Pavitra K. et al. / Afr.Res.J.Med.Sc. 3(2) (2026) 163-173
https://doi.org/10.62587/AFRJMS.3.2.2026.163-173 ISSN: 3006-7421

African Research Journal of Medical Sciences

Journal homepage: https://www.afrjms.com

Research Paper **Open Access**

Comparison of ultrasound-guided transversus abdominis plane block with plain ropivacaine versus ropivacaine-fentanyl for postoperative analgesia after unilateral open inguinal hernia repair

Pavitra K.[1*], Sri Devi S.[1] and Darshan M.S.[1]

[1]Department of Anaesthesiology, Chamarajanagar Institute of Medical Sciences, Chamarajanagar, Karnataka, India. E-mail: pavitra0045@gmail.com

Article Info
Volume 3, Issue 2, July 2026
Received : 10 August 2026
Revised : 07 September 2026
Accepted : 12 October 2026
Published : 14 November 2026
doi: 10.62587/AFRJMS.3.2.2026.163-173

Abstract

Background: Postoperative pain after open inguinal hernia repair can require rescue analgesia. Ultrasound-guided transversus abdominis plane (TAP) block is used as part of multimodal analgesia. Adding fentanyl to ropivacaine may prolong analgesia, but it may also affect adverse-event frequency. **Aim:** To compare postoperative analgesia after ultrasound-guided TAP block with plain ropivacaine versus ropivacaine with fentanyl in patients undergoing unilateral open inguinal hernia repair. **Methods:** This prospective, double-blinded, randomised controlled study included 64 patients aged 18–70 years with ASA physical status I–II, allocated equally to two groups. Group RP received 19 mL of 0.375% ropivacaine plus 1 mL normal saline; Group RF received 19 mL of 0.375% ropivacaine plus 50 μg fentanyl in 1 mL. The primary outcome was time from TAP block to first rescue analgesia. Postoperative pain scores, haemodynamic parameters and adverse effects were also assessed over 24 hours. **Results:** Mean duration of analgesia was 261.28 ± 44.49 minutes in Group RP and 475.34 ± 140.95 minutes in Group RF ($p < 0.001$). Reported VAS scores generally favored Group RF during much of the early postoperative period, but some values were inconsistent with the study narrative, and standard deviations were not reported. Haemodynamic measurements were broadly comparable at the displayed baseline and 24-hour assessments. Nausea/vomiting and pruritus occurred in 46.9% of each group. Urinary retention occurred in 18.8% of Group RF and none of Group RP ($p = 0.024$). Total rescue analgesic consumption was not reported. **Conclusion:** Adding fentanyl to ropivacaine in ultrasound-guided TAP block was associated with a longer time to first rescue analgesia. The higher reported incidence of urinary retention and inconsistencies in pain-score reporting should be considered when interpreting the findings.

Keywords: *Transversus abdominis plane block, Ropivacaine, Fentanyl, Postoperative analgesia, Inguinal hernia repair*

© 2026 Pavitra K., Sri Devi S. and Darshan M.S.. This is an open access article under the CC BY license (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

1. Introduction

Open inguinal hernia repair is a common operation, but postoperative pain can delay mobilisation and recovery and increase the need for systemic analgesics. Pain may arise from the incision and dissection of the abdominal wall, with sensory input carried through lower thoracic and upper lumbar nerves supplying the groin. Adequate postoperative analgesia is therefore an important part of perioperative care.

The transversus abdominis plane (TAP) block is a regional analgesic technique in which local anaesthetic is deposited between the internal oblique and transversus abdominis muscles. Rafi (2001)

* *Corresponding author: Pavitra K., Senior Resident, Department of Anaesthesiology, Chamarajanagar Institute of Medical Sciences, Chamarajanagar, Karnataka, India. E-mail: pavitra0045@gmail.com*

3006-7421/© 2026 Pavitra K., Sri Devi S. and Darshan M.S.. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

described the abdominal field block approach, and McDonnell *et al.* (2007) later evaluated the block's anatomical spread and analgesic potential. Ultrasound guidance allows the needle and tissue planes to be visualised during injection, helping the clinician confirm drug spread in the intended fascial plane.

Evidence supports studying TAP block specifically in inguinal hernia surgery (Wang *et al.*, 2016b). Aveline *et al.* (2011) compared ultrasound-guided TAP block with ilioinguinal/iliohypogastric nerve block for day-case open hernia repair, while Salman *et al.* (2013) evaluated TAP block in a prospective randomised study. Venkatraman *et al.* (2016) reported lower pain scores and analgesic use with ultrasound-guided TAP block using ropivacaine than with saline in patients undergoing unilateral inguinal hernia repair. These findings support its use as one component of multimodal postoperative pain management, although analgesic effects may vary with the local anaesthetic regimen and study population (Saliminia *et al.*, 2015; Flaherty *et al.*, 2020).

