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Original Research Article

Comparative Evaluation of Analgesic Efficacy of Quadratus Lumborum Block versus Transversus Abdominis Plane Block in Patients Undergoing Laparoscopic Transabdominal Preperitoneal Inguinal Hernia Repair: A Prospective Observational Study

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Abstract

Background: Effective postoperative analgesia is central to enhanced recovery following laparoscopic transabdominal preperitoneal (TAPP) inguinal hernia repair. Fascial plane blocks such as the Quadratus Lumborum (QL) block and the Transversus Abdominis Plane (TAP) block represent widely used opioid-sparing regional anaesthetic techniques. While TAP block provides somatic analgesia to the anterior abdominal wall, the QL block may additionally cover visceral nociceptive pathways through paravertebral spread. This study prospectively compared the analgesic efficacy and perioperative outcomes of bilateral transmuscular QL block versus bilateral posterior TAP block in patients undergoing elective laparoscopic TAPP repair.

Methods: A prospective observational comparative study was conducted at the Institute of Anaesthesiology, Madurai Medical College, Government Rajaji Hospital, Madurai. Eighty adult patients (ASA I–II) were equally allocated into two groups: Group A received bilateral transmuscular QL blocks and Group B received bilateral posterior TAP blocks, each using 20 mL of 0.25% bupivacaine per side under ultrasound guidance following induction of general anaesthesia. The primary outcome was postoperative pain assessed by Numerical Rating Scale (NRS) at 0, 1, 2, 4, 6, 12, and 24 hours. Secondary outcomes included time to first rescue analgesia, total fentanyl consumption, postoperative nausea and vomiting (PONV), QoR-18 quality of recovery score, patient satisfaction, and intraoperative haemodynamic parameters. Data were analysed using unpaired t-test and Chi-square test; $p < 0.05$ was considered significant.

Results: Both groups were demographically comparable at baseline ($p > 0.05$ for all variables). NRS scores were equivalent at 0–2 hours but diverged significantly from 4 hours onward, with the QL group maintaining lower scores through 24 hours (NRS 2 vs 4; $p = 0.001$). Time to first rescue analgesia was significantly longer in Group A (6.78 ± 0.83 hrs vs 3.45 ± 0.50 hrs; $p < 0.05$). Total fentanyl consumption was significantly lower in the QL group (415.77 ± 57.50 µg vs 616.62 ± 96.71 µg; $p = 0.001$). PONV-free rate was 95% in Group A versus 70% in Group B ($p = 0.026$). QoR-18 scores ≥16 were achieved by 90% of QL patients versus 55% TAP patients ($p = 0.011$). Patient satisfaction (Satisfied/Very Satisfied) was 90% in Group A versus 37.5% in Group B ($p = 0.001$). Haemodynamic parameters remained stable and comparable throughout in both groups.

Conclusion: The transmuscular Quadratus Lumborum block provides superior, longer-lasting postoperative analgesia with significantly reduced opioid consumption, lower PONV incidence, and higher patient satisfaction compared to the TAP block in laparoscopic TAPP inguinal hernia repair. The QL block may be recommended as the preferred regional technique within enhanced recovery protocols for this surgical population.

Keywords: Quadratus Lumborum Block, Transversus Abdominis Plane Block, Laparoscopic Hernia Repair, TAPP · Postoperative Pain, Regional Anaesthesia, Fascial Plane Block, Opioid-Sparing Analgesia, QoR-18, Enhanced Recovery.

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Introduction

Inguinal hernia repair ranks among the most frequently performed elective surgical procedures worldwide, with over 20 million operations conducted annually. The laparoscopic transabdominal preperitoneal (TAPP) approach has gained widespread acceptance over the past two

decades, offering well-documented advantages over open repair, including reduced wound complications, faster return to daily activity, and lower rates of chronic groin pain. Despite these benefits, postoperative pain in the immediate 24-hour period remains a clinically significant concern. Inadequately managed pain delays early ambulation, prolongs hospital stay, increases opioid consumption, and raises the risk of chronic postsurgical pain — a complication reported in up to 10% of patients following inguinal hernia surgery[1-5].

Contemporary perioperative practice increasingly emphasises multimodal analgesia as the cornerstone of enhanced recovery protocols. Within this framework, ultrasound-guided fascial plane blocks have emerged as effective, opioid-sparing regional anaesthetic techniques for abdominal surgeries. Among these, the Transversus Abdominis Plane (TAP) block has historically been the most widely employed for lower abdominal procedures.

