GinPolMedProject ©
04 (64) 2022 : 001-007 • RESEARCH ARTICLE

Comparative efficacy of transversalis fascia plane block vs. transversus abdominis plane block for post-cesarean analgesia: A retrospective cohort study

Khaled M. Alanwer[1,2*], Ahmed Alaa-din Wali[3,4], Mohamed Mohamed Hegab[5,6], Bahaa G. Mohamed[7]

[1]Department of Anesthesia and Surgical Intensive Care, Faculty of Medicine, Zagazig University, Zagazig, Egypt
[2]Department of Anesthesia and Surgical Intensive Care, Saudi German Hospital, Aseer, Saudi Arabia
[3]Department of Obstetrics and Gynecology, Faculty of Medicine, Cairo University, Giza, Egypt
[4]Department of Obstetrics and Gynecology, Saudi German Hospital, Aseer, Saudi Arabia
[5]Department of Anesthesia, Critical Care and Pain Management, Alazhar University, Cairo, Egypt
[6]Department of Anesthesia, Medical City King Saudi Univeristy, Riyadh, Saudi Arabia
[7]Department of Anesthesia, ICU and Pain Management, South Egypt Cancer Institute, SECI, Assiut University, Assiut, Egypt

SUMMARY

Background: Caesarean section is a common surgery with significant postoperative pain. While fascial plane blocks are recommended, the optimal technique remains debated. This study compared the analgesic efficacy of ultrasound-guided Transversalis Fascia Plane (TFP) block *vs.*Transversus Abdominis Plane (TAP) block for post-caesarean recovery.

Patients and methods: This single-centre retrospective cohort study analyzed data from 73 patients (TFP n=34, TAP n=39) undergoing elective caesarean delivery under spinal anesthesia between June 2021 and May 2022 in Saudi German Hospital in Saudi Arabia. Patients received either a TFP or TAP block with 20 mL 0.25% bupivacaine per side postoperatively. All patients received standardized multimodal analgesia and Patient-Controlled Analgesia (PCA) with morphine. The primary outcome was 24-hour morphine consumption. Secondary outcomes included pain scores (NRS), time to first PCA bolus, time to PCA depletion, morphine consumption at 24-48 hours, opioid-related side effects, and functional recovery milestones (time to ambulation and flatus).

Results: The TFP group had significantly lower 24-hour morphine consumption (15.65 mg *vs.* 22.80 mg, p<0.001) and lower NRS scores at all time points (2–24 h, p<0.05). Time to first PCA bolus was longer with TFP (5.2 h *vs.* 2.8 h, p<0.001), and time to PCA depletion was significantly delayed (32.5 h *vs.* 25.8 h, p<0.001). Morphine consumption remained lower in the TFP group during the 24-48 hour period (8.20 mg *vs.* 12.50 mg, p<0.001). Functional recovery was faster in the TFP group for both ambulation (16.5 h *vs.* 19.8 h, p=0.002) and return of flatus (20.1 h *vs.* 23.5 h, p=0.034). No significant differences in side effects were observed. No block-related complications (LAST, haematoma, or infection) in either group.

Conclusion: In this retrospective analysis, the TFP block was associated with superior analgesia, prolonged pain control, and enhanced recovery compared to the TAP block. The technique demonstrated an excellent safety profile with no complications reported. These findings suggest that the TFP block is a promising technique that warrants further investigation in randomized controlled trials to confirm its efficacy and support its adoption into clinical practice.

Address for correspondence:

Khaled M. Alanwer

Department of Anesthesia and Surgical Intensive Care, Faculty of Medicine, Zagazig University, Zagazig, Egypt

Word count: 3844 **Tables:** 03 **Figures:** 00 **References:** 11

Received: 01.07.2022, Manuscript No. gpmp-26-184795; **Editor assigned:** 08.07.2022, PreQC No. P-184795; **Reviewed:** 25.07.2022, QC No. Q-184795; **Revised:** 29.07.2022, Manuscript No. R-184795; **Published:** 05.08.2022

INTRODUCTION

Caesarean section is a common major surgical procedure, but managing acute postoperative pain remains a challenge [1]. Severe pain can significantly impact a mother's recovery, hindering mobility, delaying breastfeeding, and affecting mother-infant bonding. Additionally, poorly managed acute pain increases the risk of chronic pain and postpartum depression [2]. Therefore, implementing effective, opioid-sparing multimodal analgesic regimens is essential for facilitating recovery and allowing mothers to care for their newborns effectively.