Ropivacaine is a long-acting amide local anaesthetic used for peripheral and fascial-plane blocks (Su *et al.*, 2015). A single-shot block may provide useful early pain relief, but its effect can diminish during the postoperative period. Fentanyl, a potent opioid, has been studied as an adjuvant to local anaesthetics with the aim of improving analgesia or extending its duration. Because the benefit and adverse-effect profile of adding fentanyl may depend on the block and drug regimen, a direct comparison with plain ropivacaine is clinically relevant.

2. Aim and objectives

2.1. Aim

To compare postoperative analgesia following ultrasound-guided TAP block with plain ropivacaine versus ropivacaine with fentanyl in patients undergoing unilateral open inguinal hernia repair.

2.2. Objectives

1. To compare the duration of postoperative analgesia between the two study groups.
2. To compare postoperative pain scores and rescue analgesic requirements between the groups.
3. To compare haemodynamic parameters and the incidence of adverse effects between the groups.

3. Materials and methods

3.1. Source of data

Data were obtained from adult patients admitted to Chamarajanagar Institute of Medical Sciences Hospital for elective unilateral open inguinal hernia repair. Eligible patients were enrolled after ethics approval and written informed consent.

3.2. Study design

The study was conducted as a prospective, double-blinded, parallel-group randomised controlled study. Participants were allocated using a computer-generated randomisation sequence into two groups of 32 each. The study drug was prepared by an anaesthesiologist who was not involved in outcome assessment. Patients and the investigator assessing outcomes were blinded to group allocation.

3.3. Study location

The study was conducted in the Department of Anaesthesiology, Chamarajanagar Institute of Medical Sciences Hospital, Chamarajanagar, Karnataka.

3.4. Study duration

The study was conducted over one and a half years, from June 2024 to December 2025.

3.5. Sample size

The calculated sample size was rounded up to 32 participants per group, giving a total sample of 64 patients.

3.6. Inclusion criteria

- Patients of either sex, aged 18–70 years.
- Patients with ASA physical status I or II.
- Patients scheduled for unilateral open inguinal hernia repair.
- Patients without a history of coagulation disorders or anticoagulant use.

3.7. Exclusion criteria

- Patients who declined participation.
- Infection at the proposed block site.
- Known allergy to the study drugs or hypersensitivity to local anaesthetics.
- Surgery performed under general anaesthesia.
- Obesity, defined as BMI greater than 30 kg/m^2.

3.8. Procedure and methodology

After written consent, patients underwent preoperative assessment, including medical history, physical examination and relevant investigations. Patients were kept nil per oral for eight hours before surgery. Standard monitors were applied, baseline heart rate, blood pressure and oxygen saturation were recorded, and intravenous access was secured.

Spinal anaesthesia was administered under aseptic precautions at the L3–L4 or L4–L5 interspace using a 25-gauge Quincke needle and 3 mL of 0.5% hyperbaric bupivacaine. Surgery was commenced after a sensory block up to the T8 dermatome was achieved.

After surgery, when sensory regression reached the T10 dermatome, an ultrasound-guided TAP block was performed on the operative side with the patient supine. The skin was prepared and draped aseptically. A high-frequency linear ultrasound probe was placed transversely in the mid-axillary line between the lower costal margin and iliac crest to identify the abdominal wall muscle layers. A 22-gauge needle was advanced using an in-plane approach. The needle tip was positioned between the internal oblique and transversus abdominis muscles. Correct placement was confirmed by hydrodissection and visible spread of the injectate in the fascial plane.

Patients received one of the following 20 mL study solutions:

- **Group RP:** 19 mL of 0.375% ropivacaine plus 1 mL normal saline.
- **Group RF:** 19 mL of 0.375% ropivacaine plus 1 mL fentanyl (50 μg).

The solution was injected incrementally with intermittent aspiration while spread was observed under ultrasound. Patients were monitored postoperatively. Intravenous paracetamol 15 mg/kg was given as rescue analgesia when the visual analogue scale (VAS) score exceeded 4 or when requested by the patient, whichever occurred earlier. Duration of analgesia was measured from completion of the TAP block to the first request for rescue analgesia.

VAS pain scores and haemodynamic parameters were recorded at 0, 15, 30, 45 and 60 minutes, and at 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22 and 24 hours after the block. Adverse effects, including haemodynamic instability, pruritus, nausea, vomiting and urinary retention, were monitored during the first 24 hours. Regression of spinal motor blockade was assessed using the Modified Bromage Score.

3.9. Sample processing

No biological samples were collected or processed for this study. Clinical observations and outcome measurements were checked for completeness, coded by study group and entered into a database for analysis.