It deposits local anaesthetic in the neurofascial plane between the internal oblique and transversus abdominis muscles, providing reliable somatic analgesia to the anterior abdominal wall by targeting the anterior rami of thoracic spinal nerves T10–T12 and L1[6,7]. However, the analgesic coverage offered by the TAP block is anatomically limited to the somatic components of abdominal wall pain. In laparoscopic TAPP repair, a significant component of postoperative discomfort arises from peritoneal insufflation, mesh placement, and visceral handling — nociceptive signals that travel via pathways beyond the reach of a standard TAP block. This limitation has driven clinical interest in the Quadratus Lumborum (QL) block, a deeper fascial plane technique first described by Blanco in 2007. Local anaesthetic deposited adjacent to the quadratus lumborum muscle — particularly using the transmuscular approach — is thought to track cephalad along the thoracolumbar fascia toward the thoracic paravertebral space, providing both somatic and visceral nociceptive blockade across a wider dermatomal range of T8–T12[8,9]. Several recent studies have investigated the comparative efficacy of these two techniques in inguinal hernia surgery, with findings generally favouring the QL block for prolonged analgesia and reduced opioid requirements. However, high-quality evidence from Indian tertiary care settings remains limited. This study was therefore designed to prospectively compare the analgesic efficacy, opioid consumption, recovery quality, and patient satisfaction following bilateral transmuscular QL block versus bilateral posterior TAP block in adults undergoing elective laparoscopic TAPP inguinal hernia repair.

Materials and Methods

Study Design and Setting: This prospective observational comparative study was carried out over twelve months at the Institute of Anaesthesiology, Madurai Medical College, Government Rajaji Hospital, Madurai, in collaboration with the Department of General Surgery. Ethical clearance was obtained from the Institutional Ethics Committee prior to patient recruitment. All participants provided written informed consent after receiving a detailed explanation of the study procedures, risks, and their right to withdraw at any stage. The flow of participants through each phase of the study is illustrated in the STROBE-compliant flow diagram (Figure 1)

Study Population: Eighty adult patients aged between 18 and 65 years, classified under ASA physical status I or II, and scheduled for elective laparoscopic transabdominal preperitoneal (TAPP) inguinal hernia repair were enrolled. Patients were excluded if they refused consent, had a known hypersensitivity to local anaesthetics, coagulopathy, pre-existing neurological deficits or neuropathic pain, chronic pain at the surgical site, BMI exceeding 35 kg/m², or presented with obstructed or complicated hernia.

Sample Size Calculation: Sample size was computed using an unpaired t-test with an alpha error of 0.05, power of 0.95, and an effect size of 0.75, yielding a minimum of 40 patients per group — 80 in total. The actual achieved power was 0.9535.

Group Allocation and Block Technique: Patients were divided into two equal groups of 40. Group A received bilateral transmuscular Quadratus Lumborum (QL) blocks. Under ultrasound guidance using a curvilinear transducer positioned cranial to the iliac crest, the shamrock sign was identified at the L4 transverse process level. A 45 mm, 18-gauge needle was advanced to deposit 20 mL of 0.25% bupivacaine bilaterally in the fascial plane between the quadratus lumborum and psoas major muscles, facilitating spread toward the thoracic paravertebral space[10].

Group B received bilateral posterior Transversus Abdominis Plane (TAP) blocks using a linear ultrasound transducer. A 20 mL volume of 0.25% bupivacaine was deposited bilaterally in the fascial plane between the internal oblique and transversus abdominis muscles. All blocks were administered by experienced consultant anaesthesiologists under real-time ultrasound guidance immediately following induction of standardised general anaesthesia.

Outcome Measures: The primary outcome was postoperative pain intensity, assessed using the

Numerical Rating Scale (NRS) at seven postoperative intervals: 0, 1, 2, 4, 6, 12, and 24 hours.

Secondary outcomes included:

- Time to first rescue analgesia (hours)
- Incidence and severity of PONV, graded on a validated 4-point scale (1 = none; 4 = two or more episodes of vomiting)
- Patient satisfaction at 24 hours on a 5-point Likert scale (1 = very unhappy; 5 = very satisfied)
- Quality of Recovery assessed using the QoR-18 questionnaire on postoperative day 1
- Intraoperative haemodynamic parameters (SBP, DBP, MAP, SpO_2) at 5, 15, 30, 45, and 60 minutes.

