Section: Anaesthesiology

Original Research Article

COMPARATIVE STUDY OF ULTRASOUND-GUIDED TRANSVERSUS ABDOMINIS PLANE BLOCK VS TRANSVERSALIS FASCIA PLANE BLOCK FOR POSTOPERATIVE ANALGESIA IN PATIENTS UNDERGOING UNILATERAL OPEN INGUINAL HERNIA REPAIR

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Received : 10/05/2023
Received in revised form : 04/06/2023
Accepted : 17/06/2023

Keywords:
Transversalis Fascia plane block, Transversus abdominis plane, Postoperative analgesia, Unilateral inguinal hernia repair, NRS score.

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DOI: 10.47009/jamp.2023.5.3.459

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (3); 2335-2339

Abstract

Background: The Transversus Abdominis Plane (TAP) block and Transversalis Fascia Plane (TFP) block are effective techniques for postoperative pain control in inguinal hernia surgery. The study aims to assess the effectiveness of ultrasound-guided Transversalis Fascia plane block (TFP) compared to Transversus abdominis plane (TAP) block as a modality of postoperative analgesia for patients undergoing unilateral inguinal hernia repair. **Materials and Methods:** This cross-sectional study was conducted at the Department of Anaesthesiology, Tirunelveli Medical College, Tirunelveli, for one year. For the patients who met the eligibility criteria, Inj. Bupivacaine 0.5% 15mg was given. The patients who fulfilled the inclusion and exclusion criteria, those receiving 25 ml 0.25% levobupivacaine in the Transversus abdominis and Transversalis Fascia planes, were included equally. **Results:** Among 60 patients, 92% were male, and 8% were females, and there is no significant difference in age, gender, height, weight, ASA, and tramadol dose required between groups. The mean NRS score at 10, 30, 60, and 90 minutes among group TAP is slightly higher than that of group TFP, and this difference was statistically significant. The mean NRS score at 24 hours among group TAP is slightly higher than that of group TFP, but no significant difference. The mean duration of analgesia among group TFP is higher than that of group TAP, and this difference was statistically significant. **Conclusion:** Ultrasound-guided regional blocks for inguinal hernia repair are recommended as part of a multimodal pain-relieving routine, with the transversalis fascia plane block performing better sensory coverage.

INTRODUCTION

Inguinal hernioplasty often presents with moderate to severe pain in the first 24-hour postoperative period. Insufficient pain control elevates the risk of prolonging the recovery phase, leading to the incidence of postoperative complications and an extended hospital stay after surgery.[1,2] Various analgesic techniques have been used for effective postoperative analgesia in patients undergoing inguinal hernia surgery. Regional nerve blocks, when used as a component of multimodal analgesia, help in the effective management of postoperative pain and help to reduce drug-induced complications when various medications, including opioid drugs, are used for pain relief.[3,4] Transversus Abdominis Plane (TAP) block has proven to be an effective analgesic method for lower abdominal surgeries. The Transversalis Fascia Plane block (TFP) is a recently developed technique for postoperative pain control in inguinal surgery and other procedures. With ultrasound, rather than the blind landmark-guided technique, the reliability and safety of these blocks are very high.[5]

The Transversus Abdominis Plane (TAP) block is useful for sensory nerve supply blockade of the anterolateral abdominal wall involving T7-T12 intercostal nerves, ilioinguinal and iliohypogastric nerves, and the lateral cutaneous branches of the dorsal rami of L1.[5,6] Studies indicate that blockade

ISSN (O): 2687-5365; ISSN (P): 2753-6556

of the lateral cutaneous branches of the subcostal nerve (T12) and the iliohypogastric nerve (L1) is not always feasible.[7] This is because both nerves arise more posteriorly and move far down deeper on the anterior surface of the quadratus lumborum muscle before they enter the Transversus Abdominis Plane. The TAP block injects local anaesthetic drugs between the internal oblique and transverse abdominal muscles.

