

Original Research Article

# Effectiveness of quadratuslumborum block for post-operative analgesia in open urosurgical procedures

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## Abstract:

**Background:**Open surgeries are associated with significant morbidities post operatively such as pain and restricted ambulation causing delayed recovery. A multimodal analgesic approach combining different analgesia modes with local or regional anaesthesia to maximise effectiveness is essential. Among the various regional anaesthesia techniques quadratus lumborum block(QLB) is found to be an effective alternative.

**Aims:**In this study we aim to assess the post operative analgesic efficacy of USG guided quadratuslumborum block in open urosurgical procedures.

**Materials and Methods :** Ninety patients of ASA Grade I or II undergoing open urological procedures under GA were divided into 2 groups one group receive USG guided QLB(Group Q) and other control (Group C).Each patient was assessed for the duration of analgesia, (time to first rescue analgesic), total dose of rescue analgesics required in 24hrs,VAS score post operatively(1,2,4,6,8,12,18,24hrs) at PACU and the incidence of any adverse events post operatively.

**Results:** The mean VAS score was higher in control group compared to both the study groups which was statistically significant(p value<0.0001).The mean time of demand for first rescue analgesia(duration of analgesia)was  $4.87 \pm 1.01$ hrs in QLB group compared to control group  $1.40 \pm 0.50$ hrs which was statistically significant(p value<0.0001).The total rescue analgesic requirement was low in the study groups compared to control group(p value<0.0001).There was no incidence of any side effects found.

**Conclusion:**Ultrasound guided QLB provide effective analgesia,decrease intraoperative and postoperative opioid consumption and is beneficial to shorten hospital stay in patients undergoing open urological procedures.

**Keywords:** Quadratuslumborum block(QLB),Post operative analgesia, open urosurgical procedures.

## 1. INTRODUCTION

Open urological procedures are performed for cases like Pyeloplasty, Nephrectomy, complicated renal stone retrieval. These open techniques are associated with significant morbidity postoperatively such as pain at rest and on movement, restricted ambulation and

other daily activities which causes delayed recovery and hospital discharge<sup>(1,2)</sup>. The pathophysiology of acute pain is explained as it is mediated by inflammatory cell infiltration, activation of spinal cord pain pathways, and also by reflex muscle spasm. All of these three mechanisms of acute pain are typically ameliorated during the postoperative recovery<sup>(3)</sup>. Regional anaesthesia techniques are mostly recommended for pain management in open Nephrectomy as they are found to decrease parenteral opioid requirements and improve patient satisfaction<sup>(4)</sup>. Postoperative analgesic methods are essential so as to avoid respiratory and thromboembolic complications in radical or partial open Nephrectomy. Postoperative pain and stress response can aggravate patients' disease, increase the incidence of complications, and prolong postoperative recovery period. A multimodal analgesic approach combining different analgesia modes with local or regional anaesthesia to maximize effectiveness is essential<sup>(5)</sup>. There are various methods for post-surgical pain management after Nephrectomy described in the literature. These methods include systemic opioid drugs, systemic nonsteroidal anti-inflammatory drugs (NSAIDs), epidural analgesia, surgical site analgesia, paravertebral block, and quadratus lumborum block<sup>(6-8)</sup>. Although epidural analgesia is the gold standard for perioperative analgesia in open surgeries,<sup>(9)</sup> anaesthesiologists are also searching for alternative analgesic modalities that have adequate analgesia and a lower complication risk. Non opioid analgesia techniques are especially important in aging populations when comorbidities are considered.

