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Comparison of Ultrasound-Guided Ilioinguinal and Iliohypogastric Nerve Block with and without Tramadol for Postoperative Pain in Patients Undergoing Caesarean Delivery

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ABSTRACT

Maternal relief, early mobilization, and breastfeeding are dependent on the effective postoperative pain management following caesarean section. **Objectives:** To compare the analgesic effect of ultrasound-guided ilioinguinal-iliohypogastric nerve block with ropivacaine only versus ropivacaine with tramadol in patients who underwent elective cesarean delivery. **Methods:** A retrospective study was performed on a sample of 100 individuals, and the study was performed in two groups. Group A was given ropivacaine, and Group B was given ropivacaine and tramadol to relieve postoperative pain. Median [IQR] and mean ± SD were estimated, and comparisons between them were done by Fisher's Exact test, Mann-Whitney U-test, and independent t-test, with p≤0.050 taken as significant. **Results:** The combination of Ropivacaine and Tramadol gave better analgesia in patients who had a caesarean than when Ropivacaine was used. The combination group had a much longer pain-free period (20 vs. 14 hours, p=0.002), and the overall pain scores were lower (1.0 ± 0.7 vs. 1.8 ± 1.0, p=0.001). The patients needed fewer rescue analgesics, and there was no difference in opioid side effects. **Conclusions:** The combination of Tramadol and Ropivacaine has a significant positive effect on postoperative analgesia in patients undergoing a caesarean section, extending pain-free periods and decreasing the intensity of pain, with minimal adverse effects, which makes it an effective and safe approach to enhancing patient comfort and satisfaction.

INTRODUCTION

Cesarean section (CS) is one of the most prevalent surgical procedures globally, the rate of which has grown significantly over the past 30 years, rising from about 7% in 1990 to about 21% in 2021, with regional disparities still existing and some areas still increasing in use [1]. The global estimates are showing a rise in the rate of CS at the population level, with rates rising to 7% in 1990 to about 21% by 2021, and with more regional differences and increasing trends in most regions. The increased number of CS surgeries worldwide means that even minor changes in perioperative pain management may lead to significant population-level benefits in maternal recovery, breastfeeding, mobility, and opioid exposure [2]. Despite the advances in obstetric anesthesia methods, clinically significant acute postoperative pain in a considerable percentage of women who have undergone CS has remained [3]. The first 24 hours following a CS have been associated with moderate to severe pain, with reported rates ranging from roughly 50% to even higher, depending on circumstances and analgesic treatments, according to

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several research studies and systematic reviews [4, 5]. Improper nursing, delayed mobilization, disturbed mother-infant attachment, increased opiate intake, and a high risk of developing chronic pain all coexist with the phenomenon of uncontrollable acute postoperative pain following cesarean surgery [6]. As a result, these results bring forward the pressing need to implement effective, opioid-sparing analgesic measures implementable in the everyday obstetric environment [7]. Pfannenstiel incision-directed peripheral nerve blocks have been identified as useful adjuncts in multimodal analgesics after CS [5]. A bilateral ilioinguinal-iliohypogastric nerve block not only provides localized analgesia to the lower abdominal wall but also has been shown to reduce early postoperative pain scores and opioid consumption following lower abdominal surgeries, which include CS and gynecologic surgeries when performed under ultrasound guidance [8]. Ultrasound guidance increases block accuracy, reduces local anesthetic volume, and lowers complication rates compared with landmark-based methods, making these blocks attractive for routine practice in obstetric anesthesia. Observational trials and randomized controlled studies in the 2020s reported good analgesic and safety effects of ultrasound-guided ilioinguinal/iliohypogastric blocks [9]. Integration of adjuvants into local anesthetics (PA) used to block peripheral nerves has been widely studied to increase peripheral nerve block duration and decrease dependence on systemic opioids. Tramadol is a weak μ opioid receptor agonist that also has monoaminergic effects and thus has been investigated as a co-administration agent with local anesthetics with a range of peripheral and truncal blockade methods [10]. A study reported that tramadol extends the duration of sensory blockade and reduces postoperative analgesic consumption of some types of blocks, although the effect size and the adverse-effect profile are dependent on dose and route of administration, and the type of surgery [11]. Modern studies also compare tramadol and other adjuvants in the form of dexamethasone and note that tramadol is effective in many of these environments; other adjuvants may have an extended action or a different side-effect profile. Since the use of opioid-sparing methodologies and tramadol has remained of intense interest, and due to the pharmacologic properties of tramadol, its use as an adjunct to truncal blocks during a caesarean section is a phenomenon that warrants specific study [12, 13]. The addition of a pharmacologic adjuvant such as tramadol with a highly selective, ultrasound-guided ilioinguinal and iliohypogastric nerve block can cause a clinically significant improvement in postoperative analgesia, a decrease in the requirement for opioid rescue, and a quicker recovery in mothers after CS [14].

