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Comparison of Ultrasound-Guided Transversalis Fascia Plane Block, Quadratus Lumborum Block, and Ilioinguinal-Iliohypogastric Block for Postoperative Analgesia in Cesarean Section

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ABSTRACT

Background: Postoperative pain is a common complication after caesarean section (CS), and its management is essential to prevent adverse perioperative outcomes. Well-managed postoperative analgesia improves patient comfort while encouraging early ambulation and breastfeeding. This study aims to compare the analgesic efficacy of transversal fascial plane block (TFPB) vs. quadratus lumborum block (QLB) vs. Ilioinguinal Iliohypogastric (ILIH) block in patients undergoing caesarean section under neuraxial anaesthesia.

Methods And Materials: In this randomized clinical trial, 90 patients undergoing elective CS under spinal anesthesia were randomly allocated to receive TFPB or QL, or ILIH block under ultrasound guidance after surgery. The severity of pain was assessed using Visual Analogue Scale (VAS) during rest at 0, 2, 4, 6, 12, and 24 hours after surgery, time to first analgesic request, and dosage of analgesic use and complications were compared between groups.

Results: The cumulative paracetamol consumption over 24 hours was 1 gram for the QL group, 1 to 1.5 grams for the TFP group, and > 2 grams for the ILIH group. The median paracetamol consumption at 12 hours and 16 hours was also lower in the QL group compared to the TFP and ILIH groups ($P < 0.05$). There was no statistically significant difference between groups regarding time to first analgesia request ($p > 0.05$). The pain scores at 18 hours and 24 hours were lower in the QL group compared to the TFP and ILIH groups, respectively ($p < 0.05$). There is no statistically significant difference between groups regarding the postoperative side effects and complications.

Conclusion: In all three QLB, TFPB had comparable high analgesic efficacy during the first 24 hours. QL block had longer analgesic effectiveness compared to TFPB and ILIH block, with an effect lasting for 18- 24 hours.

1. INTRODUCTION

Effective postoperative analgesia following lower-segment cesarean section (LSCS) is crucial for enhancing maternal recovery, promoting early mobilization, and ensuring successful initiation of breastfeeding. Despite advancements in anesthetic techniques, managing postoperative pain remains a challenge, particularly in the context of enhanced recovery after surgery (ERAS) protocols[1].

Neuraxial anesthesia is commonly employed during cesarean deliveries and provides satisfactory intraoperative analgesia. However, its postoperative analgesic duration is limited, necessitating the addition of peripheral nerve blocks as part of a multimodal analgesic regimen[2]. Ultrasound-guided abdominal wall blocks are increasingly utilized to target somatic pain while minimizing opioid consumption and associated side effects.

Among the various regional techniques, the Transversalis Fascia Plane Block (TFPB), Quadratus Lumborum Block (QLB), and Ilioinguinal-Iliohypogastric (ILIH) nerve block have shown promise in providing analgesia for lower abdominal surgeries, including cesarean section. Each block differs in terms of anatomical site, drug spread, and potential for visceral versus somatic pain coverage. While QLB has been associated with extended analgesia due to its potential spread to the paravertebral space[3], TFPB and ILIH blocks primarily offer somatic analgesia[4,5].

Existing literature has examined these blocks individually or in pairs; however, direct comparisons among all three techniques in the context of LSCS are limited. This study aims to fill that gap by evaluating and comparing the postoperative analgesic efficacy of ultrasound-guided TFPB, QLB, and ILIH blocks in parturients undergoing cesarean section under neuraxial anesthesia. Primary outcomes include pain scores at rest and during movement, while secondary outcomes focus on time to first analgesic request, total opioid consumption in the first 24 hours, and patient satisfaction scores.