Quadratus Lumborum block (QLB), was first time described by Blanco et al ; in 2007. It is an emerging truncal block technique,<sup>(10)</sup> which includes injecting local anaesthetic (LA) into the Thoracolumbar fascia (TLF) surrounding the Quadratus lumborum (QL) muscle. The analgesic effect is achieved by the LA spreading along the TLF, into the thoracic paravertebral space and transversalis fascia. The anterior transmuscular quadratus lumborum block is a truncal block (ventral rami of T7- L2) that produces its analgesic effect by blocking the thoracic sympathetic trunk, the ventral rami of lower spinal nerves, the sympathetic fibers and mechanoreceptors within the thoracolumbar fascia, and the celiac ganglion by spread via the splanchnic nerves. It is an effective analgesic method for patients undergoing abdominal and hip surgeries<sup>(11-14)</sup>. It has been used for reducing postoperative pain after caesarean section, laprotomy, laparoscopic procedures and hip surgeries. Later, Borglum et al., 2013 used the posterior transmuscular approach by detecting Shamrock sign and LA injected at the anterior aspect of the QL (type III QLB)<sup>(15)</sup>. Blanco and McDonnell, described another approach by injecting the LA to the posterior aspect of the muscle (type II QLB)<sup>(16)</sup>. Finally, the intramuscular QLB (type IV QLB) which was performed by injecting LA directly into the QL muscle<sup>(17)</sup>. Hence we planned to study the efficacy of quadratus lumborum block in open urosurgical procedures

## 2. MATERIALS AND METHODS:

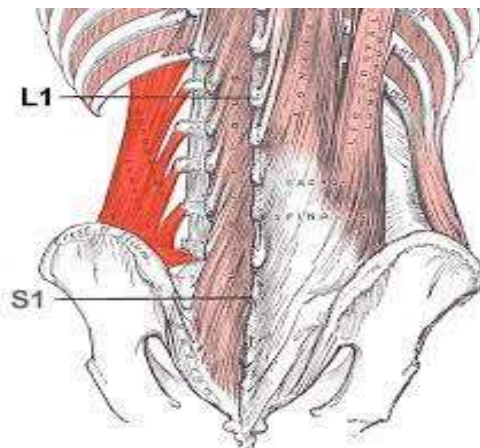
This prospective, randomised and controlled, double blinded study was carried out in the "Department of Anaesthesiology", Superspeciality Hospital; Shyam Shah Medical College & associated Sanjay Gandhi and Gandhi Memorial Hospitals, Rewa (M.P.) from January 2021 to September 2022. After getting clearance from Institutional Ethics Committee. 60 adult patients of both sex with an ASA grade I and II were included in study. Patients who refused to give consent, patients who were suffering from psychological illnesses such as language impairment, mental disease, or dementia, patients with significant systemic diseases like asthma, diabetes, hypertension, and cardiovascular disease, and patients contraindications to nerve block were excluded from study. The patients fulfilling the selection criteria were

randomized using a computer-based randomization software, in two groups of 30 patients each. A detailed history of all selected patients was taken.

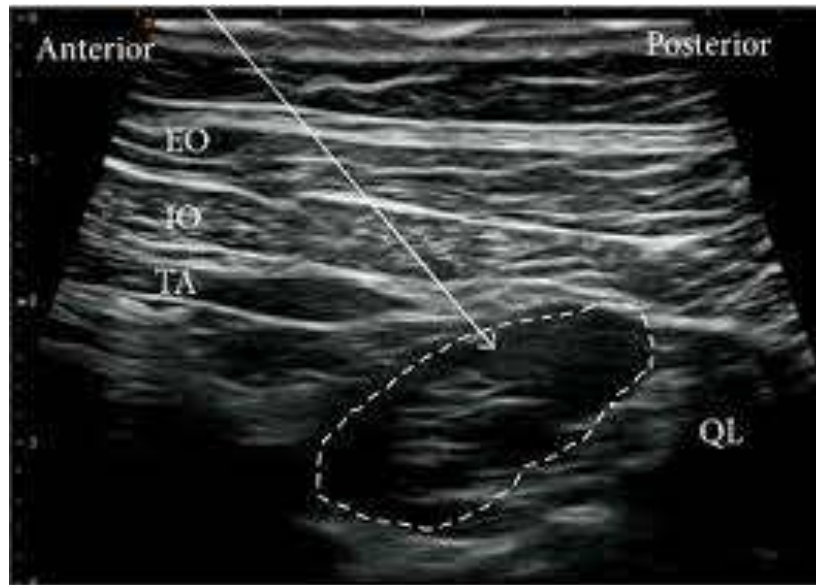
**Group Q** (n=30) received USG guided quadratuslumborum block with inj. Bupivacaine 0.25% 20ml prior to surgery after induction.

