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# Post-Operative Analgesia in Inguinal Hernia Repair by Quadratus Lumborum Versus Transversalis Fascia Block

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## Abstract

**Background:** Surgeries for inguinal hernias are common. Post-operative pain caused by traditional analgesics has worsened.

**Aim and objectives:** To evaluate the efficacy of two postoperative pain relief techniques for patients having a unilateral inguinal hernia repaired: a transmuscular quadratus lumborum block and an ultrasound-guided transversalis fascia plane block.

**Patients and Methods:** This single-masked upcoming randomized clinical study for pain control post-operative patients was conducted on 50 patients divided into two groups [QL versus TS] with anesthesiologists' companionship in American physical states I and II, aged 21–45 years old, who underwent unilateral repair of an inguinal hernia at Police and Al. Hussain University Hospitals.

**Results:** There was no significant variance amongst QL & TF blocks in the pain score at rest and movement ( $p > 0.05$ ). A significant distinction existed amongst QL and TF blocks in ease performance ( $p = 0.0039$ ). There was a statistically significant increase in the heart rate in the TF group compared to QL group 2 and 24 hours postoperatively ( $P = 0.0015, 0.003$ , respectively). There was a significant difference in hemodynamics at 1st hr, 4 hr, 12 hr, and 24 p = (0.000039, 0.03838, 0.02684, and 0.00596).

**Conclusion:** When it comes to reducing pain scores as well as opiate intake during non-recurrent inguinal herniorrhaphy, the ultrasound-guided TFP block may be just as effective as the QL block. Technically, a US-guided TFP block is more convenient and quicker.

**Keywords:** Transversalis Fascia Plane Block; Quadratus Lumborum Transmuscular Block; Inguinal Hernia Repair

## 1. Introduction

Complications after inguinal hernia repair are frequent, especially pain. Regional blocks, which are partly multi-channels for painkillers, decrease complications in the postoperative period.<sup>1</sup>

The anterior T6 rami to L1 spinal nerves that run through an inter-fascial plane (separating the transverse abdominal, internal oblique muscles) supplement the lateral in addition to the anterior abdominal wall (skin, muscles, and parietal peritoneum).<sup>2</sup> The plane is named the transverse abdominis plane (TAP).<sup>3</sup>

Local anesthesia done in the TAP blocks T6 to L1 sensory, making it difficult to block the cutaneous lateral branches of T12 subcostal nerves with L1 iliohypogastric nerves. This explains why the neurons originate behind the quadratus lumborum and go deeper along its anterior surface before bursting into TAP.<sup>4</sup>

In 2007, Dr. Blanco labeled the U/S in the QL block as a softening of the TAP block. The head of the QL block is rolled out by local anesthetic behind the TAP plane, fanning the space in the thoracic paravertebral space with the distribution of both visceral and somatosensory to anesthetic both cutaneous lateral and anterior branches from T7 to L1.<sup>5</sup>

In 2009, Hubbard described the TFP block as proximal T12 occlusion and L1 portion nerves with fanning of local anesthetic allying the muscle of transversus-abdominis. Also, its deep transversal fascia will lay out the inner quadratus lumborum surface muscle.<sup>6</sup>

This research compared the efficacy of two postoperative analgesic techniques, transmuscular quadratus lumborum block, and ultrasound-guided transversalis fascia plane block, for participants having a unilateral inguinal hernia repaired.

## 2. Patients and methods

This comparative prospective, single-blind, randomized clinical trial was conducted on 50 adult male patients with elective unilateral inguinal hernia surgery from October 2022 to August 2023 at the hospital and Al-Hussein University Hospital. After approval, the Ethics Committee, each patient provided written, informed consent. The confidentiality of the data and the participants' privacy were adequately protected.

**2.1. Inclusion criteria:** Male patients with criteria of ASA class I or II who are aged 21–45, have a body mass index (BMI) under 25 kg/m<sup>2</sup>, can rate pain on the numeric rating pain (NRS) numeric rating scale 0 originating to 10, and have surgery lasting no more than 1 hour.

**2.2. Exclusion criteria:** patient with problematic estimating level of pain; difficult block: had more than a trial skin puncture and required optimization of needle image. Patient refusal, coagulopathy, and the presence of a skin infection.

### 2.3. Randomization

After computerized enrollment in the research using generated numbers and a sealed opaque envelope, the cases were separated into two groups of equal numbers; 25 persons were randomly enrolled in each group. Quadratus Lumborum Block was done in Group (QL), and Transversalis Fascia Plane Block was done in Group (TF).

**2.4. Sample size calculation:** Using the following information and the Epi-info program, we calculated 95% test power and 95% confidence level. The number of groups was two: 51% of group QL results and 49% of group TF results. The needed sample size was a minimum of 50 individuals. A simple random sample is the type of sample.