However, the evidence that is specifically on caesarean patients on the comparative effectiveness of bilateral ultrasound-guided ilioinguinal/iliohypogastric blocks with and without tramadol is very limited and very variable. A well-planned comparative study will determine whether the addition of tramadol to the block will result in greater analgesic effect, stronger opioid-sparing effect, and a fair side-effect profile in mothers, and consequently, it will present an actionable solution immediately to improve post-caesarean outcome in accordance with the global targets to reduce the exposure of opioids in postpartum. This study aimed to compare ultrasound-guided ilioinguinal nerve block, iliohypogastric nerve block with and without tramadol in managing postoperative pain in individuals who undergo a CS.

METHODS

The study was a retrospective observational study that was carried out in the Department of Anesthesiology, Rehman Medical Institute (RMI), Peshawar, Pakistan, for six months from 1st August 2025 to 1st January 2026. The approval was obtained from the Institutional Review Board and Ethical Committee (IRB-ERC) of RMI (Approval No: RMI/IRB-EC/Approval/264). Data were collected from July 2024 to July 2025. Since this was a retrospective observational study, the sample used was decided by the number of patients who fit the inclusion criteria based on the available records. Among 417 cesarean sections done in the study period, 100 patients who satisfied the eligibility criteria were incorporated in the analysis. A post-hoc power analysis was carried out based on the difference between the 12-hour difference in pain score between groups observed in order to ensure the adequacy to detect a difference in the postoperative pain. Written informed consent was taken. The study used 50 patients per group, an effect size of 0.6, and an alpha of 0.05, yielding a power of 85%, which shows that the sample size was adequate to reveal clinically significant differences in the pain outcomes. According to the 12-hour postoperative pain scores, the mean NRS of the ropivacaine-only group was 3.0 ± 1.2, and of the ropivacaine-tramadol group was 1.8 ± 1.0. The pooled standard deviation was calculated and is equal to 1.105, which becomes a large effect size (Cohen, d = 1.086). The study had a power of more than 99 using an alpha of 0.05, and this indicates that the sample size was adequate to identify clinically significant differences in postoperative pain. All eligible patient records were screened using consecutive sampling. Additional data collected included a review of operative records and anesthesia charts available via the electronic medical record system of the hospital. Demographic variables (such as weight (kg), age (years), 'American Society of Anesthesiologists (ASA) status', gravida, and parity) were

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noted in relation to each patient. Moreover, the history of previous surgeries and post-operative pain in previous surgeries was also inquired. The nerve block data included the, the local anaesthetic used (ropivacaine 0.375%), the volume (20mL each side), and the use or non-use of tramadol (1mg/kg per each side) as needed. For all the nerve blocks, a 21G 80mm short beveled blunt tip needle (Stimuplex® Ultra 360® Needle) was used. These parameters were carefully recorded on a Performa. After data collection, patients were categorized into two groups based on the nerve block they had received during routine care. Group A consisted of patients who received a ropivacaine block, whereas Group B consisted of patients who received ropivacaine and tramadol in the nerve block. All the patients received IV paracetamol 1gm TID and IV ketorolac 30mg TID as part of multimodal analgesia. Patients were discharged from the hospital after the 2nd postoperative day. The post-operative pain data were collected in accordance with the unit's established guidelines, then entered into a structured data extraction sheet that was then imported into SPSS. The Numeric Rating Scale (NRS 0-10) was used to measure pain at the following time points: 0, 4, 8, 12, 16, 24, 30, 36, 42, and 48 hours [15]. The onset time of pain after the block, the use of rescue analgesia, the total amount of opioids consumed over 48 hours, and any adverse events related to opioids and local anesthesia were also recorded. Finally, patients' overall experience of pain relief and satisfaction was also extracted from the feedback forms. The level of patient satisfaction with pain control measurement was performed by utilizing a 5-point Likert scale, with 1 = very dissatisfied and 5 = very satisfied. SPSS (version 26.0) was used to conduct statistical tests. Initially, descriptive statistics were acquired. When continuous variables had normal distributions, they were reported as mean and standard deviation; when they did not, they were described as median with inter-quartile range; and when they were categorical, they were described as frequencies and percentages. The Shapiro-Wilk test was used to determine whether continuous variables were normal. Independent-samples t-tests were used for between-group comparisons of regularly distributed continuous data, whereas Mann-Whitney U tests were used for non-normally distributed data. Categorical variables, such as frequency and percentage of postoperative pain scores at various follow-up hours, were presented in terms of frequency and percentage. The pain scores were classified into No Pain (0), Mild Pain (1-3), Moderate Pain (4-6), and Severe Pain (7-10) to make them easy to interpret and compare. Since the Likert scale is ordinal in nature and the distribution of the responses in both groups is approximated to be normally distributed, mean + SD was deemed suitable to compare the responses using an independent t-test. The Fisher's exact test was used to compare the two groups of patients (Ropivacaine only vs. Ropivacaine + Tramadol) at each following time points. The statistically significant p-value ≤0.05.

