



EFFICACY OF QUADRATUS LUMBORUM BLOCK VERSUS TRANSVERSUS ABDOMINIS PLANE BLOCK FOR POST-OPERATIVE ANALGESIA IN ABDOMINAL SURGERIES

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Abstract

Objective: To compare the efficacy of Transversus abdominis plane block (TAP) and Quadratus lumborum block (QLB) for postoperative analgesia in abdominal surgeries.

Background: Postoperative analgesia is vital after abdominal surgery as it facilitates early ambulation, recovery rate and overall patient satisfaction as good health outcomes. Many modalities are in use for post operative analgesia, but they come along with their own disadvantages. Regional block techniques like QLB and TAP are considered as safe techniques. Our study aims at use of TAP and QLB for postoperative analgesia following abdominal surgeries.

Method: Prospective randomised study, patients undergoing abdominal surgery were randomised into 2 groups to receive ultrasound guided TAP (n=25) or QLB(n=25) bilaterally with 20ml 0.25% Bupivacaine plus 8mg Dexamethasone. The primary objective was to compare duration of analgesia. Secondary objectives was to compare the total number of rescue analgesia doses required with visual analogue scale (VAS) score up to 48 hours postoperatively. Data was compared using Pearson's chi square test and unpaired t-test .

Results: Duration of analgesia was higher in the QLB group than TAP group (mean±SD: 44.84±3.6 hours vs 24.64±1.55 hours) ($P < 0.05$). Number of rescue analgesia doses required in QLB group were significantly less than TAP group from 16 hours to 48 hours ($p < 0.05$)

Conclusion: QLB showed significantly prolonged and effective analgesia than TAP due to its additional visceral nerves blockade action along with somatic nerves blockade.

Keywords: Post-operative analgesia, Transversus abdominis plane block, Quadratus lumborum block, ultrasound guided block, abdominal surgeries.

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1. Introduction

The health and outcome of patients after abdominal surgeries can be detrimentally affected by the consequences of postoperative pain, such as respiratory complications, thromboembolism and increased duration of post-operative stay. Multimodal analgesic regimen is essential to control this postoperative pain and discomfort. Epidural analgesia, the most commonly used analgesic technique, has disadvantages like epidural haematoma, accidental dural puncture and negative cardiovascular consequences [1]. As systemic or neuraxial opioids are associated with pruritis, nausea and vomiting, it decreases patient's acceptance and satisfaction [2].

Regional anaesthesia techniques like transversus abdominis plane block (TAP) and quadratus lumborum block (QLB) are good alternatives with minimal side effects, easy to perform and facilitating early amelioration of pain, ambulation and patient satisfaction [3,4]. Somatic as well as visceral blockade are essential to provide better postoperative analgesia after abdominal surgeries. TAP provides effective somatic analgesia but minimal or no visceral blockade. Since in QLB, the local anaesthetic is injected through a more posterior approach, adjacent to quadratus lumborum (QL) muscle, visceral nerve blockade is achieved [5,6].

In 2007, Blanco defined QLB as a posterior abdominal wall block in which the drug spreads into lumbar interfascial triangle behind QL muscle [7,8]. Numerous sympathetic fibers lie in proximity to this interfascial plane which conjoin with paravertebral space resulting in its long duration of block and visceral analgesia [9].

Our study is a randomised, double blinded prospective study to assess the postoperative analgesic efficacy of QLB and TAP in lower abdominal surgeries under subarachnoid block with primary objective to compare the duration of analgesia and secondary objective to compare number of rescue analgesia doses required with VAS score up to 48 hours postoperatively. In this study, we have also added dexamethasone as an additive.

2. Materials and Methods

After institutional ethics committee approval (IESC/ FP/2020/63), this prospective, randomised controlled trial was conducted in a tertiary care hospital over a period of six months. The study was done in accordance with the principles of the Declaration of Helsinki.