2. MATERIALS AND METHODS

The study was conducted in the Department of Anaesthesiology, Narayana Medical College and Hospital, after obtaining approval from the Institutional Ethics Committee. Informed and written consent was obtained from all participants before enrollment. This prospective, randomized study was conducted between August 2023 and February 2024. A total of 90 parturients scheduled for elective lower-segment cesarean section (LSCS) under neuraxial anesthesia were included in the study. Inclusion criteria were parturients aged between 18–40 years, ASA physical status II and III. Patients who refused to participate, those with ASA grade IV, known coagulation disorders, local infection at the injection site, or allergic reactions to study drugs were excluded. After thorough pre-anesthetic evaluation, patients were taken to the operating theatre. Standard ASA monitors were attached. All patients received spinal anesthesia in the sitting position. A 25G Quincke spinal needle was inserted using a midline approach at the L2–L3 or L3–L4 interspace under aseptic precautions. A standard dose of 10 mg of 0.5% hyperbaric bupivacaine with 60 mcg buprenorphine was administered intrathecally. The level of sensory blockade was assessed regularly by the level of touch sensation before surgical incision (T6–T8 was considered adequate). Intraoperative vitals were monitored.

After completion of the cesarean section, patients were randomized into three groups (n = 30 per group) to receive ultrasound-guided abdominal wall blocks for postoperative analgesia:

• Group T (Transversalis Fascia Plane Block – TFPB): Performed in supine position. A linear ultrasound probe was placed between the iliac crest and the costal margin to identify the three abdominal wall muscle layers. A 20G needle was inserted in-plane from medial to lateral, and 25 mL of 0.25% levobupivacaine with 500 mg magnesium sulfate was deposited deep to the transversalis fascia on each side.

• Group Q (Posterior Quadratus Lumborum Block – QLB): Performed in lateral position. A curvilinear probe was moved from the anterior abdominal wall to the posterior to identify the thoracolumbar fascia and associated musculature (quadratus lumborum, psoas major, erector spinae). A 20G needle was inserted in-plane from posterior to anterior, and 25 mL of 0.25% levobupivacaine with 500 mg magnesium sulfate was administered bilaterally.

• Group I (Ilioinguinal and Iliohypogastric Nerve Block – ILIH): Performed in supine position. The probe was positioned medial to the anterior superior iliac spine (ASIS). A 20G needle was inserted in-plane in a medial-to-lateral direction targeting the fascial plane between the internal oblique and transversus abdominis muscles. A total of 10 mL of 0.25% levobupivacaine with 500 mg magnesium sulfate was injected on each side.

The primary outcome was postoperative pain, assessed using the Visual Analogue Scale (VAS) at rest and Dynamic VAS (DVAS) on movement at 0, 2, 4, 6, 12, and 24 hours postoperatively. The secondary outcomes included time to first analgesic request (defined as VAS ≥2), total number of rescue analgesic doses required within the first 24 hours. Intravenous paracetamol was used as a rescue analgesic.