RESULTS

The average age of the participants was 29.27 ± 5.7 years, and the average body weight was 72.9 ±9.9 kg. Most parturient (98%) were classified as ASA class 2. The median gravidity was 2 (IQR: 1-4), and the median parity was 1 (IQR: 1-3). The most common type of surgery was Caesarean section (42%), followed by repair of a 3rd-degree perineal tear (3%), anterior vaginal repair (1%), dilation and curettage (2%), and laparoscopic cholecystectomy (1%), with 51% having no prior surgery. The average time interval between the last surgeries was 1.75 ± 0.35 years. On the issue of pain during prior surgeries, 3% had mild pain, 22% had moderate pain, 22% severe pain, and 3% had none; 50% of the respondents had no previous surgical procedures (Table 1).

Table 1: Baseline Characteristics of the Study Population (n=100)

Variables	Mean ± SD / n (%)
Age	
Years	29.27 ± 5.7
Weight	
kg	72.9 ± 9.9
ASA Status	
ASA II	98 (98%)
ASA III	2 (2%)
Median (IQR)	
Gravida	2 (1-4)
Parity	1 (1-3)
Name of Previous Surgery	
C-Section	42 (42%)
3rd-Degree Perineal Tear	3 (3%)
Anterior Vaginal Repair	1 (1%)
D&C	2 (2%)
Laparoscopic cholecystectomy	1 (1%)
None	51 (51%)
History of previous surgery	50 (50%)
Time Since Last Surgery	
Years	1.75 ± 0.35
Pain in Previous Surgery	
Mild	3 (3%)
Moderate	22 (22%)
Severe	22 (22%)
No Pain	3 (3%)
No Previous Surgery	50 (50%)

Baseline variables (demographic and clinical) were compared between Group A (ropivacaine) and Group B (ropivacaine + tramadol). There were no notable differences between the samples, which validated that the

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two cohorts were similar before the analysis of the outcomes (Table 2).

Table 2: Baseline Characteristics of Study Groups (n=100)

Variables	Group A (Ropivacaine, n=50)	Group B (Ropivacaine + Tramadol, n=50)	p-value
Age (Years), Mean ± SD	29.4 ± 5.6	29.1 ± 5.8	0.780
Weight (kg), Mean ± SD	73.2 ± 10.0	72.6 ± 9.8	0.720
ASA II, n (%)	49 (98%)	49 (98%)	1.000
ASA III, n (%)	1 (2%)	1 (2%)	1.000
Gravida, Median (IQR)	2 (1–4)	2 (1–4)	0.850
Parity, Median (IQR)	1 (1–3)	1 (1–3)	0.920
History of Previous Surgery, n (%)	25 (50%)	25 (50%)	1.000

Independent t-test for continuous variables, Mann-Whitney U test for medians, Fisher's exact test for categorical variables. $p \leq 0.05$ is considered significant

At baseline (0 hours), all patients in both groups reported no pain. At 4 and 8 hours, most patients experienced no or mild pain, with no significant differences between groups (p=0.360 and 0.373, respectively). At 12 hours, the combination group (Ropivacaine + Tramadol) showed a significantly higher proportion of no pain (p=0.008). At 16 hours, mild pain predominated in both groups (p=0.056). Later follow-ups (24–48 hours) showed mostly mild pain, with occasional moderate pain, and differences were not statistically significant except at 42 hours (p=0.018), favoring the combination group (Table 3).