3.10. Statistical methods

Data were analysed using IBM SPSS Statistics version 27.0. Normality of continuous variables was assessed using the Kolmogorov–Smirnov test. Categorical variables were summarised as frequencies and

percentages and compared using the chi-square test. Normally distributed continuous variables were summarised as mean and standard deviation and compared between groups using the independent-samples *t* test. Duration of analgesia was compared using the Mann–Whitney U test when the distribution was non-normal. A *p* value below 0.05 was considered statistically significant.

3.11. Data collection

Data were recorded on a structured study proforma. The collected information included demographic and clinical characteristics, ASA status, baseline and postoperative haemodynamic measurements, VAS scores at prespecified intervals, time to first rescue analgesia, rescue analgesic administration and adverse effects. The outcome assessor remained blinded to the allocated study group during data collection.

4. Results

Table 1: Baseline characteristics and group comparability

Characteristic	Group RP	Group RF	Test statistic	Difference, RF−RP (95% CI)	*p* value
Age, years, mean (SD)	40.78 (12.75)	43.50 (14.52)	$t = -0.796$	2.72 (−4.11 to 9.55)*	0.429
BMI, kg/m², mean (SD)	23.93 (3.18)	24.07 (3.59)	$t = -0.160$	0.14 (−1.56 to 1.84)*	0.869
Female, n (%)	7 (21.9)	11 (34.4)	$\chi^2 = 0.70$		0.404
Male, n (%)	25 (78.1)	21 (65.6)			
ASA I, n (%)	18 (56.2)	11 (34.4)	$\chi^2 = 2.27$		0.132
ASA II, n (%)	14 (43.8)	21 (65.6)			
Duration of surgery, minutes, mean (SD)	81.00 (18.68)	79.12 (17.09)	Mann–Whitney U; statistic NR	−1.88 (CI NR)*	0.643

**Approximate value calculated from summary statistics. NR, not reported.*

The two study groups were comparable in their baseline characteristics (Table 1). Mean age was 40.78 ± 12.75 years in Group RP and 43.50 ± 14.52 years in Group RF; the difference was not statistically significant ($t = -0.796$, $p = 0.429$). BMI was also similar between Group RP (23.93 ± 3.18 kg/m²) and Group RF (24.07 ± 3.59 kg/m²; $t = -0.160$, $p = 0.869$). The approximate confidence intervals for the between-group differences in age and BMI included zero, consistent with the absence of significant differences. Sex distribution and ASA physical status were likewise comparable: neither sex distribution ($\chi^2 = 0.70$, $p = 0.404$) nor ASA grade ($\chi^2 = 2.27, p = 0.132$) differed significantly between groups. Mean duration of surgery was 81.00 ± 18.68 minutes in Group RP and 79.12 ± 17.09 minutes in Group RF, with no significant difference (Mann–Whitney U test, $p = 0.643$).

Table 2: Duration of postoperative analgesia

Outcome	Group RP, mean (SD), min	Group RF, mean (SD), min	Difference, RF−RP (95% CI)	Test statistic	*p* value
Time from TAP block to first rescue analgesia	261.28 (44.49)	475.34 (140.95)	214.06 min (161.12 to 267.00)*	Mann–Whitney U; statistic NR	<0.001

**Approximate confidence interval calculated from summary statistics. NR, not reported.*

Mean duration of analgesia, measured from TAP block administration to the first request for rescue analgesia, was 261.28 ± 44.49 minutes in Group RP and 475.34 ± 140.95 minutes in Group RF (Table 2). Analgesia lasted longer in the ropivacaine–fentanyl group, with an estimated mean difference of 214.06 minutes (approximate 95% CI: 161.12 to 267.00 minutes). This difference was statistically significant by the

Mann–Whitney U test ($p < 0.001$), indicating that the addition of fentanyl was associated with a longer time to first rescue analgesia in this sample.

Table 3: Postoperative pain scores and rescue analgesia

Time after block	Group RP VAS, mean	Group RF VAS, mean	Difference, RF−RP	Test statistic	95% CI	*p* value
0 min	2.74	1.72	−1.02			<0.001
15 min	2.10	1.14	−0.96			<0.001
30 min	1.71	0.81	−0.90			<0.001
45 min	1.16	1.72	0.56			<0.001
60 min	0.84	1.14	0.30			0.015
120 min	2.77	0.81	−1.96			<0.001
240 min	2.55	1.72	−0.83			<0.001
360 min	2.78	1.14	−1.64			<0.001
480 min	2.24	0.81	−1.43			<0.001
600 min	3.23	0.86	−2.37			<0.001
720 min	3.23	1.84	−1.39			<0.001
840 min	2.77	2.47	−0.30			0.050
960 min	3.61	3.20	−0.41			0.007
1080 min	3.98	3.56	−0.42			0.006
1200 min	3.92	3.67	−0.25			0.170
1320 min	4.03	3.72	−0.31			0.060
1440 min	3.75	3.78	0.03			0.850
First request for rescue analgesia, mean (SD), min	261.28 (44.49)	475.34 (140.95)	214.06 (161.12 to 267.00)*	Mann–Whitney U; statistic NR	Approximate CI*	<0.001