Patients with ASA grade I or II status, ages 18 to 65 years, height above 150 centimeters, haemodynamically stable, with availability of informed

consent, undergoing lower abdominal procedures under spinal anaesthesia were selected. Exclusion criteria were patients below 18 years and above 65 years of age, height below 150 centimeters, ASA III or more, major neurological, cardiac, respiratory, metabolic, renal, hepatic diseases or with coagulation abnormalities, contraindication for spinal anaesthesia and known allergies to the study drug.

50 patients were enrolled and were randomly allocated into two groups, Group A and Group B. After pre-operative evaluation and informed consent, all patients received intravenous (IV) 40mg pantoprazole, IV 4mg ondansetron. Spinal anaesthesia was given with 0.5% bupivacaine heavy 3.8 ml and level of T6 - T7 was achieved. Postoperatively, group A patients were given USG guided bilateral QLB with Bupivacaine 0.25% 20ml plus Dexamethasone 8 mg on each side whereas group B patients were given bilateral TAP Bupivacaine 0.25% 20ml plus Dexamethasone 8 mg on each side.

For QLB, transducer of US machine was placed at the level of anterosuperior iliac spine and moved cranially until clear visualisation and identification of the three abdominal wall muscles. Posterolaterally, external oblique muscle was followed until hook sign was visualized at its posterior border, leaving underneath internal oblique muscle like a roof over QL muscle. Middle layer of thoracolumbar fascia was identified as a bright hyperechoic line when probe was tilted down. From anterolateral to posteromedial, needle was inserted by in-plane technique and was placed between thoracolumbar fascia and QL muscle and drug was deposited.

TAP block was given under ultrasound (US) guidance by placing probe between iliac crest and lower costal margin in anterior axillary line at the level of umbilicus and external oblique, internal oblique and transversus abdominis muscles were identified. While using in-plane technique, tip of the needle was inserted between internal oblique and transversus abdominis muscles and drug was deposited.

Post-operative pain was recorded using VAS score (0 = no pain and 10 = worst possible pain) 2 hourly for first 12 hours, then 4 hourly for next 12 hours and then 12 hourly for next 24 hours. When VAS score was ≥ 4 , rescue analgesia of IV tramadol 2mg/kg and IV ondansetron 4mg was given and time was noted. Total consumption of analgesic drug in terms of the number of doses in 48 hours was calculated. Primary aim was to measure duration of analgesia and secondary aim was total number of rescue analgesia doses required over a period of 48 hours.

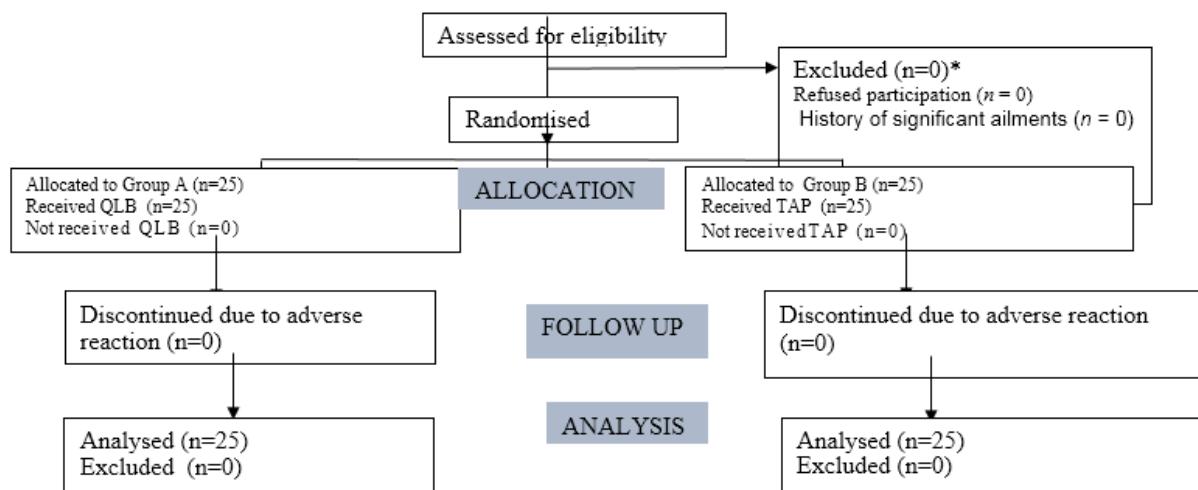
The study used for sample size calculation was Saleh AH et al's Quadratus lumborum block