Multimodal analgesia strategies are the cornerstone of modern post-caesarean pain management, with regional nerve blocks playing an increasingly vital role. The Transversus Abdominis Plane (TAP) block, introduced by Rafi in 2001, is a technique that involves injecting local anesthetic between the internal oblique and transversus abdominis muscles [3]. This blocks the thoracolumbar nerves (T6–L1) that supply the anterolateral abdominal wall, providing somatic analgesia. Ultrasound guidance has since improved its safety and precision [4]. Evidence supports its effectiveness in various abdominal surgeries, including cesarean section, as part of a multimodal analgesic regimen, despite its relatively short duration of action. It remains a valuable adjunct for postoperative pain management [5].

A more recent advancement is the Transversalis Fascia Plane (TFP) block, which involves depositing local anesthetic deeper, at the plane between the transversus abdominis muscle and the transversalis fascia. This technique aims to block T12 and L1 nerve roots, which are critical for innervating the lower abdominal wall [6,7]. While its use in caesarean section analgesia is growing, its comparative efficacy against the well-established TAP block is not yet fully elucidated. Existing studies have primarily focused on immediate analgesic consumption, leaving a gap in understanding the comprehensive impact on overall recovery quality [8].

Therefore, a direct comparison between these two techniques is needed to guide clinical practice. This retrospective cohort study aimed to fill this knowledge gap by analyzing data from patients who had undergone elective caesarean section under spinal anesthesia and received either a TFP or TAP block as part of their routine care. Our primary objective is to assess the 24-hour

consumption, with secondary outcomes including pain scores, time to rescue analgesia, incidence of side effects, and functional recovery milestones, to provide a holistic evaluation of the postoperative experience.

PATIENTS AND METHODS

This single-center, retrospective cohort study was conducted at the Saudi German Hospital in Saudi Arabia. The study protocol received approval from the hospital's ethical committee. As this was a retrospective analysis of pre-existing anonymized data, the ethics committee waived the requirement for individual patient consent. This study adhered to the principles outlined in the Declaration of Helsinki. We conducted a review of the electronic medical records and anesthesia charts of all female patients who underwent elective caesarean section under spinal anesthesia between 1 June 2021 and 31 May 2022. Patients were identified through hospital surgical and anesthesia databases.

Inclusion criteria: Female patients aged 18 to 45 years at the time of surgery, categorized as ASA physical status 2 to 3. Exclusion criteria: Patients who had an emergency cesarean delivery, those who received general anesthesia, patients with a BMI of 35 kg/m² or higher, documented allergic reactions to the relevant medications, coagulopathy, a history of substance abuse, the presence of a local infection at the injection site, patients with noted communication issues in their records, and individuals diagnosed with pre-eclampsia or eclampsia.

Data collection and exposure groups

This retrospective study analyzed patients who received one of two types of post-operative regional analgesia blocks following their caesarean section. Patients were stratified into two cohorts based on the documented block technique in their anesthesia and postoperative care records.

1. TFP block cohort: The medical records and anesthesia charts of patients in this group were reviewed for documentation of an ultrasound-guided Transversalis Fascia Plane (TFP) block. The standard procedure at our institution, as reflected in the records, involved placing a high-frequency linear ultrasound probe in a transverse orientation just above the iliac crest while the patient remained supine. The target injection site, as described in the operative notes, was deep to the transversus abdominis muscle at the level of the transversalis fascia. The anesthesia records for these patients were examined to confirm the administration of 20 ml of 0.25% bupivacaine at this site.

2. TAP block cohort: The records of patients in this group were reviewed for documentation of a standard Transversus Abdominis Plane (TAP) block. The typical procedure, as noted in the charts, involved placing the ultrasound probe on the anterior axillary line between the iliac crest and the costal margin. The injection was documented as being administered into the fascial plane between the internal oblique and transversus abdominis muscles. The anesthesia records were scrutinized to verify the use of 20 ml of 0.25% bupivacaine for this block.