**Approximate confidence interval calculated from summary statistics. NR, not reported.*

Mean VAS scores were generally lower in Group RF than in Group RP at most recorded intervals, particularly from 0 to 720 minutes (Table 3). The reported between-group differences were statistically significant at these time points ($p \leq 0.015$). At 840 minutes, the difference was at the conventional significance threshold ($p = 0.050$). Group RF also had lower reported mean scores at 960 and 1080 minutes, with significant differences at both intervals ($p = 0.007$ and $p = 0.006$, respectively). At 1200, 1320 and 1440 minutes, the differences were not statistically significant ($p = 0.170$, 0.060 and 0.850, respectively). The reported first-request times for rescue analgesia were 261.28 ± 44.49 minutes in Group RP and 475.34 ± 140.95 minutes in Group RF, a significant difference ($p < 0.001$). The thesis did not report the number of rescue doses or total paracetamol consumption by group.

The VAS table does not include standard deviations, confidence intervals or test statistics. Also, the reported means at 45 and 60 minutes are higher in Group RF than Group RP, despite the accompanying narrative stating that Group RF scores were lower through 720 minutes. These entries should be checked against the original dataset before final reporting.

Table 4: Haemodynamic measurements at baseline and 24 hours				
Parameter	**Time**	**Group RP mean**	**Group RF mean**	***p* value**
Heart rate, bpm	0 min	78.24	77.03	0.56
	1440 min	78.30	77.20	0.68
Systolic BP, mmHg	0 min	138.97	140.53	0.05
	1440 min	132.04	128.56	0.06
Diastolic BP, mmHg	0 min	86.47	85.47	0.064
	1440 min	80.00	79.44	0.245
Respiratory rate, breaths/min	0 min	17.00	16.75	0.182
	1440 min	16.50	16.22	>0.05†
SpO_2, %	0 min	98.94	99.00	0.750
	1440 min	99.00	99.22	>0.05†

†Exact p value not reported.

Table 5: Adverse effects during the first 24 hours		
Adverse effect	**Group RP, n (%)**	**Group RF, n (%)**
Nausea/vomiting	15 (46.9)	15 (46.9)
Pruritus	15 (46.9)	15 (46.9)
Urinary retention	0 (0.0)	6 (18.8)

At the displayed baseline and 24-hour assessments, mean heart rate, systolic and diastolic blood pressure, respiratory rate and oxygen saturation were broadly similar between groups (Table 4). The reported comparisons were not statistically significant at these time points, apart from the baseline systolic blood pressure comparison being reported at $p = 0.05$. The thesis reports that haemodynamic measurements remained within clinically acceptable ranges during follow-up. It also notes a significant between-group SpO_2 difference at 1320 minutes ($p = 0.014$), although both groups' values remained within the normal range. Standard deviations, confidence intervals and most test statistics for the haemodynamic comparisons were not provided.

Nausea/vomiting and pruritus were each reported in 15 patients (46.9%) in both groups, with no significant difference (Fisher's exact test, $p = 1.000$ for each) (Table 5). Urinary retention occurred in 6 patients (18.8%) in Group RF and none in Group RP; the original thesis table reported this difference as statistically significant ($p = 0.024$).

5. Discussion

5.1. Baseline characteristics and group comparability

The groups were similar in age, BMI, sex distribution, ASA physical status and duration of surgery. None of the reported baseline comparisons was statistically significant: age ($p = 0.429$), BMI ($p = 0.869$), sex ($\chi^2 = 0.70$, $p = 0.404$), ASA status ($\chi^2 = 2.27$, $p = 0.132$) or surgical duration ($p = 0.643$). The approximate confidence intervals for age and BMI differences included zero, which is consistent with the reported p values. These results suggest that the groups were reasonably comparable on the characteristics measured before or during surgery.

Comparable baseline profiles have also been reported in randomised studies of TAP block for inguinal hernia repair and in studies comparing TAP block adjuvants. Venkatraman *et al.* (2016), Arora *et al.* (2016) and Sujatha *et al.* (2017) reported groups without important baseline imbalances. Chen *et al.* (2018) likewise

found no significant differences in patient characteristics or surgical profiles across their study groups. These similarities support the use of baseline comparisons when interpreting postoperative outcomes. The present findings apply to the enrolled sample of adults aged 18–70 years with ASA I–II status and should not automatically be generalised to older or higher-risk patients (Demir *et al.*, 2022).

