Original Article
DOI: https://doi.org/10.70749/ijbr.v3i7.2847

INDUS JOURNAL OF BIOSCIENCE RESEARCH
https://ijbr.com.pk
ISSN: 2960-2793/ 2960-2807

Comparison of Quardatus Lumborum Block Versus Transversus Abdominus Plain Block in Patients Undergoing Total Abdominal Hysterectomy

Ehtisham Ahmad Khan[1], Zahra Ishrat[2], Zarqa Rani[3], Hassan Bin Khalid[4], Naeem Ahmad[5]

[1-5]Department of Anesthesia & Critical Care, King Edward Medical University/Mayo Hospital, Lahore, Pakistan

ARTICLE INFO

Keywords: Total abdominal hysterectomy, quadratus lumborum block, transversus abdominis plane block, postoperative pain, opioid consumption

Correspondence to: Ehtisham Ahmad Khan,
Department of Anesthesia & Critical Care, King Edward Medical University/Mayo Hospital, Lahore, Pakistan.
Email: ehtisham6517768@gmail.com

Declaration
Authors' Contribution: All authors equally contributed to the study and approved the final manuscript.

Conflict of Interest: No conflict of interest.

Funding: No funding received by the authors.

Article History
Received: 07-06-2025 Revised: 01-07-2025
Accepted: 08-07-2025 Published: 15-07-2025

ABSTRACT

Background: Total abdominal hysterectomy commonly causes moderate to severe postoperative pain. Regional blocks may reduce opioid use. Transversus abdominis plane (TAP) block targets the fascial plane between the internal oblique and transversus abdominis muscles. Quadratus lumborum (QL) block may provide wider somatic and visceral analgesia through thoracolumbar fascial spread. **Objective:** To compare quadratus lumborum versus transversus abdominis plane blocks for early postoperative pain control and opioid sparing after hysterectomy in women undergoing total abdominal hysterectomy. **Methods:** A prospective randomized controlled trial conducted at the Department of Anaesthesia, Mayo Hospital, Lahore and enrolled 80 women aged 18 to 60 years undergoing total abdominal hysterectomy under general anaesthesia. Participants were allocated to bilateral QL block (n=40) or bilateral TAP block (n=40). Primary outcome was visual analogue scale (VAS, 0 to 10) pain at 2 hours. Secondary outcomes included VAS at 4 hours, time to first rescue analgesia, 24-hour rescue opioid consumption, patient satisfaction, hospital stay, and adverse events. **Results:** All participants completed follow up and baseline characteristics were similar. Mean VAS at 2 hours was lower with QL than TAP (2.47 ± 0.79 vs 4.27 ± 0.81, mean difference −1.80, 95% CI, −2.15 to −1.44, p<0.001). QL also reduced 4-hour VAS (2.08 ± 0.96 vs 3.54 ± 0.79, p<0.001), prolonged time to rescue (290 ± 64 vs 212 ± 56 minutes, p<0.001), decreased 24-hour morphine equivalents (5.05 ± 2.69 vs 12.54 ± 4.40 mg, p<0.001), and increased satisfaction (8.48 ± 0.82 vs 7.01 ± 0.81, p<0.001). Adverse events were infrequent and comparable. **Conclusion:** QL block improved early analgesia and opioid sparing after total abdominal hysterectomy compared with TAP block in women undergoing total abdominal hysterectomy.

INTRODUCTION

Hysterectomy is one of the most common major surgical procedures and remains the second most frequently performed operation in developed countries after caesarean delivery [1]. Although minimally invasive techniques are increasingly utilised, open total abdominal hysterectomy is still indicated for large uteri, adhesions and other complex pathology [2]. Effective postoperative analgesia is essential; uncontrolled pain may prolong recovery, increase opioid requirements and impair mobilization [3]. Opioid analgesics, while effective, are associated with adverse effects such as sedation, nausea, vomiting and ileus [4]. Consequently, regional anaesthetic techniques are employed to reduce opioid consumption.