(transmuscular approach) versus transversus abdominis plane block (unilateral subcostal approach) for perioperative analgesia in patients undergoing open nephrectomy: a randomized, double-blinded, controlled trial^[10]. In their study, time to rescue analgesia in QLB GROUP was 138.75 ± 52.39 minutes and that in TAP GROUP was 202.50 ± 72.25 minutes. Entering this data in WinPepi software at 5% significance level and 80% power and considering attrition rate of 10% sample size came to 50 patients (25 in each group). Allocation concealment was done by keeping the random allocation number enclosed in a sealed opaque envelope. The envelope was opened by an anaesthesiologist not involved in the study. The

drug preparation was done by the anaesthesiologist who was involved in administration of anaesthesia and patient care. Monitoring and data collection was done by another doctor not involved in drug administration.

Statistical analysis was done using software SPSS version 16. Continuous variables represented with mean and SD. Parametric and non parametric tests were done as applicable. Normally distributed data was assessed by Student's t test and non normally distributed data was assessed by Mann-Whitney U test. Categorical variables were analysed by Pearson's Chi square test. Probability if less than 0.05 was considered to be significant with an alpha level of 5.

PARTICIPANT ENROLMENT



*Since all the patients were given analgesia immediately after the surgery ,there were no drop outs.

3. Results

Table 1. Distribution of Age, Height And Body Weight

VARIABLES	GROUP		p VALUE	SIGNIFICANCE (p <0.05)
	A (QLB)	B (TAP)		
Height (Centimeters)	149.84±11.98 (Mean ± SD)	150.2±10.34 (Mean ± SD)	0.476	Not significant
Age (Years)	26 (7.5) Median (IQR)	27 (11) Median (IQR)	0.322	Not significant
Body weight (Kilograms)	68 (8) Median (IQR)	68 (11) Median (IQR)	0.617	Not significant

As p>0.05 for all the above variables, both groups were comparable. p value for Height variable was calculated using student's t test, whereas that of age and body weight was calculated using Mann-Whitney U test.