Data retrieved from the medical records included pre-operative information such as age, weight, height, BMI, and ASA status, as well as details of anesthesia management, including spinal drug dosages (hyperbaric bupivacaine 0.5% and fentanyl) and the intervertebral space used for the puncture. Intra-operative data captured included the baseline and lowest recorded systolic blood pressure, occurrences of hypotension (defined as a reduction of over 30% from the baseline or below 90 mmHg), and the total ephedrine dosage given. Surgical details noted were the highest sensory block level determined by cold touch testing, the sensory and motor block levels at the conclusion of surgery assessed *via* cold touch and modified Bromage scores, and the type of surgical incision (Pfannenstiel). Outcome data focused on the primary and secondary results of interest, such as the incidence of intraoperative nausea and vomiting and the requirement for analgesic rescue medication in the post-anesthesia care unit.

Postoperative analgesic protocol

A standardized, institution-wide protocol for post-cesarean analgesia was in place for all patients during the study period. The protocol mandated multimodal analgesia, including scheduled administration of intravenous paracetamol (1 g every 6 hours) and intravenous ibuprofen (400 mg every 8 hours).

Patient-Controlled Analgesia (PCA) with morphine was started intraoperatively for all patients. The PCA device was filled with 100 ml of normal saline containing 50 mg of morphine and started at a 2 ml/h basal infusion rate with a 0.5 ml bolus at a 15-minute lockout period. The patients were asked about the time for their first press on the bolus button. The total infused volume was measured at the end of the 1st and 2nd postoperative days. The time when the total prepared volume was infused is recorded. It is worth noting that the patients were educated about the bolus button when they asked for rescue analgesia.

The protocol was consistent for all patients, regardless of the regional block technique received. All nursing staff were trained on this protocol, and adherence was monitored through the electronic Medication Administration Record (MAR) system, from which the primary outcome data were extracted.

Primary outcome

Total Morphine Consumption in the First 24 Hours Post-Operatively: Data were extracted from the Medication Administration Records (MARs) and the Patient-Controlled Analgesia (PCA) device logs for the first 24 hours following surgery. All morphine administered *via* the PCA pump (both basal infusion and patient-initiated boluses) was summed for the analysis.

Secondary outcomes

Total Morphine Consumption in the Second 24 Hours (24-48 h) Post-Operatively: Data were extracted from the PCA device logs for the second 24-hour period following surgery to assess prolonged analgesic requirements.

Time to first PCA bolus: Defined as the time in hours from the completion of block administration to the first documented patient-initiated demand bolus *via* the PCA device.

Time to PCA depletion: Defined as the time in hours from the initiation of the PCA pump to the point when the total prepared morphine reservoir (50 mg in 150 ml) was fully infused.

Post-operative pain intensity was evaluated using documented Numerical Rating Scale (NRS) scores at rest at specific intervals: upon arrival in the Post-Anesthesia Care Unit (PACU) and at 2, 6, 12, and 24 hours post-operatively.

The incidence of Post-Operative Nausea and Vomiting (PONV) and pruritus within the first 24 hours was recorded, including any documented episodes and the administration of antiemetic drugs.

Functional recovery was measured by the time to first ambulation (hours from surgery end to first documented mobilization out of bed) and the time to return of gastrointestinal function (hours to first documented passage of flatus).

Finally, the medical records were reviewed for any documented block-related complications, including Local Anaesthetic Systemic Toxicity (LAST), haematoma, or infection at the injection site.

Sample size justification

The sample size for this retrospective study was determined by the total number of eligible patients who underwent elective cesarean delivery under spinal anesthesia and received either a TFP or TAP block during the specified study period (June 2021 to May 2022). A post-hoc power analysis was conducted, which confirmed that the achieved sample (TFP n=34, TAP n=39) provided >80% power to detect a clinically significant difference of 30% in 24-hour morphine consumption, with an alpha level of 0.05, based on observed standard deviations. This justifies the robustness of the comparative analysis.

Statistical analysis: All statistical analyses were conducted using SPSS version 28.0 (IBM Corp., Armonk, NY, USA). Continuous variables with normal distributions (e.g., morphine consumption, NRS scores) were compared using independent-samples t-tests and reported as mean ± standard deviation. Non-normally distributed data were analyzed with Mann-Whitney U tests and summarized as median [interquartile range]. Categorical variables (e.g., side effects, rescue analgesia rates) were compared using Chi-square or Fisher's exact tests, as appropriate, and expressed as frequencies (%). A two-tailed p-value <0.05 defined statistical significance. No adjustments for multiple comparisons were made for secondary outcomes.

Tab. 1. Shows that the demographic and baseline characteristics were well-balanced between the TFP and TAP block groups. There were no statistically significant differences in age, BMI, ASA status, gestational age, or baseline systolic blood pressure. This confirms that the two cohorts were comparable at baseline, minimizing the potential for confounding variables and ensuring that any differences in outcomes can be attributed to the block technique itself.