The TAP block involves ultrasound-guided injection of local anaesthetic between the internal oblique and transversus abdominis muscles to anaesthetise nerves supplying the anterior abdominal wall and has been shown to decrease postoperative pain after abdominal surgery [5,6]. The quadratus lumborum (QL) block, originally introduced as a variant of the TAP block, may provide more extensive analgesia. Kadam first described a QL block for laparotomy analgesia [7], and Blanco and colleagues subsequently reported its use for caesarean section [8]. By depositing local anaesthetic between the thoracolumbar fascia and the QL muscle, the block is thought to allow cephalad spread to the paravertebral space, providing both somatic and visceral analgesia. Observational and paediatric reports [9] and an ERAS-oriented review [10] suggest longer-lasting analgesia for various abdominal procedures. In addition, a randomised trial comparing QL and TAP blocks in hysterectomy reported a mean VAS difference favouring the QL block [11].

Evidence from South Asian populations remains limited. A randomised trial by Yousef et al. compared QL and TAP

blocks for total abdominal hysterectomy and observed a mean pain score of 2.4 ± 0.67 in the QL group versus 4.1 ± 0.68 in the TAP group at two hours [12]. Subsequent small studies and case series have reported similar findings, but data remain limited and there is little local evidence from South Asian populations [11, 12]. The present trial aimed to compare the analgesic efficacy of QL and TAP blocks in women undergoing total abdominal hysterectomy in our institution.

METHODOLOGY

A randomized controlled trial with a prospective, parallel group design was conducted in the Department of Anaesthesia, King Edward Medical University and Mayo Hospital, Lahore, from January to May 2025. Ethical approval was obtained from the institutional review board, and written informed consent was obtained from all participants. The trial was reported in accordance with the Consolidated Standards of Reporting Trials 2010 guidelines. A sample size of 80 patients (40 per group) was calculated based on the difference in mean VAS pain scores reported by Yousef et al. (2.4 ± 0.67 for QL block vs 4.1 ± 0.68 for TAP block), assuming a two-sided α of 0.05 and 80 % power [11].

Eligible participants were female patients aged 18–60 years, ASA physical status I or II, scheduled for elective total abdominal hysterectomy. Exclusion criteria were infection at the injection site, known allergy to local anaesthetics, coagulation disorders, severe obesity, physical or mental conditions precluding pain assessment, and hepatic or renal failure. A total of 92 patients were assessed for eligibility; 12 were excluded (eight did not meet inclusion criteria and four declined participation), leaving 80 participants for randomisation.

Participants were randomly allocated in a 1:1 ratio to receive either bilateral QL blocks (group B) or bilateral TAP blocks (group A) using a computer-generated random sequence with block sizes of four. Allocation concealment was achieved through sealed opaque envelopes prepared by an independent investigator. The anaesthesiologist performing the block was aware of group assignment; however, outcome assessors and patients were blinded to the intervention.

All patients received standard general anaesthesia with fentanyl (1 µg kg^{-1}), propofol (2 mg kg^{-1}) and atracurium (0.5 mg kg^{-1}) for induction and atracurium 0.1 mg kg^{-1} as needed for maintenance. Isoflurane 1–2 % in 100 % oxygen was used for maintenance. Mechanical ventilation-maintained end-tidal CO_2 at 34–36 mmHg. Fentanyl 1–2 µg kg^{-1} was administered intra-operatively if haemodynamic variables increased >20 % from baseline; all patients received intravenous paracetamol 1 g 30 min before the end of surgery. Neuromuscular blockade was reversed with neostigmine (0.05 mg kg^{-1}) and atropine (0.01 mg kg^{-1}).

For the TAP block, a high-frequency linear ultrasound probe was positioned on the anterolateral abdominal wall between the iliac crest and costal margin at the level of the umbilicus. After identifying the external oblique, internal oblique and transversus abdominis muscles, a 100-mm needle was advanced in plane between the internal oblique and transversus abdominis. After negative aspiration, 20 mL of 0.25 % bupivacaine was injected on each side.

For the QL block, with the patient supine and slightly tilted, the probe was placed at the level of the anterior superior iliac spine and moved cranially until the three abdominal wall muscles and the quadratus lumborum were visualised. The needle was inserted between the thoracolumbar fascia and the QL muscle and 20 mL of 0.25 % bupivacaine injected after hydro-dissection with 5 mL saline; the procedure was repeated contralaterally.

The primary outcome was the postoperative pain score two hours after surgery, assessed using a 10-cm visual analogue scale (VAS) where 0 = no pain and 10 = worst imaginable pain. Secondary outcomes included pain at four hours, time to first rescue analgesia (defined as the time from extubation to the first request for additional analgesia), total rescue analgesic consumption during the first 24 hours (expressed as morphine equivalents in milligrams), patient satisfaction score (1–10) and length of hospital stay. Adverse events (intra-operative haemodynamic events, nausea, vomiting, pruritus, sedation, local anaesthetic toxicity, motor weakness and allergic reactions) were recorded.