Table 3: Distribution of Static Pain Scores at Different Follow-up Hours in Patients Receiving Ropivacaine Alone in Block or Ropivacaine plus Tramadol in Block

Follow-up Hours	Patient Group	No Pain (0), n (%)	Mild Pain (1–3), n (%)	Moderate Pain (4–6), n (%)	Severe Pain (7–10), n (%)	p-value
0	Ropivacaine Only	50 (100%)	0 (0%)	0 (0%)	0 (0%)	–
	Ropivacaine + Tramadol	50 (100%)	0 (0%)	0 (0%)	0 (0%)	
4	Ropivacaine Only	47 (94%)	3 (6%)	0 (0%)	0 (0%)	0.360
	Ropivacaine + Tramadol	49 (98%)	1 (2%)	0 (0%)	0 (0%)	
8	Ropivacaine Only	43 (86%)	7 (14%)	0 (0%)	0 (0%)	0.373
	Ropivacaine + Tramadol	41 (82%)	9 (18%)	0 (0%)	0 (0%)	
12	Ropivacaine Only	19 (38%)	31 (62%)	0 (0%)	0 (0%)	0.008*
	Ropivacaine + Tramadol	33 (66%)	15 (30%)	2 (4%)	0 (0%)	
16	Ropivacaine Only	16 (32%)	34 (68%)	0 (0%)	0 (0%)	0.056
	Ropivacaine + Tramadol	22 (44%)	23 (46%)	5 (10%)	0 (0%)	
24	Ropivacaine Only	4 (8%)	46 (92%)	0 (0%)	0 (0%)	0.210
	Ropivacaine + Tramadol	1 (2%)	43 (86%)	6 (12%)	0 (0%)	
30	Ropivacaine Only	13 (26%)	37 (74%)	0 (0%)	0 (0%)	0.181
	Ropivacaine + Tramadol	7 (14%)	39 (78%)	2 (4%)	2 (4%)	
36	Ropivacaine Only	6 (12%)	44 (88%)	0 (0%)	0 (0%)	0.438
	Ropivacaine + Tramadol	5 (10%)	40 (80%)	3 (6%)	2 (4%)	
42	Ropivacaine Only	16 (32%)	34 (68%)	0 (0%)	0 (0%)	0.018*
	Ropivacaine + Tramadol	13 (26%)	33 (66%)	4 (8%)	0 (0%)	
48	Ropivacaine Only	27 (54%)	23 (46%)	0 (0%)	0 (0%)	0.079
	Ropivacaine + Tramadol	14 (28%)	34 (68%)	2 (4%)	0 (0%)	

Fisher's Exact Test to take out p-value, and *$p \leq 0.05$ is considered significant

The analgesic need and pain relief results revealed that the Ropivacaine + Tramadol group delayed the onset of pain significantly more than the Ropivacaine-only group (p=0.004). Though more patients in the combination group needed rescue analgesia, the difference was not significant (p=0.100). The Ropivacaine + Tramadol group performed significantly better than the Ropivacaine-only group (p=0.004). Also, the incidence of opioid related side effects was higher in the combination group (14%) compared with the Ropivacaine-only group (p=0.005). The two groups did not differ in patient satisfaction scores of pain control (p=0.351) (Table 4).

Table 4: Analgesic Requirements and Pain Relief Outcomes (n=100)

Outcome Variables	Group A Mean ± SD/ n (%)	Group B Mean ± SD/ n (%)	p-value
The Onset of pain	14.0 ± 2.9	16.1 ± 4.0	0.004*
Rescue analgesic required, n (%)	3 (6.0%)	8 (16.0%)	0.100+
Timings of Rescue Analgesia Administration	19.6 ± 7.6	15.5 ± 6.2	0.004*
Opioid-Related Side Effects, n (%)	4 (8%)	7 (14%)	0.005+
Patient Satisfaction Score with Pain, Mean ± SD	4.8 ± 0.4	4.7 ± 0.5	0.351*