5.2. Duration of postoperative analgesia

Mean time from TAP block to the first rescue analgesia request was 475.34 $\pm$ 140.95 minutes in Group RF and 261.28 $\pm$ 44.49 minutes in Group RP. The reported between-group comparison was statistically significant ($p < 0.001$), with an estimated mean difference of 214.06 minutes. This suggests that, in this study, adding fentanyl was associated with a longer interval before the first rescue analgesia request.

The finding is consistent with Chen *et al.* (2018), who reported mean effective analgesia of 8.79 hours with ropivacaine–fentanyl TAP block, compared with 7.86 hours with ropivacaine alone, in patients undergoing gynaecological surgery. However, Chen *et al.* (2018) also found that dexmedetomidine provided longer analgesia than fentanyl, and their surgical population and fentanyl dose differed from those in the present study.

Evidence for fentanyl as a TAP-block adjuvant is mixed. Wang *et al.* (2016a) found that adding fentanyl to ropivacaine did not improve analgesia after caesarean delivery. In that study, fentanyl was also used in the spinal anaesthetic and patients received multimodal analgesia, which limits direct comparison with this unilateral open hernia study. Joseph *et al.* (2020) compared fentanyl with dexmedetomidine as ropivacaine adjuvants after caesarean delivery and found similar times to first analgesia request between the two adjuvant groups. These differences across studies may reflect variation in procedure, block technique, drug dose and rescue-analgesia protocol.

Studies using other adjuvants show that the duration of TAP-block analgesia can be prolonged, but they do not establish that fentanyl is superior to plain ropivacaine in every setting. For example, Sharma *et al.* (2018) reported longer analgesia and lower tramadol use with dexamethasone added to ropivacaine for inguinal hernia repair. Jiang *et al.* (2025), in a meta-analysis of TAP blocks for inguinal hernia repair, found no significant overall difference in time to rescue analgesia between TAP block and comparator interventions, while noting substantial variation among the included trials.

The reported 95% CI of 161.12 to 267.00 minutes is an approximate Welch interval calculated from group means and SDs; the study's p value came from a Mann–Whitney U test. Because the corresponding U statistic and a confidence interval from the rank-based analysis were not reported, the estimate should be interpreted as descriptive support for the observed difference, rather than as the confidence interval produced by the reported test.

5.3. Postoperative pain scores and rescue analgesia

The reported mean VAS scores were generally lower in Group RF than in Group RP during much of the first 12 postoperative hours, with statistically significant differences at most listed time points. By 20–24 hours, the differences were not statistically significant. This pattern broadly supports the longer time to first rescue analgesia in Group RF, although the table's values require careful checking before firm conclusions are drawn.

Trials of TAP block in hernia surgery have reported both beneficial and variable effects on pain. Venkatraman *et al.* (2016) found lower VAS scores at selected postoperative intervals and reduced analgesic use with ropivacaine TAP block compared with saline. Arora *et al.* (2016) also reported lower pain scores and lower fentanyl requirements after TAP block compared with local infiltration in laparoscopic hernia repair. By contrast, Erdoğan Arı *et al.* (2016) found similar pain scores and morphine consumption with two bupivacaine concentrations in open hernia repair (see also Singh *et al.*, 2017). Theodoraki *et al.* (2019) studied ropivacaine TAP block against placebo, and subsequent reviews have noted that study results vary according to comparator, surgery type and accompanying analgesic regimen (Wang *et al.*, 2016b; Wang *et al.*, 2021).

Evidence comparing the block with other regional techniques is also mixed. Sujatha *et al.* (2017) compared TAP block with ilioinguinal/iliohypogastric block plus wound infiltration, while Faiz *et al.* (2019) compared ultrasound-guided TAP block with ultrasound-guided ilioinguinal/iliohypogastric block. Later trials compared TAP block with quadratus lumborum or other fascial-plane blocks (Sørenstua *et al.*, 2023; Roy *et al.*, 2023; Ahuja *et al.*, 2024). These studies reinforce that outcomes depend on the comparator and the precise block protocol; they cannot be treated as direct replications of the present ropivacaine-versus-ropivacaine–fentanyl comparison.

There are important reporting limitations in the present VAS table. Standard deviations, confidence intervals and test statistics were not supplied, preventing assessment of the precision of the score differences. The means at 45 and 60 minutes are higher in Group RF than in Group RP, despite the accompanying narrative stating that Group RF had lower scores through 720 minutes. Also, a significant p value does not by itself establish that the difference is clinically meaningful. These entries should be verified against the source dataset, and conclusions about pain scores should remain provisional until that check is completed.