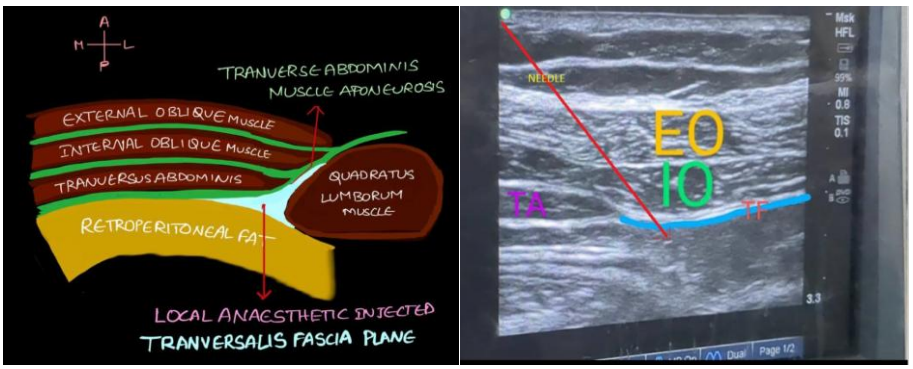


Figure 1: Transversalis fascia plane block

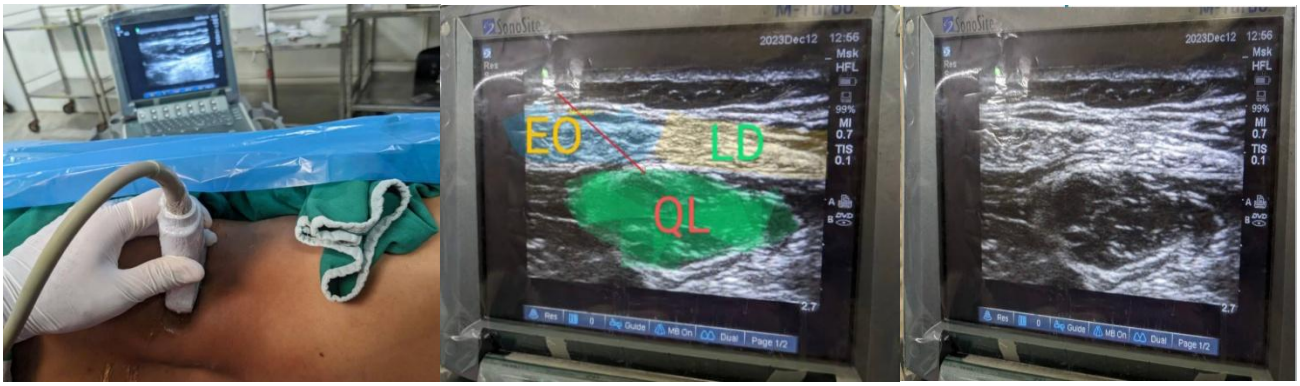


Figure 2: Quadratus Lumborum Block

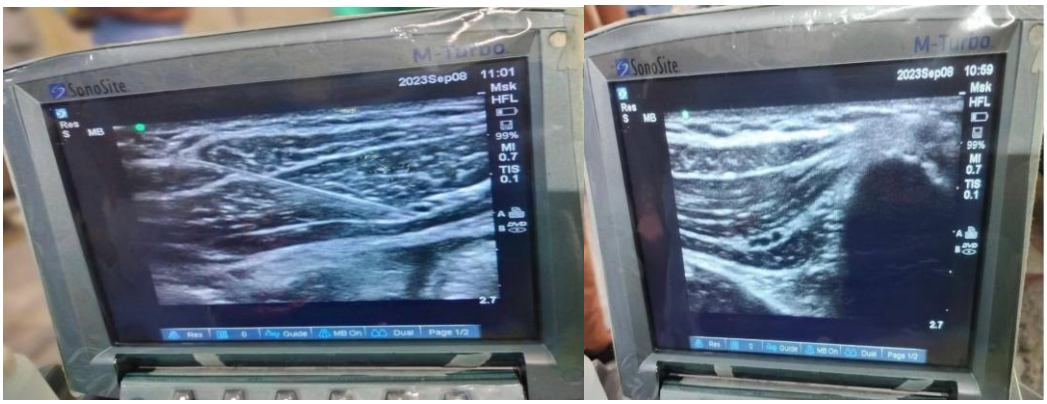
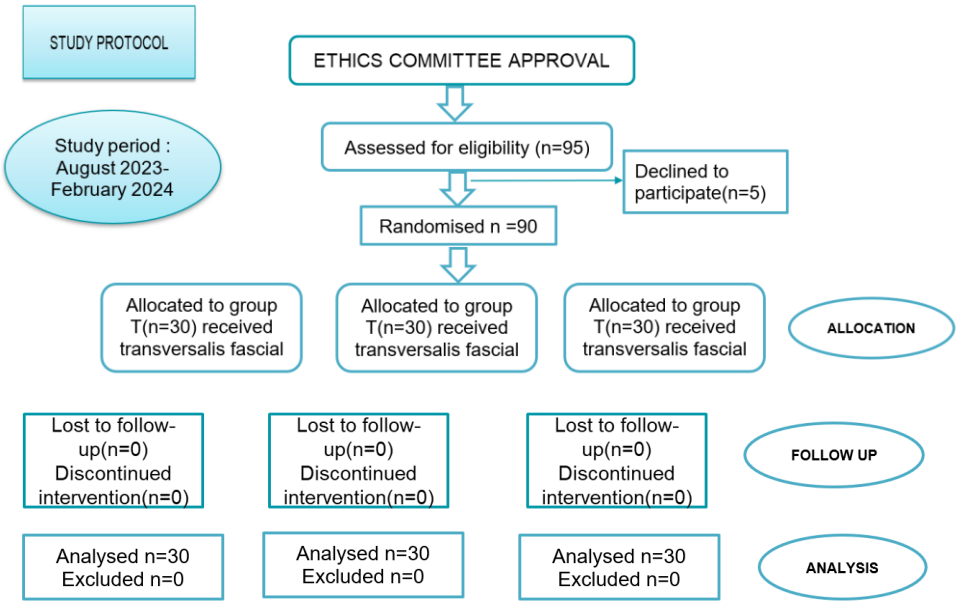


