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Original Research Article

Comparison Between Ultrasound Guided Transversalis Fascia Plane Block and Standard Wound Infiltration Technique on Postoperative Pain Management in Patients Undergoing Inguinal Hernia Surgery: A Randomized Controlled Trial

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Conflict of interest: Nil

Abstract

Introduction: Effective postoperative pain control following inguinal hernia surgery is essential for early recovery, improved patient comfort, and reduced analgesic consumption. Ultrasound-guided regional techniques such as the Transversalis Fascia Plane (TFP) block have gained popularity as alternatives to conventional wound infiltration; however, comparative evidence remains limited.

Aims: To compare the efficacy of ultrasound-guided TFP block with standard wound infiltration for postoperative analgesia in patients undergoing elective inguinal hernia surgery.

Materials and Methods: The present study was a Randomised controlled trail study. This Study was conducted 18months. Department anaesthesia SR, Institute of Calcutta National Medical College and Hospital. Study population 106.

Result: Both groups were comparable in demographics, with mean age 37.87 vs 37.53 years and weight 60.04 vs 60.77 kg. Satisfaction (p=0.242), rescue analgesia (p=0.293), duration (21.40 vs 21.85 hours), and VAS scores showed no significant differences.

Conclusion: Ultrasound-guided TFP block provides postoperative analgesia comparable to wound infiltration, with a tendency toward prolonged pain relief. Both techniques are safe and effective for pain management following inguinal hernia surgery.

Keywords: Ultrasound-Guided Transversalis Fascia Plane Block; Wound Infiltration; Postoperative Pain; Inguinal Hernia Surgery; Regional Anaesthesia; Analgesia; Randomized Controlled Trial.

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Introduction

Inguinal hernia repair is one of the most commonly performed general surgical procedures worldwide. Despite advances in surgical techniques, postoperative pain remains a significant concern, affecting patient comfort, early mobilization, and overall recovery. Effective pain management is essential to reduce opioid consumption, minimize complications, and improve patient satisfaction [1].

Among the various analgesic strategies, regional anesthesia techniques and local wound infiltration are widely used. The ultrasound-guided transversalis fascia plane (TFP) block is a relatively recent regional technique that provides targeted analgesia by blocking the ilioinguinal, iliohypogastric, and genitofemoral nerves supplying the lower abdominal wall and groin. With the use of ultrasound, this block allows precise drug deposition, potentially resulting in prolonged and effective analgesia with fewer systemic side effects [2,3]. On the other hand, wound infiltration with local anesthetics is a simple, economical, and commonly practiced technique. It directly targets nociceptors at the surgical site and is easy to perform without specialized equipment. However, its analgesic duration is often limited, frequently necessitating additional systemic analgesics in the postoperative

period [4]. The comparison between these two techniques is clinically relevant, as they differ in mechanism, duration of analgesia, technical expertise, and resource requirements. Previous studies have evaluated ultrasound-guided regional blocks for postoperative analgesia in patients undergoing inguinal hernia repair [5,6]. Comparative evidence has also examined transversalis fascia plane block against transversus abdominis plane block in different surgical settings [7,8]. Further studies have investigated the efficacy of different local anaesthetic concentrations for postoperative analgesia following inguinal hernia repair [9]. These techniques require appropriate training and ultrasound equipment, whereas wound infiltration remains a practical option in settings where specialized resources may be limited [10].

This randomized controlled trial aims to compare the efficacy of ultrasound-guided TFP block and standard wound infiltration in patients undergoing inguinal hernia repair, focusing on postoperative pain scores, analgesic consumption, patient satisfaction, and overall feasibility.

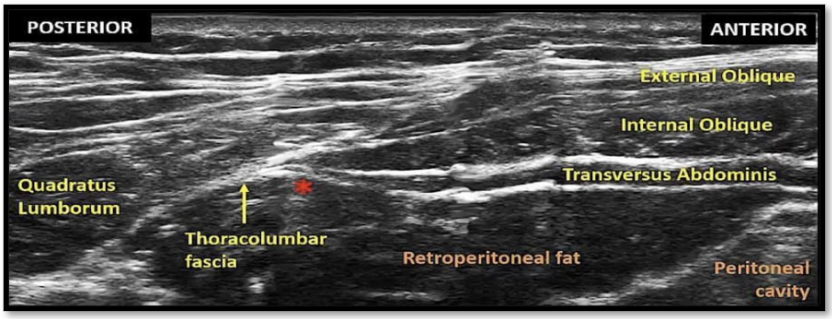


Figure 1:

Materials and Methods

Study design: Randomised controlled trail

Place of study: Department anaesthesia SR, Institute of Calcutta National Medical College and Hospital.