The first request for rescue analgesia occurred later in Group RF, but the number of patients who received rescue doses and the total paracetamol consumption in each group were not reported. Therefore, the study supports a difference in time to first rescue request, but it does not permit a direct comparison of overall rescue-analgesic consumption. This distinction matters because other trials have measured total opioid or non-opioid consumption as a separate outcome. Venkatraman *et al.* (2016), for example, reported lower total analgesic consumption in their ropivacaine TAP group than in their saline group.

5.4. Haemodynamic parameters and adverse effects

At the displayed baseline and 24-hour assessments, the reported heart rate, blood pressure, respiratory rate and SpO_2 values were similar between groups. The thesis narrative also describes generally stable haemodynamic measurements during follow-up. This is consistent with studies reporting that TAP block can be incorporated into multimodal analgesia without major haemodynamic disturbance; for example, Canakci *et al.* (2021) evaluated ultrasound-guided TAP block in inguinal hernia surgery and reported postoperative pain control alongside haemodynamic observations. However, the present table provides means without SDs, confidence intervals or test statistics, and displays only selected time points. The exact p values for respiratory rate and SpO_2 at 24 hours are also not stated.

Small isolated differences should be interpreted cautiously. The source reports a significant SpO_2 difference at 1320 minutes ($p = 0.014$), although both groups' means remained within the normal range. Repeated measurements across many time points create multiple opportunities for a nominally significant result; without an analysis accounting for repeated measures or multiple comparisons, such an isolated finding may not indicate a clinically important treatment effect. The reported respiratory stability is reassuring, but the available summary data do not allow detailed evaluation of the size or precision of between-group differences.

Nausea/vomiting and pruritus were reported in 15 of 32 patients in each group (46.9%), with no difference between groups (Fisher's exact test, $p = 1.000$). Urinary retention occurred in 6 patients in Group RF (18.8%) and none in Group RP; the original thesis reports $p = 0.024$. This is compatible with a possible opioid-related adverse effect, but the result is based on a small number of events. Other TAP-block trials have reported variable adverse effects and different adjuvant profiles; Chen *et al.* (2018) reported no increase in postoperative complications across their TAP groups, while Wang *et al.* (2016a) found no analgesic benefit from adding fentanyl in their caesarean-delivery regimen. These studies used different populations, doses and protocols, so they provide context rather than a direct safety comparison.

6. Conclusion

In this study of 64 patients undergoing unilateral open inguinal hernia repair, ultrasound-guided TAP block with ropivacaine and fentanyl was associated with a longer duration of postoperative analgesia than

TAP block with plain ropivacaine. Mean time to first rescue analgesia was 475.34 minutes in Group RF and 261.28 minutes in Group RP ($p < 0.001$). Reported pain scores generally favored the combination during much of the early postoperative period, although some values were inconsistent and should be verified. Haemodynamic measurements were broadly comparable at the reported time points. Urinary retention was more frequent in Group RF, while nausea/vomiting and pruritus were reported at similar rates. These findings suggest that fentanyl may extend analgesia when added to ropivacaine for TAP block, while warranting attention to opioid-related adverse effects.

7. Limitations of the study

1. The study was conducted at a single centre with a relatively small sample of 64 patients, which may limit generalisability and the ability to detect uncommon adverse effects.
2. Participants were limited to ASA I–II patients aged 18–70 years; findings may not apply to higher-risk patients or other populations excluded from the study.
3. Follow-up for the reported outcomes was limited to 24 hours, so longer-term analgesia, chronic pain and recovery outcomes were not assessed.
4. The thesis did not report VAS standard deviations, confidence intervals or test statistics. In addition, some VAS means appear inconsistent with the accompanying narrative and require verification against the original dataset.
5. The number of patients receiving rescue analgesia and total paracetamol consumption by group were not reported, limiting assessment of overall analgesic requirements.
6. Haemodynamic results were presented without standard deviations and with incomplete test statistics and p values. Numerous time-point comparisons were reported, and no adjustment for multiple comparisons was described.
7. The confidence interval reported for the duration difference was calculated approximately from summary statistics, whereas the p value was based on the Mann–Whitney U test. The U statistic and a confidence interval from the rank-based analysis were not available.