The Transversalis Fascia Plane (TFP) block is an ultrasound-guided technique, and it effectively targets T12 and L1 spinal nerves when a local anaesthetic is injected between the posterior aponeurotic extension of the transversus abdominis muscle and the transversalis fascia, which invests deeply. The thoracoabdominal nerves (T6 to L1) give rise to lateral cutaneous branches just proximal to the angle of the rib.[8] These branches lie obliquely and supply the skin of the lateral thorax, lateral abdomen, iliac crest, and upper thigh as far as the greater trochanter of the femur. The subcostal and iliohypogastric nerves are situated proximally in the Transversus Abdominis Plane and leave it in a posterior position. The iliohypogastric nerve proceeds deep into the aponeurosis of the transversus abdominis muscle and belly to penetrate the transversus abdominis muscle in an inconsistent and more anterior position. The study aims to assess the effectiveness of ultrasound-guided Transversalis Fascia plane block (TFP) compared to Transversus abdominis plane (TAP) block as a modality of postoperative analgesia for patients undergoing unilateral inguinal hernia repair.

MATERIALS AND METHODS

This cross-sectional study was conducted at the Department of Anaesthesiology, Tirunelveli Medical College, Tirunelveli, for one year. Patients who met the eligibility criteria were included, and patient informed consent and Ethical committee approval were obtained.

Inclusion Criteria

Adult patients 20 to 60 years of age, both males and females, patients weighing 50 and 80 kgs, and patients with ASA I and ASA II grades posted for unilateral inguinal hernia surgery with mesh repair under spinal anaesthesia were included.

Exclusion Criteria

Patient refusal to participate, known hypersensitivity to local anaesthetics, patients belonging to ASA GRADE III, IV, V, VI, local infection over the block area, patients with haemorrhagic disorders or patients who are on anticoagulant therapy, disease and deformities of the spinal cord or vertebral column, and failure of the spinal block were excluded.

For the patients who met the eligibility criteria, Inj. Bupivacaine 0.5% 15mg was given. The patients who fulfilled the inclusion and exclusion criteria, those receiving 25 ml 0.25% levobupivacaine in the Transversus abdominis and Transversalis Fascia planes, were included equally. After a thorough pre-anaesthetic assessment, patients were taken for surgery. The patient was connected to standard monitoring devices on entering the operating room, and intravenous fluids were started. The subarachnoid block was done in patients using 3 ml of hyperbaric bupivacaine 0.5%.

After completion of the surgery, unilateral Ultrasound Guided TAP block or TFP Block was done using 25 ml 0.25% Levobupivacaine in alternating patients. After the blocks, standard patient monitoring was done, and a pain scale rating using Numerical Rating Scale (NRS) was monitored just after the blocks T0, 30, 60, 90 minutes, and 24 hours. Rescue analgesia was given according to institutional protocol whenever the NRS ≥ 4 was on rest or the patient's demand.

Statistical Analysis

Data were entered in Microsoft Excel, and analyses were done using the statistical package for social sciences (SPSS). Descriptive statistics such as mean and standard deviation for continuous variables and frequencies and percentages for categorical variables were used. Bar charts and pie charts were used for visual representation of data. To find the association between two categorical variables chi-square test was used. An independent sample t-test was used to find the association between two quantitative variables. The Mann-Whitney U test was used for non-parametric distribution, and the significance level was set at 0.05.

RESULTS

Among 60 patients, 92% of the study participants were male, and 8% were females; in both groups, the majority were males. 32% of the population belonged to 20-35 years, 33% to 36-50 years and 35% to >50 years. The participants ranged between 20-60 years, and the mean age was 42.8 ± 12.4. 50% belonged to ASA I, and 50% to ASA II [Table 1].