Figure 3: Ilioinguinal and Iliohypogastric Nerve Block – ILIH

3. DATA ANALYSIS

All recorded data was entered using MS Excel software, and SPSS version 25 software was used to analyse all the data. Continuous variables were presented as mean and standard deviation. Statistical difference between the study groups is determined by the 'ANOVA TEST'. P value <0.05 is considered statistically significant.



4. RESULTS

- No significant difference was seen between the 3 groups in demographic data

Table 1: VAS score of group T, Q, and I parturients

Visual analogue scale

VAS	TFPB(n=30)		QL(n=30)		ILIH (n=30)		P-value	S/NS
	Mean	SD	Mean	SD	Mean	SD		
VAS_2	0.28	0.42	0.26	0.39	0.42	0.49	0.09	. NS
VAS_4	0.43	0.50	0.33	0.48	0.60	0.50	0.11	NS
VAS_6	0.73	0.49	0.68	0.51	3.87	0.45	0.04	S
VAS_12	2.95	0.73	2.80	0.71	3.95	0.61	0.03	S
VAS_24	3.80	0.76	3.60	0.67	5.20	0.81	0.01	S

In the present study, we found that the difference in VAS score became statistically significant from 6 hours postoperatively onwards

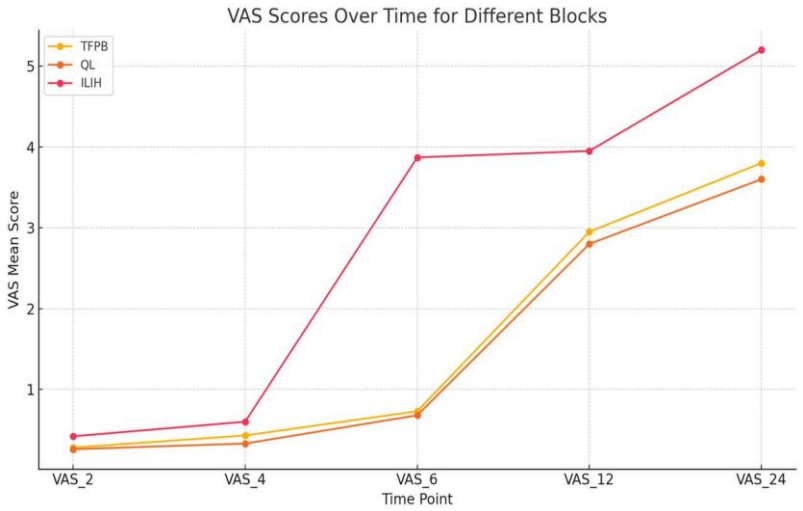


Figure 4: VAS SCORES

Table 2: DVAS score of group T, Q, and I parturients

Dynamic visual analog scale(DVAS)

DVAS	TFPB (n=30)		QL(n=30)		ILIH (n=30)		P-value	S/NS
	Mean	SD	Mean	SD	Mean	SD		
DVAS_2	0.50	0.57	0.43	0.50	0.67	0.48	0.16	NS
DVAS_4	0.80	0.45	0.73	0.41	0.87	0.52	0.24	NS
DVAS_6	1.06	0.57	0.98	0.62	4.45	0.68	0.037	S
DVAS_12	3.17	0.68	2.90	0.70	4.98	0.75	0.045	S
DVAS_24	4.13	0.75	3.83	0.73	5.93	0.56	0.049	S