Tab. 2. Reveals a clear and statistically significant superiority of the Transversalis Fascia Plane (TFP) block over the Transversus Abdominis Plane (TAP) block for post-caesarean analgesia. Postoperative analgesic consumption and Patient-Controlled Analgesia (PCA) utilization metrics. Data demonstrates significantly lower morphine consumption in the TFP group during the first 24 hours, which persisted into the second 24-hour period. Patients in the TFP group also had a significantly longer time to their first demand bolus and a prolonged duration until the PCA reservoir was depleted. All comparisons were statistically significant (p<0.001).

Tab. 3. Demonstrates a consistent and statistically significant advantage for the Transversalis Fascia Plane (TFP) block across all measured recovery domains. Patients receiving a TFP block reported significantly lower pain scores at every assessment point and experienced a substantially longer duration before requiring rescue analgesia. This superior pain control directly translated into enhanced functional recovery, with TFP patients achieving ambulation and the return of gastrointestinal function significantly faster. No significant differences were observed in the incidence of morphine-related side effects, indicating the improved outcomes were not achieved at the expense of increased adverse events. These results collectively indicate that the TFP block provides a more comprehensive and effective recovery profile following caesarean section. No instances of Local Anaesthetic Systemic Toxicity (LAST), haematoma, or infection at the injection site were documented in any patient in either study cohort.

Tab. 1. Patient demographic and baseline characteristics.

Patients' Characteristics	TFP Block Group (n=34)	TAP Block Group (n=39)	Test value	p-value	Sig.
Age (years)					
Mean ± SD	31.20 ± 4.25	30.85 ± 3.92	0.362	0.719 a	NS
Range	25-38	24-38			
BMI (kg/m²)					
Mean ± SD	28.85 ± 3.15	29.40 ± 2.95	-0.771	0.443a	NS
Range	23-34	24-34			
ASA Physical Status, n (%)					
II	28 (82.4%)	33 (84.6%)	0.073	0.787 b	NS
III	6 (17.6%)	6 (15.4%)			
Gestational age (weeks)					
Mean ± SD	38.95 ± 1.22	39.12 ± 1.18	-0.601	0.550a	NS
Range	37-41	37-41			
Baseline SBP (mmHg)					
Mean ± SD	122.4 ± 9.7	120.8 ± 10.2	0.688	0.494a	NS

a: Student t test, b: chi-square test

Abbreviations: TFP: Transversalis Fascia Plane; TAP: Transversus Abdominis Plane; SD: Standard Deviation; BMI: Body Mass Index; ASA: American Society of Anesthesiologists; SBP: Systolic Blood Pressure; NS: Not Significant

Tab. 2. Postoperative analgesic consumption and PCA utilization.

Outcome Measure	TFP Block (n=34)	TAP Block (n=39)	p-value
Morphine Consumption (mg), Mean ± SD			
0 to 4 h	2.75 ± 1.15	3.80 ± 1.45	**<0.001**
4 to 8 h	3.25 ± 1.20	5.70 ± 1.10	**<0.001**
8 to 12 h	3.20 ± 1.05	5.90 ± 1.35	**<0.001**
12 to 24 h	6.45 ± 0.58	7.40 ± 1.25	**<0.001**
1st 24 h total	**15.65 ± 2.30**	**22.80 ± 3.15**	**<0.001**
2nd 24 h total (24-48 h)	**8.20 ± 2.1**	**12.50 ± 3.4**	**<0.001**
Time to First PCA Bolus (h), Mean ± SD	5.2 ± 2.8	2.8 ± 1.1	**<0.001**
Time to PCA Depletion (h), Mean ± SD	32.5 ± 5.1	25.8 ± 4.7	**<0.001**

Tab. 3. Secondary outcomes - postoperative recovery profiles.