### 2.5. Study protocol

All patients underwent a health check and were on midazolam (amount) (0.02 mg/kg) intravenously. In the operation room, an IV line was inserted, and monitoring devices (GE-Datex Ohmeda) were attached, which included using five lead cables (ECG), pulse oximetry (SpO<sub>2</sub>), and NIBP. All patients in preoperative visits interpreted NRS. All the patients receive 10 ml/kg of Ringer's lactate solution (Almottahedoon Pharma). Then, applying quint spinal anesthesia, a [B. Braun [B. Braun 25-gauge] spinal needle was introduced intrathecally midline at level lumbar L3,4 space in the sitting position. Following an efficacious dural puncture, spinal anesthesia will be performed with 15 mg of bupivacaine (Sunny pharmaceutical) and 20 mcg of fentanyl (Sunny pharmaceutical). At the end of the surgery, all blocks were received by patients in aseptic skillfulness using a short-bevel echogenic needle,

a digital ultrasonic imaging system (sonosite M-turbo), frequent (2–6 MHz), and a 100–150 mm curvilinear probe.

Patients in the QL group (n = 25): With the side to be anesthetized facing upwards, the patients lay down in a lateral position. The ultrasound probe is located on the transverse plane by quarter abdominal and directly cranial to the iliac crest. Keeping transverse inclination by shifting the probe dorsally until the QL muscle attachment is spotted to the lateral L4 vertebral processes. A finely identifiable (shamrock pattern) sign with a triplet leaflet was seen anteriorly psoas major (PM), posteriorly erector spinae (ESM), and at the apex of the transverse process adherent to QL muscle. The needle slides in-degree to the transducer (lateral edge), and the needle tip passes through the QL muscle and pricks the ventral fascia. Negative aspiration was done, the needle tip was correctly positioned, and 2 ml of normal saline was infused to vouch for the correct plane allying. Succeeding, inject 30 ml of 0.25% bupivacaine, allying PM and the QL, which is the plan for (QL) transmuscular block.

Patients in the TF group (n = 25): As the anesthetized flank inlays upwards, the patient lies down laterally. The probe was inserted between the cephaloid and the iliac crest in the midaxillary line. Ventral Scanning and spotting of three anterior abdominal muscles (the internal oblique, transversal abdominis, and external oblique). The abdominis transversalis thins to form a hyper-echoic aponeurosis that passes posteriorly to the quadratus lumborum. Posteriorly scan to envision solid organs (e.g., liver, kidney) lower than transversus abdominis that might be bruised with the needle. The needle is positioned anterior to the transducer and goes in-plane with the three lateral abdominal muscles. Once the spot on the needle with negative aspiration was set, I infused 2 ml of saline to vouch for correct plane splitting. Next, 30 ml of 0.25% bupivacaine was injected, allying transversalis abdominis muscle and fascia transversalis anterolateral to QL. Individuals were taken to the post-anesthesia care unit (PACU) to be monitored. In the PACU, patients were given ketorolac 30mg as rescue analgesia in cases of NRS greater than 4, & 5 mg of pethidine intravenously if NRS greater than 6. In the first two hours following surgery, if the patient needed more than one dosage of pethidine, the block was determined to be unsuccessful.

Data to be collected: patient character, numeric pain score at 2, 4, 8, 12, and 24 hours.

### 2.7. Statistical analysis

IBM's SPSS v27, located in Chicago, IL, USA, was employed to conduct the statistical research. The data distribution was checked for normality using the Shapiro-Wilks test and histograms. The quantitative parametric information was examined

using an unpaired student t-test and provided as mean and standard deviation (SD). Statistical significance was determined by a two-tailed P value less than 0.05.

### 3. Results

There was no significant different between QL and TF blocks as regards patients characteristics  $p > 0.05$ . (Table 1)

Table 1. Patients' characteristics; age, BMI and clinical criteria in QL and TF groups

	QL (N=25)	TF (N=25)	P VALUE	MD	T value	SIGNIFICANTLY DIFFERENT (P<0.05)?
AGE	Mean ± SD 32.34 ± 7.418	32.84 ± 5.982	0.753	-0.6	0.3156	NO
BMI	23.08 ± 1.152	23.18 ± 1.147	0.726	-0.1	0.3039	NO
ASA SCORE	ASA I (84%) ASA II (16%)	20 (80%) 5 (20%)	>0.99	4%	0.3159	NO
SURGERY SIDE	Rt (64%) Lt (36%)	14 (56%) 11 (44%)	0.563	8%	0.4249	NO