Statistical Analysis: Data were entered into Microsoft Excel and analysed using SPSS version 20.0. Continuous variables were expressed as mean ± SD and compared using the unpaired t-test. Categorical variables were analysed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

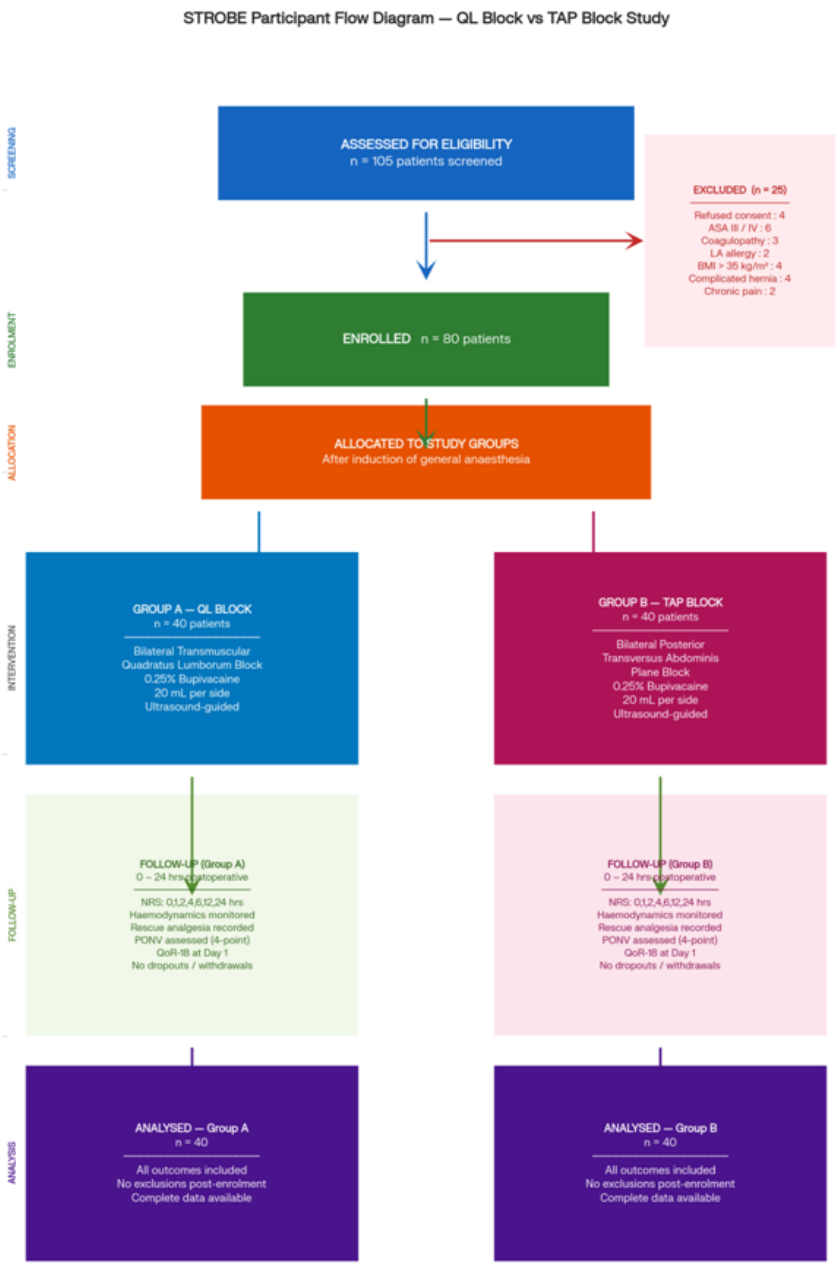

Figure 1: STROBE-compliant participant flow diagram illustrating patient screening, enrolment, group allocation, follow-up, and analysis for the prospective observational study comparing QL Block (Group A) and TAP Block (Group B) in laparoscopic TAPP inguinal hernia repair (n = 80)

Results

This prospective observational study enrolled 80 adult patients undergoing elective laparoscopic transabdominal preperitoneal (TAPP) inguinal hernia repair, equally allocated into Group A (Quadratus Lumborum Block, n=40) and Group B (Transversus Abdominis Plane Block, n=40). All 80 patients completed the study without protocol deviations or dropouts. Results are presented under six domains: (i) demographic and baseline characteristics, (ii) postoperative pain scores, (iii) rescue analgesia and opioid consumption, (iv) postoperative nausea and vomiting, (v) quality of recovery, and (vi) haemodynamic stability.

Table 1 Demographic & Baseline Characteristics: Pre-operative demographic parameters — including age, weight, height, BMI, and ASA physical status — were compared between both groups to confirm baseline homogeneity before interpreting outcome differences. As presented in Table 1, all parameters were statistically comparable between groups ($p>0.05$ for all variables).