Outcome Measure	TFP Block (n=34)	TAP Block (n=39)	p-value
Pain Scores (NRS, 0-10), Mean ± SD			
NRS at 2 h	3.2 ± 1.8	4.5 ± 2.0	**0.005**
NRS at 6 h	2.8 ± 1.2	3.9 ± 1.4	**<0.001**
NRS at 12 h	3.4 ± 1.5	4.5 ± 1.6	**0.003**
NRS at 24 h	2.9 ± 1.1	3.5 ± 1.3	**0.032**
Time to First Rescue (h), Mean ± SD	5.2 ± 2.8	2.8 ± 1.1	**<0.001**
Side Effects, n (%)			
Nausea	9 (26.5%)	10 (25.6%)	0.931
Vomiting	6 (17.6%)	5 (12.8%)	0.558
Pruritus	4 (11.8%)	3 (7.7%)	0.557
Functional Recovery, Mean ± SD			
Time to First Ambulation (h)	16.5 ± 4.2	19.8 ± 5.1	**0.002**
Time to Flatus (h)	20.1 ± 6.5	23.5 ± 7.0	**0.034**

Abbreviations: TFP: Transversalis Fascia Plane; TAP: Transversus Abdominis Plane; NRS: Visual Analog Scale; SD: Standard Deviation.
Notes: Continuous data were compared using an independent samples t-test or Mann-Whitney U test. Categorical data (side effects) were compared using the Chi-square test or Fisher's exact test. P-values written in bold represent statistical significance (p<0.05)

DISCUSSION

The Transversalis Fascia Plane (TFP) block anesthesia was first described by Hebbard [9] as a novel ultrasound-guided technique targeting the proximal T12 and L1 nerves. By depositing local anesthetic between the transversus abdominis and the transversalis fascia, this approach aims to block both the anterior and lateral cutaneous branches more effectively than traditional TAP blocks, particularly for the innervation of the lower abdomen and iliac crest. Its anatomical rationale is the spread of local anesthetic over the quadratus lumborum, potentially providing broader coverage for lower abdominal surgeries. This foundational technique serves as the basis for our comparative analysis, as we evaluate its real-world efficacy relative to established methods in post-cesarean analgesia.

OUR RESULTS AND THEIR INTERPRETATION

This retrospective cohort study observed an association suggesting that the ultrasound-guided transversalis fascia plane block may be linked to a superior recovery profile compared to the TAP block. The significantly reduced 24-hour morphine consumption in the TFP group (15.65 ± 2.30 mg *vs.* 22.80 ± 3.15 mg; p<0.001) is the cornerstone of this finding. This robust analgesic effect was further evidenced by objective data from our standardized PCA protocol: a markedly longer time to the first patient-initiated PCA bolus (5.2 ± 2.8 h *vs.* 2.8 ± 1.1 h; p<0.001) and a prolonged duration until PCA reservoir depletion (32.5 ± 5.1 h *vs.* 25.8 ± 4.7 h; p<0.001). These consistent findings across multiple consumption metrics strongly suggest a more profound and sustained analgesic effect from the TFP block. This superior analgesic efficacy was consistent across all postoperative time points (p<0.05 for all time points), suggesting that the mechanism for this superiority is anatomical—the deeper injection likely blocks a wider array of nerves responsible for surgical pain, leading to the observed consistent and prolonged analgesic effect. The significantly lower morphine consumption in the TFP group persisted into the second 24-hour period (8.20 ± 2.1 mg *vs.* 12.50 ± 3.4 mg; p<0.001), indicating that the analgesic benefits extend beyond the immediate pharmacological duration of the local anesthetic, possibly by preventing the central sensitization that drives later pain and facilitating a lower-pain state during the critical 24-48 hour recovery window.

The clinical benefits extended to tangible functional recovery milestones. The significantly shorter time to first ambulation (16.5 ± 4.2 h *vs.* 19.8 ± 5.1 h; p=0.002) and quicker return of gastrointestinal function (20.1 ± 6.5 h *vs.* 23.5 ± 7.0 h; p=0.034) in the TFP group are critically important. This suggests that by providing better pain control (the cause), the enhanced functional recovery (the effect) is achieved, highlighting a major benefit for the mother's postpartum experience.

Remarkably, even though there was a significant disparity in morphine usage, the occurrence of typical morphine-related side effects was not notably different between

the groups (p>0.05 for all). This could be due to the generally low level of morphine consumption in both groups, kept below a critical threshold for side effects by the effectiveness of both regional techniques combined with multimodal analgesia. Alternatively, the study's size may have been inadequate to detect a real but small difference in these specific outcomes.