In the present study, we found the difference in DVAS score became statistically significant from 6 hours postoperatively onwards ($p<0.05$)

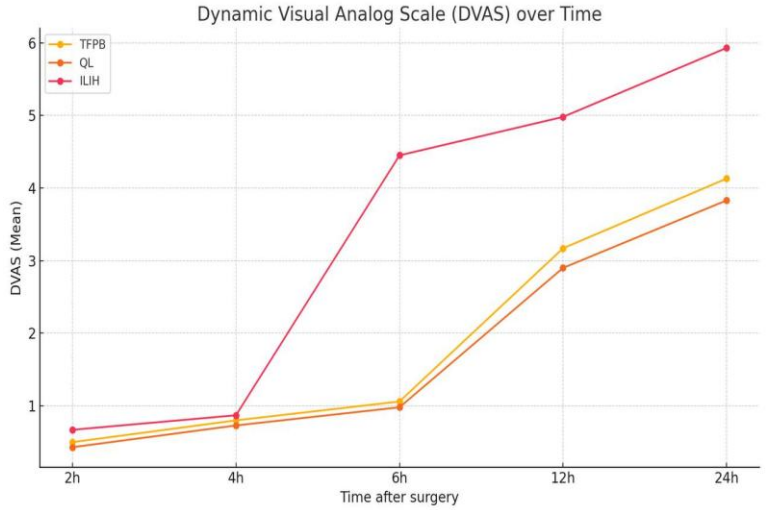


Figure 5: DVAS SCORES

Table 3: Time for 1st rescue analgesic dose(hours) and total number of analgesic doses in 1st 24 hours in group T, Q, and I parturients

	TFPB(n=30)		QLB(n=30)		ILIH(n=30)		P-value	S/NS
	Mean	SD	Mean	SD	Mean	SD		
Time for first rescue analgesic dose(Hours)	19.43	2.57	20.57	2.45	7.23	3.28	0.045	S
Total number of analgesic doses in first 24 Hours	1.25	0.59	1.02	0.65	3.05	0.71	0.040	S

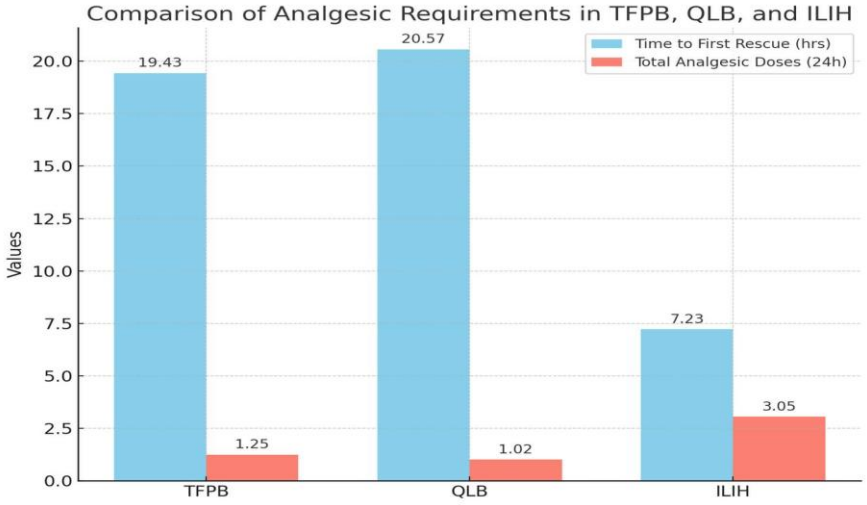


Figure 6: Time for 1st rescue analgesic dose(hours) and total number of analgesic doses in 1st 24hours

5. DISCUSSION

Optimal postoperative analgesia following lower-segment cesarean section (LSCS) is critical for improving maternal outcomes, enhancing early ambulation, and facilitating breastfeeding and newborn care. Regional nerve blocks have become an essential component of multimodal analgesia protocols aimed at minimizing opioid consumption and associated side effects. Among these, the ultrasound-guided Transversalis Fascia Plane (TFP) block, Quadratus Lumborum (QL) block, and Ilioinguinal-Iliohypogastric (II-IH) nerve block are widely employed. However, their comparative efficacy in the context of

LSCS continues to be investigated.