Table 1: Demographic and Baseline Characteristics of Study Participants (N = 80)

Parameter	Category	Group A — QL Block (n=40)	Group B — TAP Block (n=40)	Total (N=80)	p-value
Age (years)	< 30	4	4	8	0.171 (NS)
	31 – 40	15	11	26	
	> 40	21	25	46	
	Mean ± SD	39.55 ± 6.68	41.55 ± 6.28	40.55 ± 6.48	
Weight (kg)	51 – 60	5	8	13	0.455 (NS)
	61 – 70	34	25	59	
	71 – 80	1	7	8	
	Mean ± SD	64.85 ± 3.54	65.60 ± 4.98	65.23 ± 4.32	
Height (cm)	151 – 160	12	16	28	0.239 (NS)
	161 – 170	28	24	52	
	Mean ± SD	163.0 ± 4.26	164.15 ± 4.41	163.58 ± 4.34	
BMI (kg/m²)	< 24	25	15	40	0.866 (NS)
	≥ 24	15	25	40	
	Mean	24.44	24.37	24.41	
ASA Grade	I	23	28	51	0.352 (NS)
	II	17	12	29	

QL = Quadratus Lumborum; TAP = Transversus Abdominis Plane; BMI = Body Mass Index; ASA = American Society of Anaesthesiologists Physical Status Classification.

Data expressed as frequency (n) and Mean ± SD. Statistical tests: Unpaired t-test for continuous variables; Chi-square test for categorical variables. $p < 0.05$ considered statistically significant. NS = Not Significant. Both groups received bilateral ultrasound-guided blocks with 20 mL of 0.25% Bupivacaine per side after induction of general anaesthesia. All baseline demographic and clinical parameters were statistically comparable between the two groups, confirming successful pre-study allocation. The absence of significant intergroup differences in age, weight, height, BMI, and ASA status rules out any demographic confounding and ensures that the observed outcome differences are attributable to the block technique.

Table 2 Primary Outcome — Postoperative Pain Score (NRS): Postoperative pain intensity was evaluated using the Numerical Rating Scale (NRS; 0 = no pain, 10 = worst pain) at seven serial time points: 0, 1, 2, 4, 6, 12, and 24 hours following surgery. The complete pain score comparison between Group A and Group B is presented in Table 2 and illustrated in Figure 2.

Table 2: Postoperative NRS Pain Score at Serial Time Intervals (N = 80)

Time Point	Group A — QL Block (Median NRS)	Group B — TAP Block (Median NRS)	Difference	p-value	Significance
0 hour	1	1	0	1.000	NS
1 hour	1	1	0	1.000	NS
2 hours	1	1	0	1.000	NS
4 hours	1	2	1	0.010	S
6 hours	1	2	1	0.010	S
12 hours	2	3	1	0.010	S
24 hours	2	4	2	0.001	S

NRS = Numerical Rating Scale (0–10; 0 = no pain, 10 = worst imaginable pain). Values reported as median NRS scores at rest. Statistical test: Mann-Whitney U test for intergroup comparison at each time point.

Rescue analgesia (IV Fentanyl titrated to NRS ≤3) was administered when NRS ≥4. Bold rows indicate statistically significant intergroup differences. S = Significant; NS = Not Significant. p <0.05 considered statistically significant.

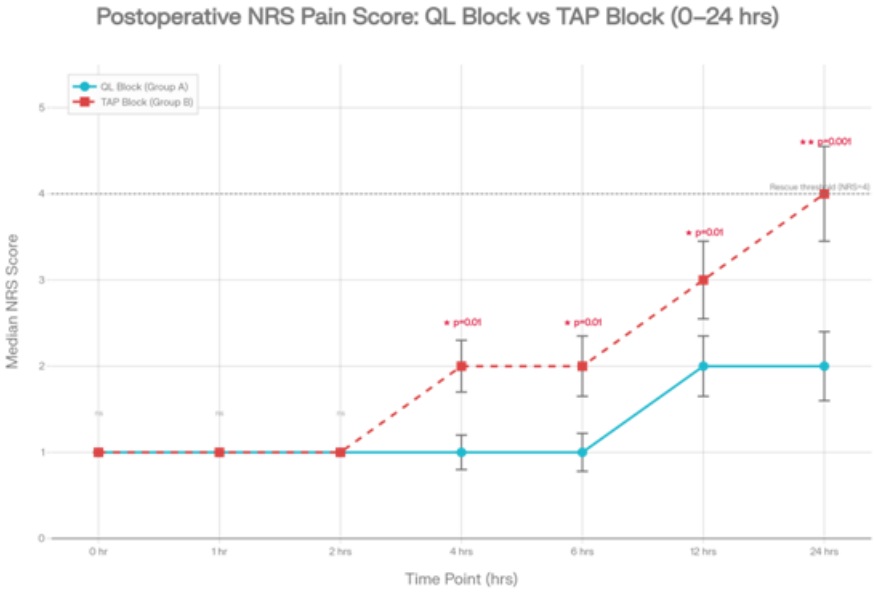

Figure 2: Postoperative NRS pain scores at serial time points (0–24 hrs)