SD: standard deviation, p: probability value, BMI: Body mass index, RT: right, LT: left, MD: Mean difference, PD: Percentage difference, Data are expressed as number (percentage)

There was no significant different between QL and TF blocks in pain score at rest  $p > 0.05$ . (Table 2)

Table 2. Numeric pain score at rest in 2, 4, 8, 12 and 24 hours postoperatively in QL and TF groups

	2HS	4HS	8HS	12HS	24HS
QL MEAN ± SD	1.08 ± 0.282	2 ± 0	2 ± 0	2 ± 0.507	3 ± 0.51
TF MEAN ± SD	1 ± 0	2 ± 0	2 ± 0	2 ± 0.476	3 ± 0.523
MD	0.08	0	0	0.12	0.24
P VALUE	0.379	>0.99	>0.99	0.202	0.011
T RATIO SIGNIFICANCE?	1.476 NO	NO	NO	0.863 NO	1.643 NO

There was no significant diverse among QL & TF blocks in pain score with movement  $p > 0.05$ . (Table 3)

Table 3. Numeric pain score with movement in 2, 4, 8, 12 and 24 hours postoperatively in QL and TF groups

	2HS	4HS	8HS	12HS	24HS
QL MEAN ± SD	2 ± 0	2.16 ± 0.554	2 ± 0.71	3 ± 0.6	4 ± 1
TF MEAN ± SD	2 ± 0	2 ± 0	2 ± 0.5	3 ± 0.40	4.08 ± 0.95

	MD	P VALUE	T RATIO SIGNIFICANCE?
MD	0	0.16	0.04
P VALUE	>0.99	0.339	0.811
T RATIO SIGNIFICANCE?	9	3	8
MD	0	0.956	0.239
P VALUE	2	0	0.71
T RATIO SIGNIFICANCE?	NO	NO	NO

There was no significant change among QL and TF blocks for the need of rescue analgesia  $p$  value=0.8887. (Table 4)

Table 4. Patients' need for rescue analgesia in QL and TF groups

	KETOL AC AT	PETHIDI NE AT 24	NOTHING
QL N (%)	5 (20%)	15 (60%)	5 (20%)
TF N (%)	3 (12%)	15 (60%)	6 (24%)
PD	8%	0	4%
CHI SQUARE	0.6338		
P VALUE SIGNIFICANCE	0.8887 NO		

There was significant different between QL and TF blocks as ease performance  $p = 0.0039$ . (Table 5)

Table 5. Ease of performance in QL and TF groups

	EASE OF PERFORMANCE	
	easy	difficult
QL N (%)	10 (40%)	15 (60%)
TF N (%)	20 (80%) **	5 (20%)
PD	-40%	40%
CHI SQUARED	8.33	
P VALUE SIGNIFICANCE	0.0039 Yes	

There was a statistical significant increase in the heart rate in the TF group compared to QL group 2 as well as 24 hours postoperatively ( $P = 0.0015, 0.003$  respectively). (Table 6)

Table 6. Patients' hear rate (beat/min) 1, 2, 4, 8, 12 and 24 hours postoperatively in QL and TF groups

HR	1HR	2HS	4HS	8HS	12HS	24HS
QL	69.2 ± 3.4	71.4 ± 2.2	72.6 ± 2.5	73 ± 2.5	77.2 ± 4.3	77 ± 4
TF	71.4 ± 4.7	74.03 ± 87	73.4 ± 2.7	75.08 ± 5.5	79.4 ± 4.8	79.16 ± 3.4
MD	-1.8	-	-0.8	-	-2.2	-
P VALUE	0.1	0.0	0.2	0.0	0.0	0.0
T RATIO	333	015	946	962	980	030
P VALUE	89	40	18	53	30	82
T RATIO	1.5	3.3	1.0	1.6	1.6	2.1
P VALUE	27	59	60	97	87	94

There was significant different in hemodynamics at 1st hr , 4 hr, 12hr and 24 p= (0.000039, 0.03838, 0.02684, 0.00596). but there was no significant alteration in hemodynamics at 2hs, 8hs P= (3.359, 1.697) respectively. (Table 7)

Table 7. Patients' MBP(mmHg) 1, 2, 4, 8, 12 and 24 hours postoperatively in QL and TF groups

MBP	1HR	2HS	4HS	8HS	12H S	24 HS
QL	85 ± 5.09	85 ± 4.77	88.1 6 ± 3.04	88.5 6 ± 3.27	86.8 ± 4.3	92 ± 9.6 8
TF	79.04 **** ± 4.14	82.7 6 ± 4.15	85* ± 6.78	86.8 ± 6.44	90.3 6' ± 6.5	99** ± 7.3 6
MD	5.96	2.24	3.16	1.76	- 3.56	-7
P VALUE	0.000 039	0.09 23	0.03 838	0.22 869	0.02 684	0.0 059
T RATIO	1.527	3.35 9	1.06 0	1.69 7	1.68 7	2.1 94
SIGNIFICANCE?	Yes	NO	Yes	NO	Yes	Yes