The TFP block, which involves deposition of local anesthetic between the transversus abdominis muscle and the transversalis fascia, primarily targets the ilioinguinal and iliohypogastric nerves, with potential cephalad spread to T12 and T11. Gultekin et al. demonstrated that the TFP block significantly reduced postoperative pain scores and opioid consumption in parturients undergoing LSCS compared to a control group receiving only systemic analgesia[6]. Moreover, patients in the TFP group had a longer duration before the first rescue analgesic request and experienced lower incidence of postoperative nausea and vomiting (PONV), suggesting an overall improvement in analgesic quality.

In contrast, the QL block, particularly the posterior and transmuscular approaches, has been associated with a broader analgesic effect due to its ability to facilitate the spread of local anesthetic to the thoracic paravertebral space, thus covering both somatic and visceral components of postoperative pain. **Kim et al.**[7], in a meta-analysis of 13 RCTs, demonstrated that QL block significantly reduces 24-h opioid consumption by approximately 10–24 mg morphine equivalents, lowers resting and dynamic pain scores (by ~1-point reductions), halves the incidence of PONV, and increases patient satisfaction compared to placebo/no block. Salama et al.[8] further reported that the QL block, when used in conjunction with spinal anesthesia, offered superior early postoperative analgesia compared to intrathecal morphine alone[8]. However, it is important to note that some randomized trials, including the study by Irwin et al., found that when QL block was added to intrathecal morphine, the additional benefit in opioid sparing was not statistically significant, though transient improvements in pain scores were observed [9]. This suggests that the clinical utility of QL block may depend on whether intrathecal opioids are employed.

The ILIH block, a more traditional approach, anesthetizes the L1 dermatome and provides effective somatic analgesia in the lower abdomen. However, its relatively limited dermatomal spread and lack of visceral analgesic component reduce its efficacy in extensive abdominal procedures like LSCS. Zahoor et al. directly compared the TFP and ILIH blocks in a randomized controlled trial and concluded that the TFP block offered superior postoperative analgesia, with significantly lower visual analog scale (VAS) pain scores and reduced opioid consumption [10]. These findings highlight the limitations of ILIH block in the setting of LSCS, especially when deeper visceral pain pathways are involved.From a technical standpoint, the IIIH block is simpler and requires less anatomical depth, making it a suitable choice in low-resource settings or for less experienced operators. In contrast, QL block demands higher expertise and carries a slightly increased risk of complications due to a deeper needle trajectory and proximity to retroperitoneal structures. The TFP block offers an intermediate option: it is more technically straightforward than the QL block while still offering broader coverage than the II-IH block.

Taken together, the evidence suggests that while all three blocks can contribute to postoperative analgesia in LSCS, their utility and effectiveness differ based on clinical context. The QL block provides the most comprehensive analgesia, especially in opioid-sparing protocols, while the TFP block is a valuable alternative with favorable safety and efficacy profiles. The II-IH block may still hold value in multimodal protocols or resource-limited settings, but appears less effective as a standalone technique.

As there are not many studies on the comparison of these three blocks, we compared and concluded in our study that there was a significant reduction in the opioid demand in the 1st 24 hours in QLB compared to the other two groups, suggesting that QLB also provides visceral analgesia in this group of patients. The satisfactory score was superior in QLB, followed by TFPB, and lowest in ILIH

6. CONCLUSION

In our study, the total paracetamol demand in the first 24h was reduced in the QLB group compared to the TFPB group and ILIH group, but there was no difference in the early (0–6h) paracetamol requirements. In all three groups, QLB had superior analgesia when compared to TFPB and ILIH block with an effect lasting for 18- 24 hours

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