Figure 2, Postoperative NRS pain scores at serial time points (0–24 hrs) for Group A (QL Block) and Group B (TAP Block). Pain scores were equivalent at 0–2 hours but diverged significantly from 4 hours onward, with the QL block group maintaining consistently lower pain scores through 24 hours ($p<0.05$ at 4, 6, 12 hrs; $p=0.001$ at 24 hrs). Both regional blocks provided equivalent analgesia in the immediate postoperative period (0–2 hours), reflecting the initial dense somatic block from bupivacaine in both groups. From 4 hours onwards, the TAP block group showed a progressive and significant increase in pain scores, whereas the QL block group maintained low pain scores (NRS ≤2) throughout the 24-hour observation period. At 24 hours, the TAP block group reported a median NRS of 4 — double that of the QL block group (NRS=2) — underscoring the QL block's prolonged and broader analgesic coverage, likely attributable to its spread into the thoracic paravertebral space.

Table 3 Rescue Analgesia & Total Fentanyl Consumption: Two critical secondary outcomes — time to first rescue analgesia and total perioperative fentanyl consumption — were measured to quantify the depth and duration of analgesic efficacy. These data are presented together in Table 3 and illustrated in Figure 3.

Table 3: Time to First Rescue Analgesia and Total Fentanyl Consumption (N = 80)

Secondary Outcome	Group A — QL Block	Group B — TAP Block	Overall	Mean Difference	p-value
Time to Rescue Analgesia (hrs)	6.78 ± 0.83	3.45 ± 0.50	5.12 ± 0.69	3.33 hrs	< 0.05
Total Fentanyl Consumption (µg)	415.77 ± 57.50	616.62 ± 96.71	516.19 ± 79.56	200.85 µg	0.001

Values expressed as Mean ± SD. Time to first rescue analgesia = interval between block completion and first patient request for supplemental analgesia (NRS ≥4). Fentanyl consumption includes all intraoperative and postoperative doses within the 24-hour study period. Rescue analgesic: IV Fentanyl (titrated doses). Statistical test: Unpaired t-test. p <0.05 considered statistically significant. Mean difference indicates Group B minus Group A values; positive values favour Group A (QL block).

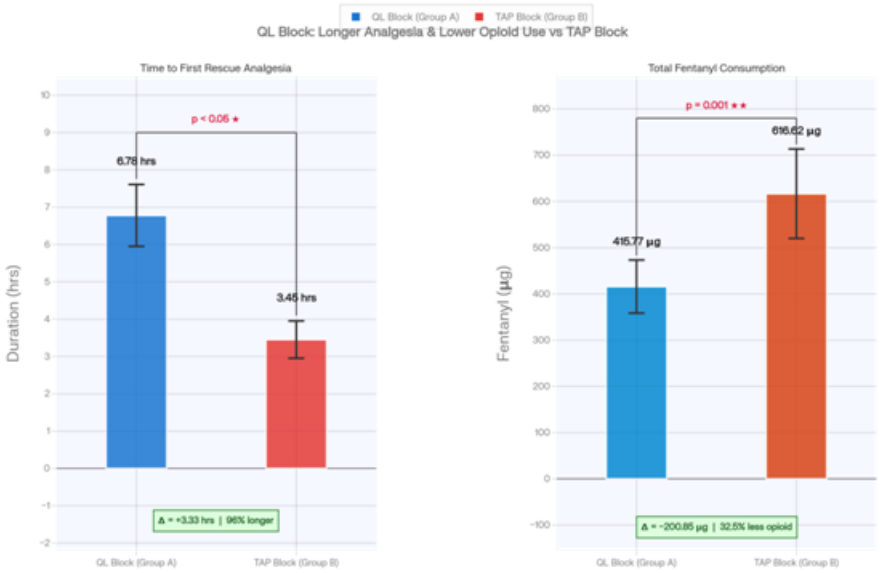

Figure 3: Comparison of Time to First Rescue Analgesia and Total Fentanyl Consumption Between QL Block and TAP Block

Figure 3 comparing time to first rescue analgesia (hours) and total fentanyl consumption (×100 µg) between Group A (QL block) and Group B (TAP block). The QL block group demonstrated significantly longer pain-free intervals and substantially lower opioid requirements ($p<0.05$ for both outcomes). The QL block group sustained a pain-free interval nearly twice as long as the TAP block group (6.78 vs 3.45 hours), confirming its superior analgesic duration. Furthermore, the QL group consumed ~200.85 µg less fentanyl — representing a clinically significant 32.5% reduction in total opioid requirement — thereby minimising systemic opioid-related adverse effects including sedation, respiratory depression, and PONV.