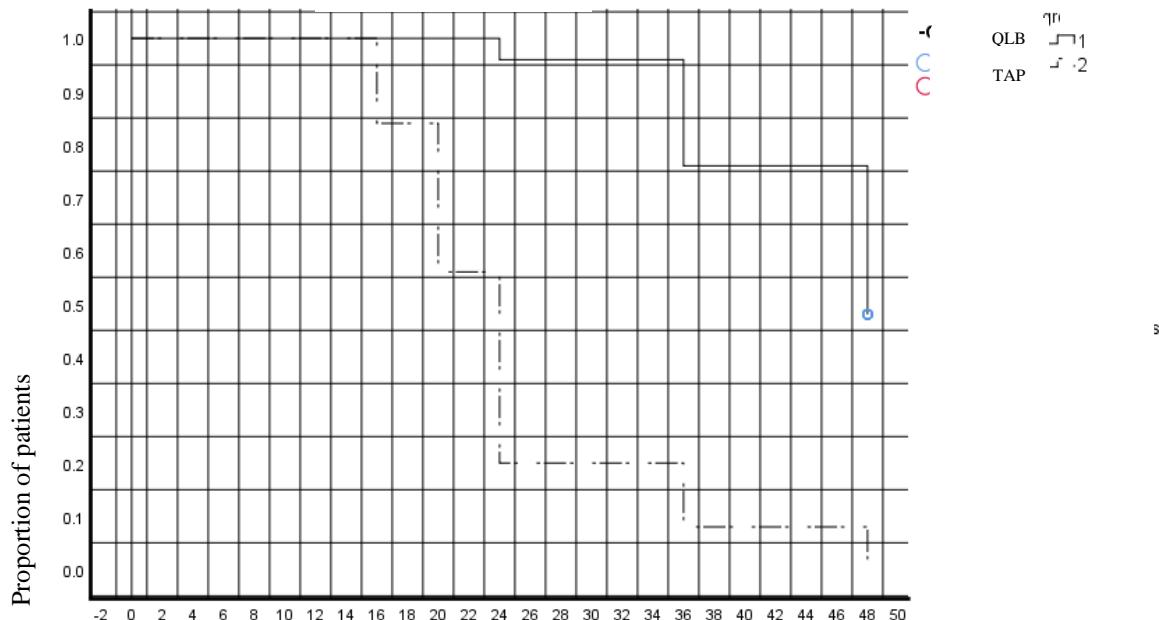
Table 2. Number of Rescue Analgesia Doses Required At Various Intervals

Time (Hours)	QLB group (number of patients)	TAP group (number of patients)	Chi Square Value	p Value
2	0	0	-	-
4	0	0	-	-
6	0	0	-	-
8	0	0	-	-

12	0	0	-	-
16	0	4	10.79	0.02
20	0	11		
24	1	20		
36	6	23		
48	12	25		

Table 2. Time for first rescue analgesia dose requirement was more in QLB than in TAP. The difference in number of rescue analgesia doses required in the two groups is statistically significant (p is < 0.05) from 16 hours to 48 hours with QLB group requiring less number of rescue analgesia doses.

Kaplan Meir Graph

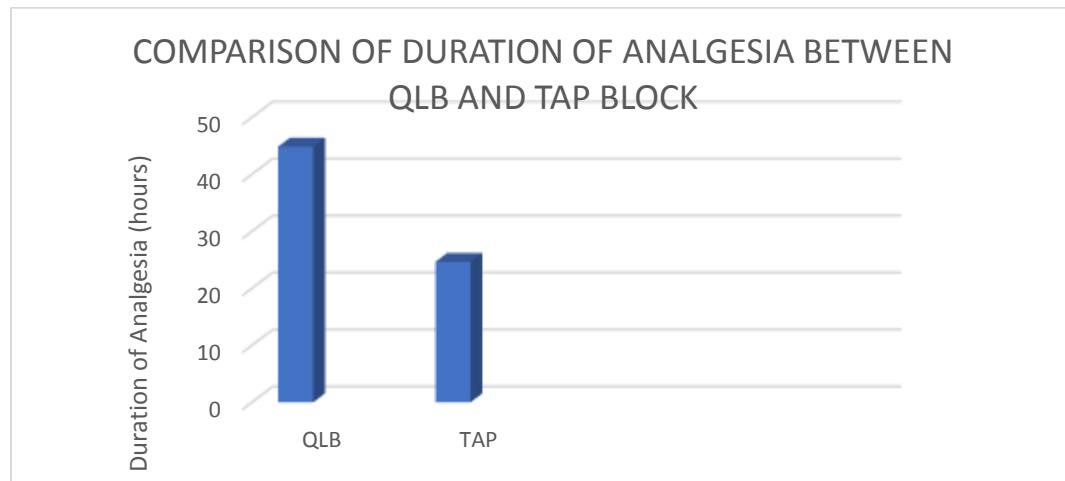


GRAPH 1. KAPLAN M Time in Hours → **G PROPORTION OF PATIENTS WHO DID NOT REQUIRE RESCUE ANALGESIA OVER 48 HOURS IN QLB and TAP GROUPS**