References

Ahuja, V., Mahajan, A., Thapa, D., Mitra, S., Gupta, D., Gupta, S. *et al.* (2024). Comparison of the analgesic efficacy of two different fascial blocks in patients undergoing laparoscopic inguinal hernia surgery: A randomized control trial. *Journal of Anaesthesiology Clinical Pharmacology*, 40(2): 228-234. https://doi.org/10.4103/joacp.joacp_424_22

Arora, S., Chhabra, A., Subramaniam, R., Arora, M.K., Misra, M.C. and Bansal, V.K. (2016). Transversus abdominis plane block for laparoscopic inguinal hernia repair: A randomized trial. *Journal of Clinical Anesthesia*, 33: 357-364. https://doi.org/10.1016/j.jclinane.2016.04.047

Aveline, C., Le Hetet, H., Le Roux, A., Vautier, P., Cognet, F., Vinet, E. *et al.* (2011). Comparison between ultrasound-guided transversus abdominis plane and conventional ilioinguinal/iliohypogastric nerve blocks for day-case open inguinal hernia repair. *British Journal of Anaesthesia*, 106(3): 380-386. https://doi.org/10.1093/bja/aeq363

Canakci, E., Cihan, M., Altinbas, A., Cebeci, Z., Gultekin, A. and Tas, N. (2021). Efficacy of ultrasound-guided transversus abdominis plane (TAP) block in inguinal hernia surgery and the immunomodulatory effects of proinflammatory cytokines: Prospective, randomized, placebo-controlled study. *Brazilian Journal of Anesthesiology (English Edition)*, 71(5): 538-544. https://doi.org/10.1016/j.bjane.2021.02.005

Chen, Q., Liu, X., Zhong, X. and Yang, B. (2018). Addition of dexmedetomidine or fentanyl to ropivacaine for transversus abdominis plane block: Evaluation of effect on postoperative pain and quality of recovery in gynecological surgery. *Journal of Pain Research*, 11: 2897-2903. https://doi.org/10.2147/JPR.S178516

Demir, H.B., Atalay, A., Uc, C., Fırat, Ö. and Ersin, S. (2022). Tension-free inguinal hernia repair with transversus abdominis plane (TAP) block in elderly high-risk patients. *ANZ Journal of Surgery*, 92(10): 2500-2504. https://doi.org/10.1111/ans.17866

Erdoğan Arı, D., Yıldırım Ar, A., Karadoğan, F., Özcabı, Y., Koçoğlu, A., Kılıç, F. *et al.* (2016). Ultrasound-guided transversus abdominis plane block in patients undergoing open inguinal hernia repair: 0.125% bupivacaine provides similar analgesic effect compared to 0.25% bupivacaine. *Journal of Clinical Anesthesia*, 28: 41-46. https://doi.org/10.1016/j.jclinane.2015.07.020

Faiz, S.H.R., Nader, N.D., Niknejadi, S., Davari-Farid, S., Hobika, G.G. and Rahimzadeh, P. (2019). A clinical trial comparing ultrasound-guided ilioinguinal/iliohypogastric nerve block to transversus abdominis plane block for analgesia following open inguinal hernia repair. *Journal of Pain Research*, 12: 201-207. https://doi.org/10.2147/JPR.S179506

Flaherty, J.M., Auyong, D.B., Yuan, S.C., Lin, S.E., Meier, A.W., Biehl, T.R. *et al.* (2020). Continuous transversus abdominis plane block for primary open inguinal hernia repair: A randomized, double-blind, placebo-controlled trial. *Pain Medicine*, 21(2): e201-e207. https://doi.org/10.1093/pm/pnz275

Jiang, F., Jia, R. and Wang, B. (2025). Efficacy of transversus abdominis plane blocks in inguinal hernia repair: A systematic review and meta-analysis of randomized controlled trials. *International Journal of Surgery*, 111(10): 7202-7212. https://doi.org/10.1097/JS9.0000000000002817

Joseph, B., Zachariah, S.K. and Abraham, S.P. (2020). The comparison of effects of fentanyl and dexmedetomidine as adjuvants to ropivacaine for ultrasound-guided transversus abdominis plane block for postoperative pain in cesarean section under spinal anesthesia: A randomized controlled trial. *Journal of Anaesthesiology Clinical Pharmacology*, 36(3): 377-380. https://doi.org/10.4103/joacp.JOACP_313_18

McDonnell, J., O'Donnell, B., Farrell, T., Gough, N., Tuite, D., Power, C. *et al.* (2007). Transversus abdominis plane block: A cadaveric and radiological evaluation. *Regional Anesthesia and Pain Medicine*, 32(5): 399-404. https://doi.org/10.1016/j.rapm.2007.03.011

Rafi, A.N. (2001). Abdominal field block: A new approach via the lumbar triangle. *Anaesthesia*, 56(10): 1024-1026. https://doi.org/10.1046/j.1365-2044.2001.02279-40.x

Roy, A., Bhoi, D., Chhabra, A., Mohan, V.K., Darlong, V. and Prasad, G. (2023). Quadratus lumborum block vs. transversus abdominis plane block in laparoscopic trans-abdominal pre-peritoneal repair of inguinal hernia in adults: A randomised controlled trial. *Indian Journal of Anaesthesia*, 67(2): 207-215. https://doi.org/10.4103/ija.ija_304_22