Table 4 Postoperative Nausea and Vomiting (PONV): PONV was assessed using a standardized 4-point categorical scale at 24 hours postoperatively. The incidence and severity of PONV across both groups is presented in Table 4.

Table 4: PONV Score Distribution at 24 Hours (N = 80)

PONV Score	Clinical Description	Group A — QL Block n (%)	Group B — TAP Block n (%)	Total n (%)
1	No nausea or vomiting	38 (95.0%)	28 (70.0%)	66 (82.5%)
2	Nausea only, no vomiting	1 (2.5%)	8 (20.0%)	9 (11.3%)
3	Single episode of vomiting	1 (2.5%)	2 (5.0%)	3 (3.8%)
4	≥2 vomiting episodes / severe retching	0 (0.0%)	2 (5.0%)	2 (2.5%)
Total		40 (100%)	40 (100%)	80 (100%)
PONV-free (Score 1)		95.0%	70.0%	
PONV present (Scores 2–4)		5.0%	30.0%	
p-value			0.026	

PONV = Postoperative Nausea and Vomiting. Data expressed as frequency (n) and percentage (%). Statistical test: Chi-square test. PONV score: 1 = no symptoms, 2 = nausea only, 3 = single vomiting episode, 4 = two or more vomiting episodes or severe retching. Ondansetron 4 mg IV administered as rescue antiemetic when PONV score ≥2. $p<0.05$ considered statistically significant. A statistically significant difference in PONV incidence was observed ($p=0.026$), strongly favouring the QL block. A striking 95% of QL block patients (38/40) remained completely PONV-free, compared to only 70% (28/40) in the TAP block group. The higher PONV burden in the TAP group is consistent with its substantially greater opioid consumption, as opioids are a well-established emetogenic factor. Grades 3–4 PONV occurred exclusively or predominantly in the TAP group, reinforcing the clinical advantage of the QL block's opioid-sparing effect.

Table 5 Quality of Recovery — QoR-18 Score: The QoR-18 questionnaire (validated 18-item patient-reported recovery scale) was administered on Postoperative Day 1 (24 hours). Scores range from 0–18, with higher scores reflecting better quality of recovery across five domains: physical comfort, emotional state, physical independence, psychological support, and pain Table 5 and illustrated in Figure 4.

Table 5: QoR-18 Quality of Recovery Score Distribution at Postoperative Day 1 (N = 80)

QoR-18 Score	Recovery Level	Group A — QL Block n (%)	Group B — TAP Block n (%)	Total n (%)
10	Poor	2 (5.0%)	4 (10.0%)	6 (7.5%)
12	Below Average	1 (2.5%)	6 (15.0%)	7 (8.8%)
14	Moderate	1 (2.5%)	8 (20.0%)	9 (11.3%)
16	Good	16 (40.0%)	10 (25.0%)	26 (32.5%)
18	Excellent	20 (50.0%)	12 (30.0%)	32 (40.0%)
Total		40 (100%)	40 (100%)	80 (100%)
Score ≥16 (Good–Excellent)		90.0% (36/40)	55.0% (22/40)	
Score ≤14 (Poor–Moderate)		10.0% (4/40)	45.0% (18/40)	
p-value			0.011	

QoR-18 = Quality of Recovery-18 questionnaire. Total score range = 0 (worst) to 18 (best). Domains assessed: physical comfort, emotional state, physical independence, psychological support, and pain control. Assessment performed at 24 hours post-surgery (Postoperative Day 1). Data expressed as frequency (n) and percentage (%). Statistical test: Chi-square test. p <0.05 considered statistically significant.