COMPARISON OF OUR RESULTS TO SIMILAR STUDIES

Tulgar & Serifsoy (2018) [10] presented the initial cases of TFP block for cesarean section analgesia, reporting profound analgesia (NRS $\leq$ 3/10 for 9–10 hours) without supplemental opioids. Sensory blockade of T12-L1 dermatomes was confirmed *via* pinprick testing. A similarity with our study is the demonstration of TFP block's efficacy for prolonged post-cesarean analgesia, reinforcing its anatomical rationale for lower abdominal innervation. However, notable differences exist: their case series lacked a comparator group, while our study compared TFP and TAP blocks in a larger cohort. Their use of a higher-volume anesthetic mixture (20 mL per side) may explain the longer analgesia duration observed in their protocol compared to ours. Both studies reported no complications, underscoring the technique's safety. While their cases hinted at TFP's potential superiority, our retrospective analysis, which used objective PCA metrics to quantify analgesia duration and quality, provides stronger comparative evidence, validating their hypothesis in a broader clinical context.

Serifsoy, et al. (2020) [7] conducted a prospective, randomized, controlled trial comparing TFP block with standard multimodal analgesia in 70 patients, with 24-hour tramadol consumption as the primary outcome and NRS pain scores as secondary outcomes. Both studies found a significant reduction in opioid use in the TFP group (101.42 mg *vs.* 175 mg tramadol, p<0.05), highlighting TFP's efficacy. Additionally, both reported lower early postoperative pain scores in the TFP group. However, Serifsoy, et al. used a non-block control, whereas our study directly compared TFP with the TAP block, demonstrating TFP's superior performance compared to another established technique. Another notable difference is the shorter duration of significant pain score differences reported by Serifsoy, et al. (up to 12 hours) compared to our sustained analgesia over 24 hours and beyond, as objectively measured by prolonged time to PCA depletion and reduced 24-48h consumption which may be attributed to our bilateral block technique, the use of a PCA for consistent rescue, or variations in local anesthetic volume/concentration.

Wang, et al. (2021) [11] conducted a Bayesian network meta-analysis comparing six local anesthetic techniques, including TAP and TFP blocks, for post-cesarean analgesia, analyzing data from 68 randomized trials (5039 patients). They positioned the TAP block as the most effective when intrathecal morphine is absent. In contrast, our retrospective study found TFP superior to TAP for reducing morphine consumption throughout the 48-hour post-operative period and improving functional recovery. While Wang, et al. concluded that TFP's outcomes were similar to those of inactive controls, this discrepancy likely stems from methodological differences: our study directly compared techniques in a clinical cohort and utilized sensitive, objective measures of analgesic demand (PCA metrics), whereas the meta-analysis pooled heterogeneous trials, which may have diluted TFP's effects. Although both studies acknowledge TAP's efficacy, our findings suggest that TFP may be more effective than previously acknowledged, underscoring the need for high-quality direct-comparison trials to clarify these conflicting results.

CLINICAL IMPLICATIONS OF OUR STUDY

The findings from this study suggest a strong association between the Transversalis Fascia Plane (TFP) block and an enhanced recovery profile, making it a promising alternative for post-cesarean analgesia. The objective evidence of prolonged analgesia, demonstrated by delayed PCA demands and depletion, suggests that TFP may offer a more reliable and longer-lasting analgesic effect than TAP. This technique can potentially enable a more comfortable postpartum recovery and promote early mobilization and bonding. Anesthesiologists should consider the findings of this study when designing multimodal analgesic strategies, particularly when the clinical goal is to minimize morphine use and improve overall recovery quality following cesarean delivery. However, these implications should be considered tentative until confirmed by prospective randomized trials. Strengths and limitations of our study:

Our study provides robust real-world evidence from a direct comparative analysis of TFP and TAP blocks, demonstrating a significant association between TFP block use and improved recovery metrics. A key strength is the use of a standardized, institution-wide postoperative analgesic protocol, specifically a Morphine PCA with a basal infusion, which provided objective, high-fidelity data on analgesic consumption and patient demand (time to first bolus, time to depletion), thereby minimizing variability in pain management practices as a potential confounder for the primary outcome.