Period of study: 18 months

Study Population: The study population will comprise adult patients undergoing elective inguinal hernia surgery under anaesthesia at the Department of Anaesthesia, Calcutta National Medical College and Hospital, Kolkata, during the 18-month study period. A total of 106 eligible patients will be enrolled and randomly allocated to receive either ultrasound-guided transversalis fascia plane block or standard wound infiltration for postoperative pain management.

Sample size: 106 patients

Inclusion Criteria

- Patients aged between 15 and 60 years.
- Patients classified under ASA I and ASA II.
- Patients undergoing elective inguinal hernia surgery lasting less than two hours duration.
- Patients with non-recurrent hernia surgeries.

Exclusion Criteria

- Patients below 15 years or above 60 years of age.
- Patients classified under ASA III and ASA IV.
- Patients with Mallampati grading of 3 or 4.
- Patients with known allergies to Bupivacaine.
- Patients with coagulopathies.
- Patients or their legal guardians who refuse participation in the study.

Study Variable

- Ultrasound-guided transversalis fascia plane block
- Standard wound infiltration technique
- Postoperative pain intensity
- Postoperative analgesic consumption
- Patient satisfaction with postoperative pain management

Statistical Analysis: For statistical analysis, data were initially entered into a Microsoft Excel spreadsheet and then analysed using SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and GraphPad Prism (version 5). Numerical variables were summarized using means and standard deviations, while Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

Result

Table 1: Distribution of demographic characteristics by groups

Demographic Characteristics	Group A (n=50) Mean ± SD	Group B (n=51) Mean ± SD	p-value
Age (years)	37.87 ± 8.59	37.53 ± 7.92	0.833
Weight (kg)	60.04 ± 10.28	60.77 ± 10.39	0.715
Female	23 (43.4%)	26 (49.1%)	0.697
Male	30 (56.6%)	27 (50.9%)	—

Table 2: Distribution of Patient Satisfaction Score among Groups

		Group A (n=50)	Group B (n=51)	p-value
Patient Satisfaction	Very Dissatisfied	6 (11.3%)	9 (17.0%)	0.242
	Somewhat Dissatisfied	12 (22.6%)	11 (20.8%)	—
	Neither Satisfied nor Dissatisfied	13 (24.5%)	7 (13.2%)	—
	Somewhat Satisfied	13 (24.5%)	21 (39.6%)	—
	Very Satisfied	9 (17.0%)	5 (9.4%)	—

Table 3: Distribution of Total Analgesia Required and Duration of Analgesia among Groups

Variable	Number of doses	Group A (n=50)	Group B (n=51)	P-value
Total rescue analgesia required	1	23 (43.4%)	15 (28.3%)	0.293
	2	13 (24.5%)	17 (32.1%)	
	3	8 (15.1%)	15 (28.3%)	
	4	6 (11.3%)	4 (7.5%)	
	5	3 (5.7%)	2 (3.8%)	
Duration of analgesia (hours)		21.40 ± 5.50	21.85 ± 5.87	0.683

Table 4: VAS Score Comparison among Groups Across Time Points

Time Point	Group A (n=50) Mean ± SD	Group B (n=51) Mean ± SD	P-value
Baseline	0.53 ± 0.70	0.51 ± 0.67	0.8871
2 Hours	1.02 ± 0.89	1.25 ± 0.73	0.1548
4 Hours	1.43 ± 0.87	1.60 ± 0.86	0.3142
12 Hours	1.77 ± 0.91	1.92 ± 0.78	0.3622
24 Hours	2.75 ± 0.83	2.66 ± 0.76	0.5425
36 Hours	3.91 ± 1.10	4.23 ± 1.03	0.1238

Table 5: Post HOC Analysis for VAS Score

Group	Comparison	P-value
Group A	Baseline vs 2 Hours	<0.001
	Baseline vs 4 Hours	<0.001
	Baseline vs 12 Hours	<0.001
	Baseline vs 24 Hours	<0.001
	Baseline vs 36 Hours	<0.001
	2 Hours vs 4 Hours	<0.001
	2 Hours vs 12 Hours	<0.001
	2 Hours vs 24 Hours	<0.001
	2 Hours vs 36 Hours	<0.001
	4 Hours vs 12 Hours	<0.001
	4 Hours vs 24 Hours	<0.001
	4 Hours vs 36 Hours	<0.001
	12 Hours vs 24 Hours	<0.001
	12 Hours vs 36 Hours	<0.001
	24 Hours vs 36 Hours	<0.001
Group B	Baseline vs 2 Hours	<0.001
	Baseline vs 4 Hours	<0.001
	Baseline vs 12 Hours	<0.001
	Baseline vs 24 Hours	<0.001
	Baseline vs 36 Hours	<0.001
	2 Hours vs 4 Hours	<0.001
	2 Hours vs 12 Hours	<0.001