Table 1: Basic characteristics of the study population

		Number	Percentage (%)
Gender	Male	55	92%
	Female	5	8%
Age group	20-35 years	19	32%
	36-50 years	20	33%
	>50 years	21	35%
ASA	I	30	50%
	II	30	50%

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The mean height among study participants is 168 ± 8.5, ranging from 152 cm to 178 cm. The mean weight among study participants is 62.2 ± 14.7, ranging between 45 to 89 kg.

Table 2: Association of patient characteristics between groups

		Group TFP	Group TAP	P-value
Age group		45.4 ± 10.5	40 ± 13.3	0.073
Gender	Male	28 (90%)	27 (93%)	1.000
	Female	3 (10%)	2 (7%)	
Mean Height		167.4 ± 7.1	168.2 ± 7.2	0.832
Mean Weight		59.5 ± 15.6	64.7 ± 13.4	0.170
ASA	I	15 (50%)	15 (50%)	1.000
	II	15 (50%)	15 (50%)	

The mean age in Group TFP was 45.4 ± 10.5, and in Group TAP was 40 ± 13.3. Most patients were male in both groups, and ASA class were equally distributed. There is no significant difference in age, gender, height, weight, and ASA between groups [Table 2].

Table 3: Distribution of Numerical Rating Scale score between groups

Mean NRS	Group TFP			Group TAP		
	1	2	3	1	2	3
10 minutes	23 (77%)	6 (20%)	1 (3%)	14 (47%)	12 (40%)	4 (13%)
30 minutes	14 (64%)	12 (40%)	4 (25%)	8 (27%)	10 (33%)	12 (40%)
60 minutes	12 (40%)	14 (47%)	4 (13%)	7 (23%)	11 (37%)	12 (40%)
90 minutes	11 (37%)	14 (47%)	5 (16%)	6 (20%)	12 (40%)	12 (40%)
24 hours	13 (43%)	12 (40%)	5 (17%)	22 (37%)	23 (38%)	15 (25%)

In Group TFP, at 10 minutes, most patients (77%) rated the attribute as NRS 1, indicating a high severity level. At 30 minutes, NRS 3 still had the highest percentage (64%), and at 60, and 90 minutes, NRS had 47%.
In Group TAP, at 10 minutes, NRS 1 had the highest percentage (47%) and NRS 2 (40%). At 30 minutes, the distribution shifted, with NRS 1 (27%), NRS 2 (33%), and NRS 3 (40%).
After 24 hours, Group TFP showed a decrease in severity ratings, with NRS 3 at 43%, followed by NRS 2 (40%) and NRS 1 (17%). In contrast, Group TAP displayed higher percentages for NRS 1 (37%) and NRS 2 (38%), with NRS 3 at 25% [Table 3].

Table 4: Comparison of mean NRS score between groups

Mean NRS	Group TFP	Group TAP	P-value
10 minutes	1.27 ± 0.521	1.67 ± 0.711	0.016
30 minutes	1.67 ± 0.711	2.13 ± 0.819	0.022
60 minutes	1.73 ± 0.691	2.17 ± 0.791	0.028
90 minutes	1.8 ± 0.714	2.2 ± 0.761	0.04
24 hours	1.73 ± 0.74	2 ± 0.809	0.139
The mean duration of analgesia	407.03 ± 8.414	352 ± 15.15	<0.001

The mean NRS score at 10, 30, 60, and 90 minutes among group TAP is slightly higher than that of group TFP, and this difference was statistically significant. The mean NRS score at 24 hours among group TAP is slightly higher than that of group TFP, but this difference was not statistically significant. The mean duration of analgesia among group TFP is higher than that of group TAP, and this difference was statistically significant ($p<0.001$) [Table 4].

Table 5: Association of Tramadol dose requirement between groups

Tramadol dose required	Group TFP	Group TAP	P-value
0	18 (56.2%)	14 (43.8%)	0.585
50	9 (43%)	12 (57%)	
100	3 (43%)	4 (57%)	

Tramadol 0 dose was required in 18 Group TFP and 14 Group TAP patients. Tramadol, 50 mg dose, was required in 9 patients in Group TFP and 12 in Group TAP. Tramadol, 100 mg dose, was required in 3 patients in Group TFP and four in Group TAP. But the groups' differences were not statistically significant ($p=0.585$) [Table 5].