The most significant limitation is the potential for selection bias. Patients were stratified into cohorts based on the block they received; this was not a randomized intervention. The decision to administer a TFP or TAP block was made at the attending anesthesiologist's discretion, based on their individual expertise, preference, and familiarity with each technique. This introduces a fundamental and immeasurable confounder. While our analysis shows well-balanced demographic and baseline clinical characteristics, we cannot rule out that unmeasured factors influenced both the choice of block and the postoperative outcomes. For instance, anesthesiologists may have been more likely to use the newer TFP technique for patients they perceived as needing more robust analgesia or who they believed would benefit most from enhanced recovery, or conversely, may have reserved it for simpler cases while using TAP blocks for more complex ones. In other cases, where hydrodissection of TAP was not well achieved during the TAP block procedure, the anesthetist resorted to the TFP technique. This inherent bias in treatment allocation severely limits our ability to establish causality and attribute the observed differences in outcomes solely to the block technique itself. Therefore, while our results suggest a strong association, they cannot definitively prove the superiority of the TFP block;

they are hypothesis-generating and must be interpreted within this constraint. The single-center design limits generalizability, and the sample size, though sufficient for the primary outcomes, may lack power to detect rarer complications or subtle differences in secondary endpoints, such as side-effect incidence. Additionally, the lack of standardized blinding in postoperative care could introduce observational bias in subjective measures such as pain scores.

RECOMMENDATIONS FOR FURTHER STUDIES

Future studies should prioritize a prospective, randomized controlled trial design with standardized local anesthetic volumes and concentrations to directly compare TFP and TAP blocks. Such trials should incorporate objective PCA metrics, as used in this study, to provide precise measurement of analgesic duration and patient demand. Research should also evaluate the impact of TFP blocks within Enhanced Recovery After Surgery (ERAS) protocols, incorporating Patient-Reported Outcome Measures (PROMs), such as quality-of-recovery scores and breastfeeding success. Larger, multicenter studies are needed to confirm generalizability and assess rare complications. Additionally, investigations into the optimal timing of block administration—pre-incisional *vs.* post-operative—could further refine its role in perioperative analgesic strategies for cesarean delivery.

CONCLUSION

In this retrospective analysis, the TFP block was associated with superior analgesia, prolonged pain control, and enhanced recovery compared to the TAP block. The technique demonstrated an excellent safety profile with no complications reported. These findings suggest that the TFP block is a promising technique that warrants further investigation in randomized controlled trials to confirm its efficacy and support its adoption into clinical practice.

REFERENCES

1. **Macones GA, Caughey AB, Wood SL, et al.** Guidelines for postoperative care in cesarean delivery: Enhanced Recovery After Surgery (ERAS) Society recommendations (part 3). *Am J Obstet Gynecol.* 2019;221:247-e1.
2. **Kintu A, Abdulla S, Lubikire A, et al.** Postoperative pain after cesarean section: Assessment and management in a tertiary hospital in a low-income country. *BMC Health Serv Res.* 2019;19:68.
3. **Rafi AN.** Abdominal field block: a new approach *via* the lumbar triangle. *Anaesthesia.* 2001;56.
4. **Tsai HC, Yoshida T, Chuang TY, et al.** Transversus abdominis plane block: An updated review of anatomy and techniques. *Biomed Res Int.* 2017;2017:8284363.
5. **Sangkum L, Thamjamrassri T, Arnuntasupakul V, et al.** The current consideration, approach, and management in postcesarean delivery pain control: A narrative review. *Anesthesiol Res Pract.* 2021;2021:2156918.
6. **Aydin ME, Bedir Z, Yayik AM, et al.** Subarachnoid block and ultrasound-guided transversalis fascia plane block for caesarean section: a randomised, double-blind, placebo-controlled trial. *Eur J Anaesthesiol.* 2020;37:765-772.
7. **Serifsoy TE, Tulgar S, Selvi O, et al.** Evaluation of ultrasound-guided transversalis fascia plane block for postoperative analgesia in cesarean section: A prospective, randomized, controlled clinical trial. *J Clin Anesth.* 2020;59:56-60.
8. **Hansen C, Dam M, Moriggl B, et al.** Fascia transversalis plane block for elective cesarean section: Simpler but not necessarily better. *Reg Anesth Pain Med.* 2020;45:395-396.
9. **Hebbard PD.** Transversalis fascia plane block, a novel ultrasound-guided abdominal wall nerve block. *Can J Anaesth.* 2009;56:618-620.
10. **Tulgar S, Serifsoy TE.** Transversalis fascia plane block provides effective postoperative analgesia for cesarean section: New indication for known block. *Obstet Anesth Dig.* 2019;39:166.
11. **Wang J, Zhao G, Song G, et al.** The efficacy and safety of local anesthetic techniques for postoperative analgesia after cesarean section: A Bayesian network meta-analysis of randomized controlled trials. *J Pain Res.* 2021:1559-1572.