	2 Hours vs 24 Hours	<0.001
	2 Hours vs 36 Hours	<0.001
	4 Hours vs 12 Hours	<0.001
	4 Hours vs 24 Hours	<0.001
	4 Hours vs 36 Hours	<0.001
	12 Hours vs 24 Hours	<0.001
	12 Hours vs 36 Hours	<0.001
	24 Hours vs 36 Hours	<0.001

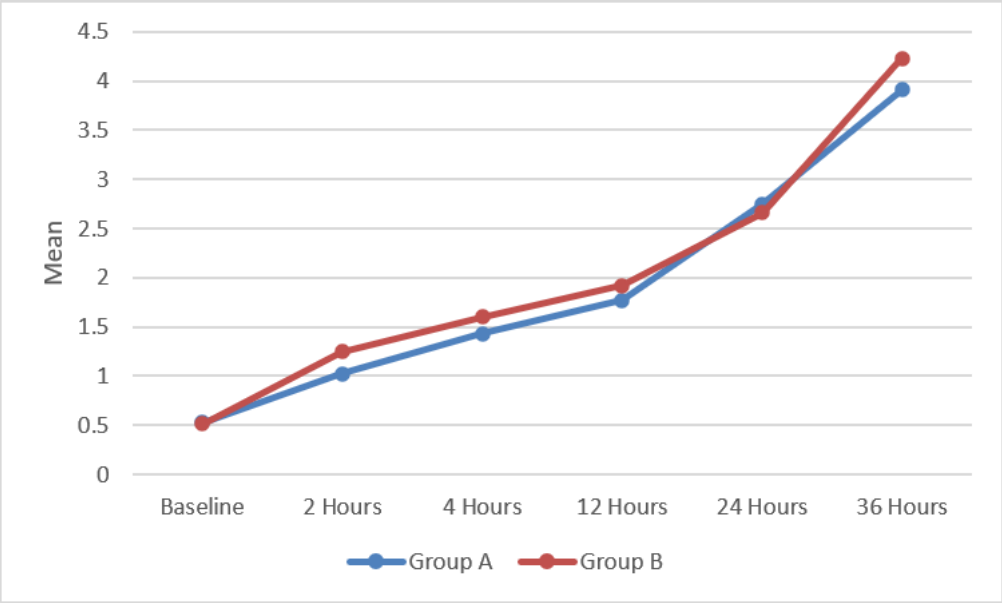


Figure 1: VAS Score Comparison among Groups across Time Points

The demographic characteristics of the patients were comparable between the two groups. The mean age was 37.87 ± 8.59 years in Group A and 37.53 ± 7.92 years in Group B, with no statistically significant difference (p=0.833). The mean weight was 60.04 ± 10.28 kg in Group A and 60.77 ± 10.39 kg in Group B, with no statistically significant difference (p=0.715). Regarding sex distribution, 23 patients (43.4%) were female and 30 patients (56.6%) were male in Group A, while 26 patients (49.1%) were female and 27 patients (50.9%) were male in Group B. The difference in sex distribution was not statistically significant (p=0.697). [Table 1] Patient satisfaction was compared between Group A and Group B. In Group A, 6 patients (11.3%) were very dissatisfied, 12 patients (22.6%) were somewhat dissatisfied, 13 patients (24.5%) were neither satisfied nor dissatisfied, 13 patients (24.5%) were somewhat satisfied, and 9 patients (17.0%) were very satisfied. In Group B, 9 patients (17.0%) were very dissatisfied, 11 patients (20.8%) were somewhat dissatisfied, 7 patients (13.2%) were neither satisfied nor dissatisfied, 21 patients (39.6%) were somewhat satisfied, and 5 patients (9.4%) were very satisfied. The difference in patient satisfaction between the two groups was not statistically significant (p=0.242). [Table 2]

The total rescue analgesia requirement was compared between Group A and Group B. In Group A, 23 patients (43.4%) required 1 dose, 13 patients (24.5%) required 2 doses, 8 patients (15.1%) required 3 doses, 6 patients (11.3%) required 4 doses, and 3 patients (5.7%) required 5 doses. In Group B, 15 patients (28.3%) required 1 dose, 17 patients (32.1%) required 2 doses, 15 patients (28.3%) required 3 doses, 4 patients (7.5%) required 4 doses, and 2 patients (3.8%) required 5 doses.