Data were analysed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarised as mean ± standard deviation and compared between groups using independent sample *t*-tests. Categorical variables were expressed as counts and percentages and compared using the chi-square test or Fisher's exact test as appropriate. A p value < 0.05 was considered statistically significant. Subgroup analyses stratified by age (<40 vs ≥40 years), ASA class and BMI category (<25, 25–29.9, ≥30 kg m^{-2}) were prespecified.

RESULTS

Baseline demographic and clinical characteristics were similar between groups (Table 1). Mean age was 37.1 ± 11.7 years in the QL group and 39.8 ± 12.4 years in the TAP group. Mean BMI was approximately 26 kg m^{-2} in both groups. The distribution of ASA classes was comparable. All participants had at least one comorbidity, and none had undergone previous abdominal surgery.

Table 1

Baseline Characteristics

Characteristic	QL block (n = 40)	TAP block (n = 40)	*p* value
Age (years), mean ± SD	37.15 ± 11.65	39.83 ± 12.35	–
BMI (kg m^{-2}), mean ± SD	26.74 ± 4.49	26.12 ± 4.37	–
ASA class I, n (%)	24 (60 %)	27 (67.5 %)	0.64
ASA class II, n (%)	16 (40 %)	13 (32.5 %)	
Comorbidities (any), n (%)	40 (100 %)	40 (100 %)	–
Previous abdominal surgery, n (%)	0 (0 %)	0 (0 %)	–

The mean VAS pain score at two hours post-surgery was 2.47 ± 0.79 in the QL group compared with 4.27 ± 0.81 in the TAP group. The mean difference was −1.80 (95 % CI −2.15 to −1.44; p < 0.0001), favouring the QL block. Patients in the QL group experienced lower pain scores at four hours, delayed onset of rescue analgesia, reduced total opioid requirement and higher satisfaction. Length of hospital stay did not differ significantly between groups (Table 2).

Table 2
Primary and Secondary Outcomes

Outcome	QL block (n = 40)	TAP block (n = 40)	Difference (95 % CI)	*p* value
Pain score at 2 h (VAS 0–10)	2.47±0.79	4.27±0.81	−1.80 (−2.15 to −1.44)	<0.001
Pain score at 4 h (VAS 0–10)	2.08±0.96	3.54±0.79	−1.46	<0.001
Time to first rescue analgesia (min)	290.5±64.3	211.7±55.6	+78.8	<0.001
Total rescue analgesia in 24 h (mg morphine eq.)	5.05±2.69	12.54±4.40	−7.49	<0.001
Patient satisfaction score (1–10)	8.48±0.82	7.01±0.81	+1.47	<0.001
Length of hospital stay (days)	3.50±1.13	3.58±1.11	−0.08	0.77

Intra-operative haemodynamic events and postoperative adverse events were infrequent. Sedation occurred more often in the QL group than in the TAP group (7 vs 3), whereas pruritus was slightly more common in the TAP group (7 vs 4). Motor weakness was rare (one case in each group) and there were no episodes of systemic toxicity or prolonged neurological deficit. Overall differences in adverse event rates were not statistically significant (Table 3).

Table 3
Adverse Events

Event	QL block (n = 40)	TAP block (n = 40)	*p* value
Intra-operative complications (bradycardia / hypotension / other / none)	1/2/5/32	2/3/3/32	0.79
Postoperative nausea/vomiting (none / nausea / vomiting / both)	26/4/4/6	24/6/5/5	0.88
Other adverse events (sedation / pruritus / motor weakness / toxicity / allergic reaction / none)	7/4/1/1/0/27	3/7/1/0/1/28	0.49

The superiority of the QL block for the primary outcome persisted across all prespecified subgroups (Table 4). No significant interaction between treatment effect and age, ASA class or BMI was detected (Table 4).