*Independent t-test applied, and +Fisher Exact Test to take out p-value, and $p \leq 0.05$ is considered significant

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Table 5: Comparative Analysis of Postoperative Pain Relief between Ropivacaine Alone and Ropivacaine with Tramadol in Patients Undergoing Caesarean Delivery (n=100)

Primary Outcome	Group A (Ropivacaine)	Group B (Ropivacaine + Tramadol)	p-value
Duration of Pain Relief (Hours)	14 [12–16]	20 [18–24]	0.002*
Degree of Pain Relief (Overall MeanNRS)	1.8 ± 1.0	1.0 ± 0.7	0.001+

*Man, Whitney U test, and Independent +t-test applied to take out p-value, and p≤0.05 is considered significant

DISCUSSION

In this retrospective observational trial involving postsurgical analgesia with Ropivacaine and Tramadol versus Ropivacaine alone in patients undergoing elective caesarean surgery, we noted superior pain control, postoperative pain onset, and slight analgesia extension with Tramadol supplement. In particular, the combination group scored lower on the measure of static pain at several postoperative time-points, took a longer period to first request analgesics, and had a better profile of analgesics. Our results are consistent with the outcomes of a recent randomized controlled trial where II IH block was found to be an effective postoperative analgesic in caesarean patients, leading to a significant decrease in pain scores and time to first rescue analgesic, compared to controls [16]. Similarly, a prospective RCT from a low-resource setting demonstrated II-IH block as a practical and efficacious method for post-CS analgesia, reducing both pain intensity and opioid consumption [17]. In addition, more comprehensive studies on the peripheral nerve blocks used in caesarean delivery (e.g., fascial plane, nerve blocks) indicate that blocks, either singly or in combination with neuraxial analgesia, are effective in reducing early postoperative rest pain and opioid needs [18]. Tramadol combined with Ropivacaine probably augmented the analgesic duration and quality of the block in our study. This is consistent with results obtained with upper-extremity surgical procedures that indicate that, when administered as an adjuvant to local anesthetics, Tramadol extends sensory blockage and general analgesia without augmenting events of adverse effects [13]. The reduced total pain scores and the delayed requirement of rescue analgesia in our combination group support the hypothesis that Tramadol is a useful adjuvant to local anesthetics in regional blocks of abdominal surgery. Although most prior studies use other adjuvants (e.g., dexmedetomidine, dexamethasone) to extend block duration, our findings with Tramadol are positive, indicating the potential of an opioid-sparing option of relevant clinical value, namely, Tramadol [19, 20]. Nonetheless, some studies also, to some extent, disagree with our results. As an example, meta-analyses comparing transversus abdominis plane (TAP) block with II IH block in the management of post-cesarean analgesia show no significant difference in 24-hour opioid consumption or rest pain scores between the two techniques, whereas the use of an adjuvant such as Tramadol is important to improve outcomes [21, 22]. Variations in the local anesthetic concentration, volume, timing, block method (nerve block vs fascial plane), and adjunct choice are probably the reasons for differences in studies.

There are some limitations in this study. First, it was a single-centered study with a relatively small sample size that could limit the extrapolation of the findings. Second, the follow-up was limited to 48 hours, and pain outcomes in the long term were not measured. Third, personal pain tolerance and perception might affect subjective pain with the help of the numerical rating scale. Moreover, we have focused on tramadol as an adjuvant but have not compared other adjuvants. A multicenter prospective randomized controlled trial could address the limitations.

CONCLUSIONS

Combining Tramadol with Ropivacaine in the use of postoperative nerve blocks in caesarean surgery is much more effective in reducing pain, extending analgesia, and decreasing the use of rescue analgesics without altering opioid-related adverse events. Such a combination is an easy, secure, and effective approach to patient comfort during the immediate postoperative period. The results indicate the use of Tramadol as an adjuvant in the regional anesthesia practice to ensure the best management of postoperative pain and patient satisfaction.

Authors' Contribution

Conceptualization: SSS
Methodology: MYBK, AA
Formal analysis: MS
Writing and Drafting: SSS, FK
Review and Editing: SSS, MYBK, AA, MS, FK

All authors approved the final manuscript and take responsibility for the integrity of the work.

Conflicts of Interest

All the authors declare no conflict of interest.

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