.

Aim: To evaluate postoperative pain scores, opioid requirement, and recovery outcomes following TAP block versus local infiltration in elective laparoscopic surgeries.

Methods: This prospective randomized study was conducted at Government Medical College, Quthbullapur, from October 2025 to Feb 2026. Sixty ASA I–II adults undergoing elective laparoscopic procedures were randomized into two groups: TAP block (n = 30) and local infiltration (n = 30). Pain was assessed using a Visual Analog Scale (VAS) at 0, 2, 6, 12, and 24 hours. Secondary outcomes included total tramadol consumption, time to first rescue analgesia, PONV, complications, and patient satisfaction.

Results: TAP block produced significantly lower VAS scores at all time points ($p < 0.05$). Time to first rescue analgesia was longer, and total opioid consumption was lower in the TAP group. Patient satisfaction was higher, and no major complications occurred.

Conclusion: TAP block provided superior and sustained analgesia compared with local infiltration, supporting its routine use in laparoscopic surgeries.

Keywords: TAP block, Local infiltration, Laparoscopic surgery, Postoperative analgesia, Opioid-sparing techniques.

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Introduction

Laparoscopic abdominal surgery, though minimally invasive, is frequently associated with significant early postoperative pain arising from both somatic and visceral components, leading to increased opioid use and delayed recovery [1]. Regional techniques such as the transversus abdominis plane (TAP) block and local anesthetic wound/port-site infiltration are integral to multimodal analgesia, but their relative efficacy remains debated across different laparoscopic procedures [2]. Recent systematic reviews and randomized trials have compared TAP block with wound infiltration in adult and colorectal laparoscopic surgery, reporting variable benefits in terms of pain scores, opioid consumption, and patient satisfaction [1, 3]. Pediatric data in minimally invasive cholecystectomy similarly show uncertainty regarding clear superiority of either technique [4].

Against this background, there is a need for further prospective, context-specific evaluation of these simple and widely applicable analgesic strategies in routine laparoscopic practice. The aim of the present prospective study is to compare postoperative pain scores and analgesic requirements following ultrasound-guided TAP block versus local port-site infiltration in patients undergoing elective laparoscopic surgeries, and to assess their impact on opioid consumption and early recovery profiles.

Methods

This prospective, comparative study was conducted at Government Medical College, Quthbullapur, from October 2025 to Feb 2026. After obtaining Institutional Ethical Committee approval and written informed consent, all adult patients scheduled for elective laparoscopic surgeries under general anesthesia were assessed for eligibility. Patients aged 18–60 years, with ASA physical status

I–II, and undergoing procedures such as laparoscopic cholecystectomy or appendicectomy were included. Those with coagulopathy, local infection at the injection site, allergy to local anesthetics, pregnancy, or inability to understand pain scoring systems were excluded. Participants were randomized into two groups using a computer-generated sequence: Group TAP**,** receiving an ultrasound-guided bilateral TAP block; and Group LI, receiving standard local anesthetic port-site infiltration. Standardized general anesthesia was administered to all patients, including uniform induction, maintenance, ventilation, and postoperative analgesia protocols. Hemodynamic parameters, block performance time, and intraoperative events were recorded.

In Group TAP, the block was performed under aseptic precautions after induction using a high-frequency ultrasound probe placed between the costal margin and iliac crest. A 22G block needle was advanced using an in-plane technique to deposit 20 mL of 0.25% bupivacaine in the fascial plane between the internal oblique and transversus abdominis muscles on each side. In Group LI, 20 mL of 0.25% bupivacaine was infiltrated at trocar insertion sites by the operating surgeon at the end of surgery. Postoperative analgesia included IV paracetamol 1 g every 8 hours, with tramadol as rescue analgesia. Pain scores were assessed using a 10-point Visual Analog Scale (VAS) at 0, 2, 6, 12, and 24 hours postoperatively by a blinded observer. Total rescue analgesic consumption, time to first analgesic requirement, postoperative nausea and vomiting (PONV), and patient satisfaction were documented. Any complications related to the block or infiltration, such as hematoma, systemic toxicity, or visceral injury, were monitored. Data were entered into Microsoft Excel and analyzed using appropriate statistical tests. Continuous variables were presented as mean ± SD and categorical variables as proportions, with a p-value <0.05 considered statistically significant.