The difference in total rescue analgesia requirement between the two groups was not statistically significant (p=0.293). The mean duration of analgesia was 21.40 ± 5.50 hours in Group A and 21.85 ± 5.87 hours in Group B, with no statistically significant difference between the groups (p=0.683). [Table 3]

The VAS scores were compared between Group A and Group B at different time points. At baseline, the mean VAS score was 0.53 ± 0.70 in Group A and 0.51 ± 0.67 in Group B, with no statistically significant difference (p=0.8871). At 2 hours, the mean VAS score was 1.02 ± 0.89 in Group A and 1.25 ± 0.73 in Group B (p=0.1548). At 4 hours, the corresponding scores were 1.43 ± 0.87 and 1.60 ± 0.86, respectively (p=0.3142). At 12 hours, the mean VAS score was 1.77 ± 0.91 in Group A and

1.92 ± 0.78 in Group B (p=0.3622). At 24 hours, the mean VAS score was 2.75 ± 0.83 in Group A and 2.66 ± 0.76 in Group B (p=0.5425), while at 36 hours, it was 3.91 ± 1.10 and 4.23 ± 1.03, respectively (p=0.1238). Thus, there was no statistically significant difference in VAS scores between the two groups at any of the assessed time points. [Table 4]

Discussion

The demographic characteristics of the patients were comparable between Group A and Group B. The mean age was 37.87 ± 8.59 years in Group A and 37.53 ± 7.92 years in Group B (p=0.833), while the mean weight was 60.04 ± 10.28 kg and 60.77 ± 10.39 kg, respectively (p=0.715). The sex distribution was also comparable, with females comprising 43.4% in Group A and 49.1% in Group B (p=0.697). Talib et al. [11] evaluated ultrasound-guided TAP block versus local wound infiltration for postoperative pain management following inguinal hernia repair. Their study established the relevance of regional analgesic techniques in this surgical population.

Patient satisfaction was comparable between the two groups, with no statistically significant difference (p=0.242). In Group A, 24.5% of patients were somewhat satisfied and 17.0% were very satisfied, whereas in Group B, 39.6% were somewhat satisfied and 9.4% were very satisfied. Sujatha et al. [12] compared TAP block with ilioinguinal/iliohypogastric nerve block with wound infiltration for postoperative analgesia in inguinal hernia surgery. Their study assessed postoperative analgesic outcomes, including patient-related postoperative parameters. The present findings showed that patient satisfaction did not differ significantly between the two techniques.

The total rescue analgesia requirement did not differ significantly between Group A and Group B (p=0.293). In Group A, 43.4% of patients required one dose of rescue analgesia compared with 28.3% in Group B. The mean duration of analgesia was 21.40 ± 5.50 hours in Group A and 21.85 ± 5.87 hours in Group B (p=0.683). Bhatia et al. [13] compared ultrasound-guided ilioinguinal-iliohypogastric nerve block with medial TAP block and evaluated postoperative analgesic efficacy in inguinal hernia repair. The present study similarly demonstrated comparable analgesic requirements between the groups.

VAS scores were comparable between the groups at all assessed postoperative time points. At baseline, the mean VAS score was 0.53 ± 0.70 in Group A and 0.51 ± 0.67 in Group B (p=0.8871). At 12 hours, the scores were 1.77 ± 0.91 and 1.92 ± 0.78 (p=0.3622), while at 36 hours they were 3.91 ± 1.10 and 4.23 ± 1.03, respectively (p=0.1238). Aveline et al. [14] compared ultrasound-guided TAP block with conventional ilioinguinal/iliohypogastric nerve blocks for open inguinal hernia repair and assessed postoperative analgesia. In the present study, although VAS scores increased progressively over time, the between-group differences remained statistically non-significant.

Post hoc analysis demonstrated statistically significant differences between all assessed time points within both groups ($p<0.001$ for all comparisons). This indicates significant changes in VAS scores over time within each group. Abd El-Hamid et al. [15] compared TAP block with local anaesthetic wound infiltration in open inguinal hernia repair and evaluated postoperative analgesic efficacy. The present findings similarly demonstrate the importance of assessing pain across multiple postoperative time points rather than relying only on a single postoperative measurement.

Priya et al. [16] compared posterior TAP block with fascia transversalis plane block for pre-emptive analgesia in unilateral inguinal hernia repair. Their study further supports the evaluation of ultrasound-guided fascial plane blocks in postoperative pain management. In the present study, despite significant changes in VAS scores across time within both groups, there were no statistically significant between-group differences in VAS scores, rescue analgesic requirement, duration of analgesia, or patient satisfaction.

Conclusion

This study demonstrates that the ultrasound-guided TFP block is as effective a technique for postoperative pain management as wound infiltration following inguinal hernia repair, offering prolonged pain free period and reduced analgesic requirements. But Patient satisfaction was higher with the TFP block, likely due to better pain control and reduced reliance on systemic analgesics.

Despite its advantages, practical considerations such as cost, accessibility, and the need for specialized training must be addressed before widespread implementation. Future research should focus on optimizing multimodal analgesic strategies, assessing long-term outcomes, and evaluating the cost-effectiveness of different pain management approaches to enhance perioperative care for inguinal hernia repair patients.

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