DISCUSSION

Lately, there has been an increased demand for regional blocks such as the Transversalis Fascia plane block (TFP) and Transversus abdominis plane (TAP) blocks.[9-12] They provide excellent analgesia and reduce complications in the postoperative period. There are several reports documented as

ISSN (O): 2687-5365; ISSN (P): 2753-6556

comparative studies between postoperative analgesia modalities. Fouad et al. demonstrated the ultrasound-guided transversalis fascia (TF) plane block versus transmuscular quadratus lumborum block for postoperative analgesia in inguinal hernia repair. They found no statistically significant difference in NRS at rest and during movement among patients of both groups in the first 24h post-surgery. However, the performance of the TF block was technically easier.[13] In another report by Kamal et al., ultrasound-guided TAP Vs ilioinguinal-iliohypogastric (IIN/IHN) blocks for postoperative analgesic efficacy in adults undergoing inguinal hernia surgery. The results suggested the effectiveness of IIN/IHN blocks over the TAP block.[14]

Abdelbaser et al. reported a randomised controlled non-inferiority study on ultrasound-guided transversalis fascia plane block versus lateral quadratus lumborum plane block for analgesia after inguinal herniotomy in children. The data suggested that the transversalis fascia plane block (TFB) and quadratus lumborum block (QLB) showed similar effects for pain reduction, pain scores, and analgesic consumption.[15] Sørenstua et al. documented the efficacy of a TAP block versus an anterior QLB for laparoscopic inguinal hernia repair. They found no difference between the two blocks regarding oral morphine equivalent (OME) consumption, pain, nausea, or sedation.[16]

In a recent report by Purohit et al., the efficacy of blind transverse abdominis plane block (landmark-based) for postoperative pain relief in inguinal hernia.[17] The literature has many reports on TAP and QLB and their comparative assessment. However, the comparative report on TAP and TFP are very few. Our study assessed the usefulness of ultrasound-guided TFP compared to TAP block as postoperative analgesia for patients undergoing unilateral inguinal hernia repair. In our study, the mean NRS score at 10, 30, 60, and 90 minutes among group TAP is slightly higher than that of group TFP, and a statistically significant difference was observed. The mean NRS score at 24 hours among group TAP is slightly higher than that of group TFP. Still, this difference is not statistically significant. Further, the mean duration of analgesia for the TFP group is statistically significantly higher ($p<0.001$) than the TAP group. Moreover, the different doses of Tramadol in both groups are not significant ($p=0.585$).

The findings of our study were very similar to the study report of González et al. effect of both the blocks (TAP and TFP) as effective postoperative analgesia in patients undergoing inguinal hernia repair.[18] Our study recommends using both blocks as an analgesic modality for postoperative pain relief. However, based on the NRS pain score, the TFP block works better than the TAP block. The current study possesses a scope for further evaluation regarding clinical trials.

CONCLUSION

The study concluded that using ultrasound for regional blocks to tackle postoperative pain effectively suggested being made a routine practice. The study showed a better pain tolerance scale in the postoperative period with ultrasound-guided blocks. In light of the current information, further evaluation and clinical studies suggested deciding on the advantages of transversus abdominis plane block and transversalis fascia plane block for inguinal hernia repair. These blocks are recommended as part of the multimodal pain-relieving routine that may incorporate NSAIDs, Acetaminophen, and local anaesthetic injection. The transversalis fascia plane block performed better in terms of sensory coverage than the transversus abdominis plane block.

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ISSN (O): 2687-5365; ISSN (P): 2753-6556

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ISSN (O): 2687-5365; ISSN (P): 2753-6556