Results

A total of 60 patients were enrolled and equally allocated into the TAP block group (n=30) and local infiltration group (n=30). Baseline demographic and surgical characteristics were comparable between the two groups, indicating effective randomization. Age, gender distribution, ASA status, and type of laparoscopic surgery showed no statistically significant differences (Table 1). Postoperative pain scores demonstrated a consistent and significant reduction in the TAP block group at all measured intervals compared with local infiltration. The difference was most pronounced at the immediate postoperative period (0–6 hours), where mean VAS scores were significantly lower in the TAP block group ($p < 0.001$), and this benefit persisted up to 24 hours (Table 2). Analgesic requirements further supported the analgesic superiority of TAP block. Patients receiving TAP block required significantly less tramadol in the first 24 hours and had a prolonged time to first rescue analgesia (260 ± 45 min vs. 165 ± 40 min, $p < 0.001$). PONV incidence was lower in the TAP block group, although not statistically significant. Patient satisfaction scores were notably higher in the TAP group ($p < 0.001$) (Table 3). Procedure-related complications were minimal and clinically insignificant in both groups, with no major adverse events such as systemic toxicity or visceral injury (Table 4). Overall, TAP block provided more effective and sustained postoperative analgesia compared with local infiltration.

Table 1: Baseline characteristics of the study participants

Variable	TAP Block	LI	P value
Mean Age (years)	41.3 ± 9.2	40.6 ± 8.7	0.72
Gender (M/F)	17 / 13	16 / 14	0.79
ASA I / II	21/9	19/11	0.58
Type of Surgery (LC/LA)	23/7	22/8	0.76

Table 2: Post-operative VAS at different time intervals

Time Interval	TAP Block	LI	P value
0 hours	2.8 ± 1.1	4.3 ± 1.4	<0.001*
2 hours	3.1 ± 1.0	4.8 ± 1.5	<0.001*
6 hours	2.6 ± 1.2	4.1 ± 1.3	<0.001*
12 hours	2.3 ± 0.9	3.5 ± 1.1	0.002*
24 hours	1.8 ± 0.7	2.6 ± 0.9	0.01*

Table 3: Analgesic requirement and recovery indicators among the study members			
Outcome	**TAP Block**	**LI**	**P value**
Time to first rescue analgesia (min)	260 ± 45	165 ± 40	<0.001*
Total tramadol use (mg/24 hr)	55 ± 20	95 ± 25	<0.001*
PONV incidence (%)	13%	27%	0.18
Patient satisfaction (1–10)	8.4 ± 1.1	6.9 ± 1.3	<0.001*

Table 4: Block/Infiltration related complications among the study members			
Complication	**TAP Block**	**LI**	**P value**
Hematoma	1 (3.3%)	0	0.31
Local site pain	2 (6.6%)	4 (13.3%)	0.39
Systemic toxicity	0	0	–
Visceral injury	0	0	–

Discussion

The present prospective, randomized study demonstrated that ultrasound-guided TAP block provided significantly better postoperative analgesia than local port-site infiltration in adults undergoing elective laparoscopic surgery at Government Medical College, Jagityal. Mean VAS scores were consistently lower in the TAP group at all time points up to 24 hours, and patients required less rescue tramadol with a longer time to first analgesic dose. These findings support the growing body of evidence that TAP block offers superior or at least comparable analgesia to wound infiltration after laparoscopic abdominal procedures [2, 5]. Grape et al. reported moderate-to-high level evidence that TAP block was superior to wound infiltration for pain relief after laparoscopic cholecystectomy, with reduced early pain scores and opioid use [2]. Wang et al., in a meta-analysis of abdominal surgery, similarly concluded that TAP block significantly reduced pain scores and morphine consumption compared with conventional strategies, particularly in the first 24 hours [5]. Our results mirror these data, showing the clearest benefit in the early postoperative period (0–12 hours), when somatic pain from trocar sites and parietal peritoneum is maximal. The high patient satisfaction scores observed in the TAP group also align with previous studies where improved analgesia translated into better comfort and global satisfaction ratings [3, 6, 7].