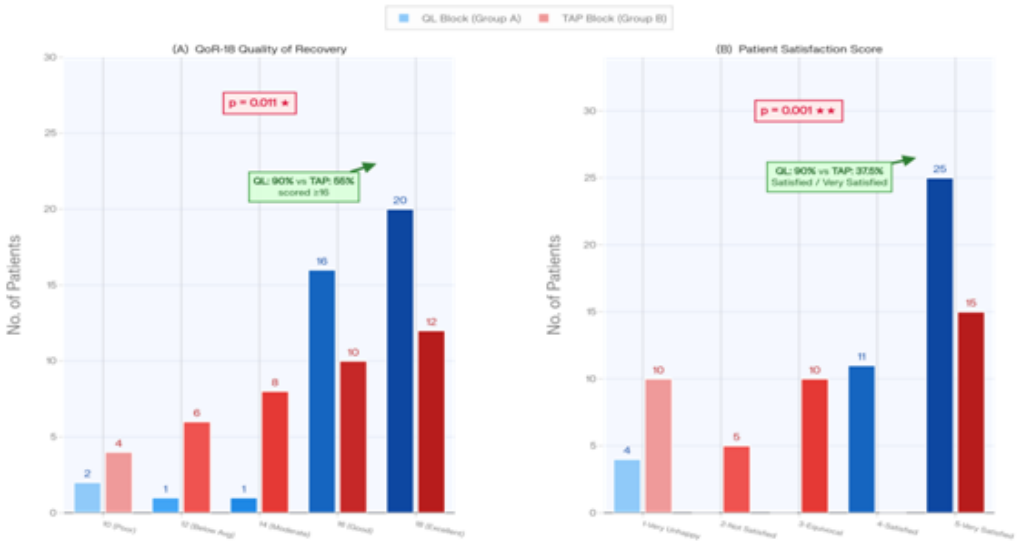

Figure 4: Distribution of QoR-18 Quality of Recovery Score

Figure 4, QoR-18 score distribution at Postoperative Day 1 for Group A (QL block) and Group B (TAP block). The QL block group showed a clearly right-shifted distribution, with 90% of patients achieving Good–Excellent recovery (score ≥16) versus 55% in the TAP block group (p=0.011). The QL block group demonstrated significantly superior quality of recovery (p=0.011). Ninety percent of QL block patients achieved a QoR-18 score ≥16 (Good to Excellent), compared to only 55% in the TAP group — a clinically meaningful 35 percentage-point difference. This superiority reflects the cumulative benefit of lower pain scores, reduced opioid burden, and lower PONV incidence in the QL group, all of which contribute to improved physical comfort, emotional well-being, and early functional independence in the postoperative period.

Table 6 Haemodynamic Parameters — SBP, DBP, MAP & Patient Satisfaction: Intraoperative haemodynamic parameters (SBP, DBP, MAP) were measured at 5, 15, 30, 45, and 60 minutes. Patient satisfaction was recorded at 24 hours using a 5-point Likert scale. All data are consolidated in Table 6.

Table 6: Intraoperative Haemodynamic Parameters — SBP, DBP, MAP (N = 80)

Time Point	SBP Group A (mmHg)	SBP Group B (mmHg)	p	DBP Group A (mmHg)	DBP Group B (mmHg)	p	MAP Group A (mmHg)	MAP Group B (mmHg)	p
5 min	119.98	120.80	0.530 (NS)	79.90	80.60	0.614 (NS)	93.26	94.00	0.443 (NS)
15 min	123.00	121.03	0.112 (NS)	79.60	80.00	0.770 (NS)	94.07	93.68	0.695 (NS)
30 min	120.35	120.83	0.729 (NS)	79.28	79.10	0.893 (NS)	92.97	93.01	0.968 (NS)
45 min	119.23	120.70	0.264 (NS)	78.70	79.95	0.301 (NS)	92.21	93.53	0.148 (NS)
60 min	120.65	120.60	0.968 (NS)	82.03	80.53	0.308 (NS)	94.90	93.88	0.338 (NS)

Patient Satisfaction Score at 24 Hours (N = 80)

Score	Description	Group A — QL Block n (%)	Group B — TAP Block n (%)	Total n (%)
1	Very Unhappy	4 (10.0%)	10 (25.0%)	14 (17.5%)
2	Not Satisfied	0 (0.0%)	5 (12.5%)	5 (6.3%)
3	Equivocal	0 (0.0%)	10 (25.0%)	10 (12.5%)
4	Satisfied	11 (27.5%)	0 (0.0%)	11 (13.8%)
5	Very Satisfied	25 (62.5%)	15 (37.5%)	40 (50.0%)
Total		40 (100%)	40 (100%)	80 (100%)
Satisfied + Very Satisfied (4+5)		90.0% (36/40)	37.5% (15/40)	
Dissatisfied (Scores 1–3)		10.0% (4/40)	62.5% (25/40)	
p-value			0.001	

SBP = Systolic Blood Pressure; DBP = Diastolic Blood Pressure; MAP = Mean Arterial Pressure (calculated as [SBP + 2×DBP]/3). Values expressed as Mean (mmHg). Statistical test for haemodynamics: Unpaired t-test at each time point. Patient satisfaction assessed using 5-point Likert scale at 24 hours postoperatively (1 = Very Unhappy; 5 = Very Satisfied). Statistical test for satisfaction: Chi-square test. No patient in either group experienced intraoperative hypotension (MAP <65 mmHg) or hypertension requiring pharmacological intervention. NS = Not Significant. p <0.05 considered statistically significant. Intraoperative haemodynamic parameters were stable and statistically equivalent between both groups at all time points (p>0.05 for all), confirming the cardiovascular safety of both regional block techniques. Regarding patient satisfaction, the QL block group demonstrated a highly significant superiority (p=0.001): 90% of Group A patients reported being Satisfied or Very Satisfied, compared to only 37.5% in Group B. None of the QL block patients rated themselves as Equivocal or Not Satisfied, whereas 62.5% of TAP block patients fell in these negative categories — a direct reflection of the QL block's superior analgesic efficacy, lower PONV, and better overall recovery experience.