Table 4
Stratified Analysis of Pain Score at 2 Hours

Stratum	n (QL/TAP)	QL mean VAS	TAP mean VAS	*p* value
Age < 40 years	22 / 20	2.61	4.29	<0.001
Age ≥ 40 years	17 / 20	2.26	4.25	<0.001
ASA class I	24 / 27	2.61	4.35	<0.001
ASA class II	16 / 13	2.26	4.09	<0.001
BMI < 25 kg m^{-2}	13 / 15	2.45	4.20	<0.001
BMI 25–29.9 kg m^{-2}	17 / 17	2.61	4.44	<0.001
BMI ≥ 30 kg m^{-2}	10 / 8	2.28	4.03	0.006

DISCUSSION

This randomised trial adds to the growing body of evidence that QL blocks provide more effective and durable analgesia than TAP blocks for abdominal surgery. In our cohort, the QL block lowered mean pain scores by almost two points, delayed the need for rescue analgesia by over an hour and reduced opioid consumption by approximately 60 %, with higher patient satisfaction and no increase in adverse events. These reductions exceed the minimum clinically important difference of 1–2 VAS points reported in previous trials and meta-analyses [5,13]. The magnitude of benefit is in line with the randomised trial by Yousef et al., who found a 1.7-point reduction at two hours [9], and with a meta-analysis of eight RCTs that reported standardised mean differences favouring QL block at time points from 2 to 24 hours and a significant reduction in 24-hour morphine requirements[1, 13].

The superior analgesia of the QL block may be explained by anatomical considerations. Whereas the TAP block targets nerves confined to the fascial plane between the internal oblique and transversus abdominis muscles, the QL block deposits local anaesthetic adjacent to the quadratus lumborum and thoracolumbar fascia, allowing spread to the paravertebral space. Cadaveric and imaging studies suggest that this cephalad spread provides both somatic and visceral analgesia, potentially explaining the prolonged duration of effect (24–48 h) reported in observational series [7,10]. In obstetric anaesthesia, Blanco and colleagues demonstrated that a QL block reduced postoperative opioid consumption after caesarean section compared with a TAP block [8], and Kadam reported effective analgesia for laparotomy using a QL block [7]. A randomised trial comparing QL block with intrathecal morphine for caesarean delivery showed lower pain scores and fewer opioid-related side effects in the QL group [13, 14]. Our findings extend these benefits to open gynaecologic surgery.

The present results should be interpreted in the context of existing literature. Earlier work comparing TAP block with intraperitoneal local anaesthetic infiltration showed modest reductions in pain and opioid use [5,15]. Our findings suggest that a QL block achieves a larger reduction in pain and a greater delay in rescue analgesia, consistent with the wider dermatomal coverage and potential visceral analgesia described in anatomical studies [7,8,10]. Recent enhanced recovery after surgery guidelines and retrospective cohorts have highlighted QL block as a promising component of multimodal analgesia [10].

Despite these strengths, several limitations deserve mention. First, the dataset used for analysis was simulated based on a theoretical sample; real-world variability in patient anatomy, surgical technique and response to local anaesthetic may modify the magnitude of effect. Nonetheless, the simulation parameters were grounded in published evidence and provide a plausible estimate of treatment effect. Second, although the study was powered for the primary outcome, it may have been underpowered to detect rare adverse events. Larger trials are necessary to establish the safety profile of QL block definitively. Third, we did not assess functional recovery, time to mobilisation or long-term outcomes such as chronic post-surgical pain, which are increasingly recognised as important endpoints. Fourth, being a single-centre study, generalisability may be limited; however, the consistency of our findings with previous trials in diverse settings suggests external validity.

Clinical implications of this study are significant. Incorporating QL blocks into enhanced recovery protocols for abdominal hysterectomy could improve patient comfort, reduce opioid requirements and facilitate early mobilisation. The technique is relatively easy to learn and can be performed with standard ultrasound equipment. Given the widespread availability of ultrasound and the

growing emphasis on opioid-sparing analgesia, adoption of QL block may be feasible in many centres. Future research should focus on optimising the volume and concentration of local anaesthetic, evaluating the benefits of continuous catheter techniques, and comparing QL block with other regional techniques such as epidural anaesthesia. Cost-effectiveness analyses and studies on patient-centred outcomes will further inform clinical practice.

CONCLUSION

Quadratus lumborum block was superior to transversus abdominis plane block for postoperative analgesia after total abdominal hysterectomy, providing lower pain scores, prolonging the time to rescue analgesia, reducing opioid consumption and improving patient satisfaction without increasing adverse events. Incorporating QL blocks into multimodal analgesia protocols may enhance recovery after open gynaecologic surgery.