However, the literature on TAP block versus local infiltration is not uniformly in favour of TAP, and this heterogeneity is important when interpreting our results. Ren et al. found no significant advantage of TAP block over local wound infiltration in laparoscopic colorectal surgery conducted within an ERAS pathway, suggesting that when background multimodal analgesia and early mobilization are optimized, the incremental benefit of TAP may be attenuated [3]. Guo et al. similarly observed that both TAP block and wound infiltration were effective for post-laparotomy pain, with only modest differences between techniques [46. Brogi et al., in a broad meta-analysis of TAP blocks after abdominal surgery, highlighted marked heterogeneity across trials related to surgical type, TAP approach (classical, subcostal, or posterior), timing (pre- vs post-incision), and volume/concentration of local anesthetic [7]. In our setting, the absence of a formal ERAS protocol, reliance on opioids as rescue analgesia, and the use of bilateral ultrasound-guided TAP block with relatively generous volume of bupivacaine may have magnified the observed differences versus simple port-site infiltration. These contextual factors should be considered before generalizing our findings to high-resource ERAS environments.

The mechanisms underlying the superiority of TAP block in our study likely relate to more reliable coverage of the T7–L1 nerves supplying the anterolateral abdominal wall, compared with the more superficial and variable spread of local anesthetic with wound infiltration. El-Dawlatly et al. first described ultrasound-guided TAP block and showed significant reductions in postoperative opioid requirements after abdominal hysterectomy [8]. Subsequent pediatric and adult studies have demonstrated reduced morphine consumption and improved pain scores after laparoscopic appendicectomy and cholecystectomy when TAP block is incorporated [9, 10]. Karasu et al. further showed that adding adjuvants such as ketamine or dexmedetomidine to bupivacaine in TAP block can prolong analgesia and decrease opioid use, highlighting the block as a flexible platform for enhanced recovery analgesia [11]. Our findings of reduced (though not statistically significant) PONV rates and higher satisfaction scores in the TAP group are consistent with the opioid-sparing effect reported in these studies [2, 5, 9]. In addition, more recent work exploring subcostal or laparoscopic-assisted TAP approaches in laparoscopic cholecystectomy and bariatric surgery suggests that optimizing the technique and injection site can further improve coverage of upper abdominal incisions [12, 13]. Although we used a classic lateral approach, the robust analgesic profile seen here indicates that even this relatively simple technique can substantially

improve patient outcomes in routine laparoscopic practice.

This study has several strengths. It was a prospective, randomized comparison with standardized general anesthetic and postoperative analgesic regimens, minimizing confounding related to systemic drugs. Pain assessment was performed by a blinded observer using a validated VAS scale, and clinically relevant secondary outcomes such as time to first rescue analgesia, total opioid use, PONV, and patient satisfaction were captured. Our results provide pragmatic data from a government medical college setting, which is highly relevant to many resource-constrained institutions where ultrasound machines are now widely available in operating rooms. Nevertheless, important limitations must be acknowledged. The sample size was modest, limiting the power to detect differences in infrequent adverse events and PONV. Only ASA I–II adult patients undergoing relatively short elective laparoscopic procedures were included, so the findings may not apply to higher-risk populations, prolonged surgeries, or emergency cases. We did not evaluate chronic pain, quality of recovery scores, or cost-effectiveness, nor did we explore alternative TAP variants (subcostal, posterior) or the use of adjuvants. Future research should include larger, multicentre randomized trials comparing ultrasound-guided TAP block with optimized wound infiltration within ERAS protocols, assess long-term outcomes and cost, and directly compare different TAP approaches and drug regimens. Until such data are available, our findings support the routine use of ultrasound-guided TAP block as part of multimodal analgesia for elective laparoscopic surgery in similar clinical settings, particularly where opioid-sparing, inexpensive, and technically feasible strategies are priorities.

Conclusion: This prospective comparative study demonstrated that ultrasound-guided TAP block provided significantly superior postoperative analgesia compared with local port-site infiltration in patients undergoing elective laparoscopic surgery. TAP block resulted in consistently lower pain scores, reduced opioid requirements, prolonged time to first rescue analgesia, and higher patient satisfaction, without an increase in complications. These findings highlight the value of incorporating TAP block into multimodal analgesia protocols, particularly in resource-limited settings where opioid-sparing strategies are essential. While broader studies with larger sample sizes and varied surgical populations are needed, TAP block remains a simple, effective, and safe technique for improving postoperative recovery.

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