Table 3. Duration of Analgesia

	GROUP A (QLB)	GROUP B (TAP)	T TEST	p VALUE
Duration of analgesia(minutes)	44.84±3.6	24.64±1.55	28.21	<0.001

TABLE 3. Significantly prolonged duration of analgesia was observed in QLB group than TAP group ($p < 0.05$)



GRAPH 2. DURATION OF ANALGESIA

4. Discussion

Modalities commonly used for postoperative analgesia like intravenous, intrathecal and epidural opioids are associated with various side effects^[11,12,13]. When using the epidural technique, there is a risk of dural puncture and epidural haematoma.

As a component of multimodal analgesia, TAP block has been widely used, as it blocks T10 to L1 nerves primarily causing somatic analgesia with little or no visceral blockade. Whereas, QLB provides both visceral and somatic blockade^[4].

QLB is given in superficial plane between posterior abdominal wall muscles (QL, erector spinae).

The fascial plane, which is bright, hyperechoic and simple to dissect, is the objective of QLB. Under ultrasonography, target point in QLB is superficial, making it a safer and better technique as QL muscle lies between the needle tip and peritoneum reducing the chances of bowel injury and intraperitoneal injection.

QLB provides analgesia from T7 to L1 dermatomes. The paravertebral space or thoracolumbar plane contains mechano-receptors and dense network of sympathetic fibres. As the drug given in QLB perlocates in these spaces, QLB results in both visceral and somatic analgesia^[14,15].

According to Carney et al., contrast solution accumulates at the lateral boundary of QL before spreading posterior-cranially to anterior portion of the QL and psoas major into the paravertebral region^[16].

The primary outcome of our study showed that patients receiving QLB had significantly longer duration of analgesia than those receiving TAP (mean \pm SD: 44.84 ± 3.6 hours vs 24.64 ± 1.55 hours). In 2018, Naglaa Khalil Yousef noticed that the QLB group had considerably lesser opioid requirements than the TAP group. Also, the duration of postoperative analgesia was longer in

the QLB group (15.1 ± 2.12 h versus 8.33 ± 4 h, $p < 0.001$)^[17]. However the duration of post-operative analgesia in QLB group in our study was more than study of Naglaa Khalil Yousef, which could be due to use of dexamethasone as an additive. In our study, secondary outcome of number of rescue analgesia doses required in the two study groups is statistically significant (p is < 0.05) from 16 hours to 48 hours with QLB group requiring less number of rescue analgesia doses. Children undergoing laparoscopic appendectomy and pyeloplasty were shown to have considerably better and more enduring postoperative analgesia with QLB, according to Baidya et al. and Murouchi^[18,19].

According to Öksüz et al., the QLB group had lower FLACC (face, legs, activities, cry, consolability) scores than the TAP group in paediatric patients, and the QLB group experienced significantly lower rescue analgesia postoperatively for 24 hours^[20].

The cause of prolonged analgesia, which lasted up to mean 44.84 hours in our study, may have been caused by drug spreading into the paravertebral space which contains adipose tissue having low local tissue perfusion rate, causing slow rate of absorption of local anaesthetic agents into the blood^[21,22].

The limitation in our study was that titration of volume of drug to height of patient was not done. Also, onset of analgesia could not be assessed as both blocks were given immediate post operatively while the effect of spinal anaesthesia was still present. More studies are required in major abdominal surgery under general anaesthesia.

5. Conclusion

Quadratus lumborum block provides long-lasting and better analgesia than TAP block due to its visceral nerves blockade in addition to somatic

nerves blockade. This prolonged duration of analgesia in QLB could also be due to spread of drugs into paravertebral space which contains adipose tissues where absorption rate is low. Dexamethasone as an additive enhances this prolonged duration of analgesia furthermore. Therefore, QLB is a novel block for postoperative analgesia which is not yet being used frequently and we recommend the same.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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