#### 4. Discussion

In 2009, Hebbard marked out the (US) assist fascia transversalis blockage from T12 anterior and lateral to L1 branches nerves were blocked by local anesthetic administered among the muscle of the abdominis transversalis and its fascia deeply. 6

Reported in 2007 that quadratus lumborum blockage by US block was a revision of the transversal abdominis plane blockage. In the QL block, LA expands, entering the space between the thoracic paravertebral, and anesthetizes the anterior and lateral abdominal walls by producing a blockade from the T7 cutaneous branches to L1.5.

Fouad et al. According to our results, the NRS score at 30 minutes was  $3.64 \pm 0.63$  in the QL group and  $3.80 \pm 0.95$  in the TF group. There were no statistical variances at the first 24 hours postoperatively between the two scored groups (NRS) when they were at ease or moved their legs. 7

Samerchua et al. directed a similar randomized assessor-blinded study by comparing ultrasound-guided iliohypogastric/ilioinguinal nerve block and posterior quadratus lumborum block for inguinal hernia in children postoperatively. Under general anesthesia, children aged up to seven are scheduled for herniotomy unilaterally to get one of two blocks: posterior quadratus lumborum blockage with 0.25% bupivacaine 0.5 mL/kg or else ilioinguinal/iliohypogastric nerve blockage with 0.25% bupivacaine 0.2 mL/kg ultrasound-guided. Pain degrees in 30 minutes, 1, 2, 6, 12, and 24 hours were alike on

condition. 8

Consistent with our findings, López-González et al. found that the delay and motion pain degree in paired groups post-operatively were similar by comparing the effectiveness of U/S anterior transversus abdominis block (TAP-A) with transversal fascia block (TFP) for repairing unilateral analgesia in inguinal hernia. 9

Our findings showed no significant alteration among groups regarding the delivered analgesia ( $P > 0.05$ ).

Consistent with our findings, Fouad et al. discovered that 12% of patients suffering (3/25) in the TF category were given analgesia 30 minutes after surgery, compared to only 4% (1/25) in the QL category with no arithmetic switch. 7

Our findings conflict with those of Ksüz et al., who investigated how well the QL, including TAP blockage, reduced strain after additional abdominal procedures. In the first 24 hours, the number of cases of analgesia was significantly lower in the QL block group than in the TAP block group. 10

Fouad et al.'s report that the average block conduit time in the TF category was 9.92 1.76 minutes, significantly lower ( $P = 0.028$ ) than in the QL group (10.84 1.97), confirms our findings. 7

Regarding ease of performance, the block performance technique was easy for 40% of patients and moderately easy for 60% of patients in the QL group, whereas it was easy for 80% of patients and moderately easy for 20% of patients in the TF group. There was a significant increase in the ease of the technique in the TF group ( $p = 0.004$ ).

The technical simplicity of the block was equivalent in both groups (López-González et al. This is because they focused more on TAP than QL blocks. 9

Interestingly, Fouad et al. documented no statistically significant difference in patient satisfaction among both groups ( $P$ -value =0.489). 7

Scimia et al. found that we can reduce opioid intake with the use of US in TFP blockage for herniorrhaphy cases by blocking the nerves in T12-L1. And as part of a plan for multichannel painkilling and excellent patient satisfaction. 11

In terms of hemodynamics, the current study showed a notable elevation in the heart rate in the TF group compared to QL group 2 and 24 hours postoperatively ( $P = 0.0015, 0.003$ , respectively). There was a significant decrease in MBP in the TF group compared to QL groups 1 and 4 hours postoperatively ( $P = 0.000039, 0.038$ ), respectively. However, there was a notable elevation in MBP in the TF group compared to the QL group 12 and 24 hours postoperatively ( $P =$

0.026, 0.005), respectively.

Yang et al. examined the dye distribution in cadavers using various needle techniques for US-guided QL blocks. In every block, they discovered heavily stained thoracolumbar fascia; however, in the other QL method, the dye stained the transversus abdominis and TFP. 12

#### 4. Conclusion

When it comes to reducing pain scores and opiate intake during non-recurrent inguinal herniorrhaphy, the ultrasound-guided TFP block may be just as effective as the QL block. On the other hand, the US-guided TFP block may offer more convenience and speed from a technical standpoint.

#### Disclosure

The authors have no financial interest to declare in relation to the content of this article.

#### Authorship

All authors have a substantial contribution to the article

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There are no conflicts of interest.

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