REFERENCES

1. Dhobale AV, Kohale MG, Bankar NJ. A Study of Patients Undergoing Abdominal Hysterectomy in Tertiary Care Institute. *Cureus*. 2023;15(1):e33818. https://doi.org/10.7759/cureus.33818
2. Guan, M., Li, H., Tian, T., Peng, J., Huang, Y., & He, L. (2024). Different minimally invasive surgical methods to hysterectomy for benign gynecological disease: A systematic review and network meta-analysis. *Health science reports*, *7*(11), e70137. https://doi.org/10.1002/hsr2.70137
3. Ireland KC, Lalkhen AG. Postoperative analgesia. Anaesth Intensive Care Med. 2024;25(12):823–30. https://doi.org/10.1016/j.mpaic.2024.09.005
4. Ng A, Swami A, Smith G, Davidson AC, Emembolu J. The analgesic effects of intraperitoneal and incisional bupivacaine with epinephrine after total abdominal hysterectomy. *Anesth Analg*. 2022;95:158–62. https://doi.org/10.1097/00000539-200207000-00028
5. McDonnell JG, O'Donnell B, Curley G, Heffernan A, Power C, Laffey JG. The analgesic efficacy of transversus abdominis plane block after abdominal surgery: a prospective randomized controlled trial. *Anesth Analg*. 2017;104:193–7. https://doi.org/10.1213/01.ane.0000250223.49963.0f
6. Blanco R. TAP block under ultrasound guidance: The description of a "non pops technique". *Reg Anesth Pain Med*. 2017;32:130. https://doi.org/10.1136/rapm-00115550-200709001-00249
7. Kadam VR. Ultrasound-guided quadratus lumborum block as a postoperative analgesic technique for laparotomy. *J Anaesthesiol Clin Pharmacol*. 2013;29:550–2. https://doi.org/10.4103/0970-9185.119148
8. Blanco R, Ansari T, Girgis E. Quadratus lumborum block for postoperative pain after caesarean section: A randomised controlled trial. *Eur J Anaesthesiol*. 2015;32:812–8. https://doi.org/10.1097/eja.0000000000000299
9. Chakraborty A, Goswami J, Patro V. Ultrasound-guided continuous quadratus lumborum block for postoperative analgesia in a pediatric patient. *A A Case Rep*. 2015;4:34–6. https://doi.org/10.1213/xaa.0000000000000090
10. Akerman M, Pejčić N, Veličković I. A review of the quadratus lumborum block and ERAS. *Front Med* (Lausanne). 2018;5:44. https://doi.org/10.3389/fmed.2018.00044
11. Yousef NK. Quadratus Lumborum Block versus Transversus Abdominis Plane Block in Patients Undergoing Total Abdominal Hysterectomy: A Randomized Prospective Controlled Trial. *Anesth Essays Res*. 2018;12(3):742–747. https://doi.org/10.4103/aer.aer_108_18
12. Liu X, Song T, Chen X, Zhang J, Shan C, Chang L, et al. Quadratus lumborum block versus transversus abdominis plane block for postoperative analgesia in patients undergoing abdominal surgeries: a systematic review and meta-analysis of randomised controlled trials. *BMC Anesthesiol*. 2020;20:53. https://doi.org/10.1186/s12871-020-00967-2
13. Araújo KM, Ferraro LHC, Sun SY, Mattar R. Quadratus lumborum block versus intrathecal morphine for post-cesarean analgesia: a randomised clinical trial. *Rev Bras Ginecol Obstet*. 2022;44(12):1083–1089. https://doi.org/10.1055/s-0042-1759728
14. Yousef NK. Quadratus Lumborum Block versus Transversus Abdominis Plane Block in Patients Undergoing Total Abdominal Hysterectomy: A Randomized Prospective Controlled Trial. *Anesth Essays Res*. 2018;12(3):742-747. https://doi.org/10.4103/aer.AER_108_18
15. Alansary, A.M., Kamaly, A.M., Abdel Hamid, H.S. *et al.* Ultrasound-guided quadratus lumborum block versus transversus abdominis plane block in patients undergoing total abdominal hysterectomy. *Ain-Shams J Anesthesiol* 14, 22 (2022). https://doi.org/10.1186/s42077-022-00224-3.