Saliminia, A., Azimaraghi, O., Babayipour, S., Ardavan, K. and Movafegh, A. (2015). Efficacy of transverse abdominis plane block in reduction of postoperation pain in laparoscopic cholecystectomy. *Acta Anaesthesiologica Taiwanica*, 53(4): 119-122. https://doi.org/10.1016/j.aat.2015.07.003

Salman, A.E., Yetişir, F., Yürekli, B. *et al.* (2013). 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 and Regional Anesthesia*, 6: 1-7. https://doi.org/10.2147/LRA.S38359

Sharma, U.D., Prateek, P. and Tak, H. (2018). Effect of addition of dexamethasone to ropivacaine on post-operative analgesia in ultrasonography-guided transversus abdominis plane block for inguinal hernia repair: A prospective, double-blind, randomised controlled trial. *Indian Journal of Anaesthesia*, 62(5): 371-375. https://doi.org/10.4103/ija.IJA_605_17

Singh, D.R., Prabhu, R. and Krishnaveni, N. (2017). A comparative study of postoperative analgesia provided by ultrasound-guided transversus abdominis plane block using two concentrations of bupivacaine in patients undergoing inguinal hernia repair. *Anesthesia: Essays and Researches*, 11(4): 934-939. https://doi.org/10.4103/aer.aer_84_17

Su, Y., Zhang, Z., Zhang, Y., Wei, L.G. and Shi, W. (2015). Efficacy of ropivacaine by the concentration of 0.25%, 0.5%, and 0.75% on surgical performance, postoperative analgesia, and patient's satisfaction in inguinal hernioplasty: A randomized controlled trial. *Patient Preference and Adherence*, 9: 1375-1379. https://doi.org/10.2147/PPA.S93276

Sujatha, C., Zachariah, M., Ranjan, R.V., George, S.K., Ramachandran, T.R. and Pillai, A.R. (2017). Transversus abdominis plane block versus ilioinguinal/iliohypogastric nerve block with wound infiltration for postoperative analgesia in inguinal hernia surgery: A randomized clinical trial. *Anesthesia: Essays and Researches*, 11(4): 976-980. https://doi.org/10.4103/aer.aer_33_17

Sørenstua, M., Ræder, J., Vamnes, J.S. and Leonardsen, A.C.L. (2023). Efficacy of a TAP block versus an anterior QLB for laparoscopic inguinal hernia repair: A randomised controlled trial. *Acta Anaesthesiologica Scandinavica*, 67(2): 221-229. https://doi.org/10.1111/aas.14160

Theodoraki, K., Papacharalampous, P., Tsaroucha, A., Vezakis, A. and Argyra, E. (2019). The effect of transversus abdominis plane block on acute and chronic pain after inguinal hernia repair. A randomized controlled trial. *International Journal of Surgery*, 63: 63-70. https://doi.org/10.1016/j.ijsu.2019.02.007

Venkatraman, R., Abhinaya, R.J., Sakthivel, A. and Sivarajan, G. (2016). Efficacy of ultrasound-guided transversus abdominis plane block for postoperative analgesia in patients undergoing inguinal hernia repair. *Local and Regional Anesthesia*, 9: 7-12. https://doi.org/10.2147/LRA.S93673

Wang, L.Z., Liu, X., Zhang, Y.F., Hu, X.X. and Zhang, X.M. (2016a). Addition of fentanyl to the ultrasound-guided transversus abdominis plane block does not improve analgesia following cesarean delivery. *Experimental and Therapeutic Medicine*, 11(4): 1441-1446. https://doi.org/10.3892/etm.2016.3053

Wang, Y., Wu, T., Terry, M.J., Eldrige, J.S., Tong, Q., Erwin, P.J. *et al.* (2016b). 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. *Journal of Physical Therapy Science*, 28(3): 1055-1060. https://doi.org/10.1589/jpts.28.1055

Wang, W., Wang, L. and Gao, Y. (2021). A meta-analysis of randomized controlled trials concerning the efficacy of transversus abdominis plane block for pain control after laparoscopic cholecystectomy. *Frontiers in Surgery*, 8: 700318. https://doi.org/10.3389/fsurg.2021.700318

Cite this article as: Pavitra K., Sri Devi S. and Darshan M.S. (2026). Comparison of ultrasound-guided transversus abdominis plane block with plain ropivacaine versus ropivacaine-fentanyl for postoperative analgesia after unilateral open inguinal hernia repair. *African Research Journal of Medical Sciences*, 3(2): 163-173. doi: 10.62587/AFRJMS.3.2.2026.163-173.