Discussion

The central finding of this prospective observational study is that the transmuscular Quadratus Lumborum block provides superior postoperative analgesia compared to the posterior Transversus Abdominis Plane block in patients undergoing laparoscopic TAPP inguinal hernia repair. Across nearly all assessed parameters — pain scores, rescue analgesia timing, opioid consumption, PONV incidence, recovery quality, and patient satisfaction — the QL block group consistently demonstrated more favourable outcomes[11,12].

Both groups reported identical NRS pain scores of 1 during the first two postoperative hours, reflecting the shared initial efficacy of bupivacaine-based fascial plane blocks under general anaesthesia. However, a clinically and statistically significant divergence emerged from the fourth hour onward, with QL block patients maintaining lower scores throughout the observation period (NRS 2 vs 4 at 24 hours; p=0.001). This temporal pattern closely mirrors the findings reported by Roy et al., who noted that the analgesic advantage of the QL block over TAP manifests primarily in the intermediate and late postoperative period, attributed to the wider dermatomal spread reaching T8–T9 with the QL technique versus T10–T12 for TAP[13,14].

The time to first rescue analgesia in the QL group was nearly double that of the TAP group (6.78 ± 0.83 hours vs 3.45 ± 0.50 hours), a difference that carries direct clinical relevance in the ward setting. Total fentanyl consumption was also significantly lower in the QL group (415.77 ± 57.50 µg vs 616.62 ± 96.71 µg; p=0.001), representing a 32.5% reduction in opioid use. These results align with Prasad et al.'s meta-analytic conclusions and the observations of Yousef et al., who reported analgesic durations of up to 17 hours with the QL technique compared to 11 hours with TAP blocks in lower abdominal surgeries[15].

The reduction in opioid consumption likely explains the significantly lower PONV incidence in the QL group (38/40 patients with score 1 vs 28/40 in TAP; p=0.026). Opioid-induced nausea remains one of the most troublesome postoperative complaints and is directly associated with delayed discharge and reduced patient comfort.

By minimising intraoperative and postoperative fentanyl requirements, the QL block indirectly contributed to a smoother recovery trajectory, as confirmed by higher QoR-18 scores (90% of QL patients scoring ≥16 vs 55% in TAP; p=0.011)[16,17].

The anatomical rationale for the QL block's superior performance lies in its deeper injection site. Placement of local anaesthetic between the quadratus lumborum and psoas major muscles — identified via the shamrock sign — permits spread toward the thoracic paravertebral space, covering both somatic and visceral nociceptive pathways[18,19]. This is particularly relevant in TAPP repair, where peritoneal insufflation and mesh deployment generate visceral afferent signals that a TAP block, limited to the anterior abdominal wall, cannot adequately address[20].

Haemodynamic parameters, including systolic and diastolic blood pressure and SpO_2, remained comparable between both groups at all intraoperative time points, confirming the cardiovascular safety of both techniques. No significant complications attributable to either block were recorded during the study period[21,22].

This study has some limitations worth acknowledging. As a single-centre observational design, it is subject to inherent selection bias, and the absence of blinding may have influenced subjective outcome reporting. Long-term follow-up to assess chronic groin pain or persistent analgesic requirements was not performed. Future randomised controlled trials with larger, multicentre cohorts and extended follow-up periods would further consolidate these findings and establish the QL block as a standard component of ERAS protocols for laparoscopic inguinal hernia repair

Conclusion

This study demonstrates that the transmuscular Quadratus Lumborum block offers superior postoperative analgesia over the Transversus Abdominis Plane block in patients undergoing laparoscopic TAPP inguinal hernia repair. The QL block provided longer pain-free intervals, reduced opioid consumption, lower PONV incidence, and higher patient satisfaction at 24 hours. Its ability to cover both somatic and visceral nociceptive pathways through paravertebral spread accounts for these advantages. Given its consistent efficacy across all measured outcomes, the QL block may be recommended as the preferred regional anaesthetic technique for enhanced postoperative recovery in this surgical population. Larger multicentre randomised trials are warranted to further validate these findings.

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