**Group C** (n=30) received standard postoperative analgesia regimen consisting of inj. Paracetamol IV 1gm and inj. Diclofenac 75mg IV

A thorough pre-anaesthetic evaluation including the airway assessment and site for block assessment was performed. A written informed consent was taken from the patients about the surgery, anaesthesia and their participation in the study. A thorough pre-anaesthetic evaluation including the airway, back of the patient and site of block assessment were performed. The patients were explained about the entire procedure, informed consent was taken, in a language of their understanding. They were also educated about the visual analogue scale (VAS) and patient's satisfaction scale. Thereafter, they were shifted to the operation theatre. Intravenous line was secured. Monitors were attached and baseline parameters viz heart rate, systolic and diastolic blood pressure, mean arterial pressure, SpO<sub>2</sub>, ECG tracings were recorded. In the operating room after routine monitoring and preoxygenation the patients received iv fentanyl (2mcg/kg), anaesthesia induced with iv propofol (1- 2.5mg/kg), succinylcholine (2mg/kg) was utilized to facilitate endotracheal intubation. Anaesthesia was maintained with nitrous oxide (70%) and isoflurane (MAC 0.8-1%) in oxygen. Following induction patients were placed in lateral decubitus position with affected side up and prepared for the administration of respective blocks under USG guidance (Mindray DC 30). In patients belonging to Group Q, depending on the chosen surgical site, patient was placed in the lateral decubitus position. Low-frequency convex probe was positioned horizontally in the anterior axillary line halfway between the subcostal margin and iliac crest, with proper sterilisation of skin and draping. The triple abdominal muscle layers were located. Following this the probe was relocated to the posterior axillary line until Quadratuslumborum muscle was visualised with its attachment to the lateral border of the transverse process of the L4 vertebra, with the psoas anteriorly, the erector spinae posteriorly, and the quadratuslumborum attached to the apex of the transverse process, a shamrock pattern with three leaves. A 22 gauge 80 mm needle was inserted in plane relative to the ultrasound probe, passing through the QL muscle in a posterior to anterior direction at the border between the QL and psoas muscles. After confirming negative aspiration, and 1ml normal saline for hydrodissection to confirm needle tip, 0.3-0.4ml/kg bupivacaine 0.25% was injected, with a maximum volume of 20ml.



**FIGURE 1: Anatomy of Quadratuslumborum muscle**



**FIGURE 2: Sonoanatomy of Quadratuslumborum block**

**FIGURE 12 : Erector spinae plane block**

Patients were moved to the post anaesthetic care facility after the surgery. A standard analgesic regimen consisting of injection Paracetamol(15mg/kg) 1gram intravenously and injection Diclofenac (75mg/ml) 1ml intravenously was given 30 minutes prior to the end of surgery. The presence and severity of pain was assessed systematically. This assessment was performed in the PACU by a trained staff nurse blinded of the procedure at 0, 1,2, 4,6, 8, 12 and 24 hours after the procedure. All patients were asked to give scores for their pain at rest. Pain severity was measured using a Visual Analogue Scale (VAS, 10 cm unmarked line which shows 0 cm = no pain and 10 cm = worst pain imaginable). If the VAS score for the patient is  $\geq 4$ , even after the administration of institutional postoperative analgesic regimen, intravenous Tramadol at an incremental dose of 2mg/kg was given as rescue analgesia. The time to first dose of rescue analgesic given was recorded. The total consumption of tramadol over 24 hrs was also noted. Each patient was also be assessed using a 5-point patient's satisfaction scale to evaluate the level of postoperative analgesic satisfaction which was classified as:.A. Highly Satisfied. B. Satisfied. C. Neither Satisfied nor Dissatisfied. D. Dissatisfied. E. Highly Dissatisfied. Any signs of local site infection, hematoma formation, local anaesthetic toxicity due to intravascular injection of anaesthetic agents (such as dizziness, tinnitus, perioral numbness and tingling, lethargy, seizures), signs of cardiac toxicity such as atrioventricular conduction block, arrhythmias, myocardial depression, and cardiac arrest were noted. The study ended 24 hours after the surgery.

**STATISTICAL ANALYSIS**

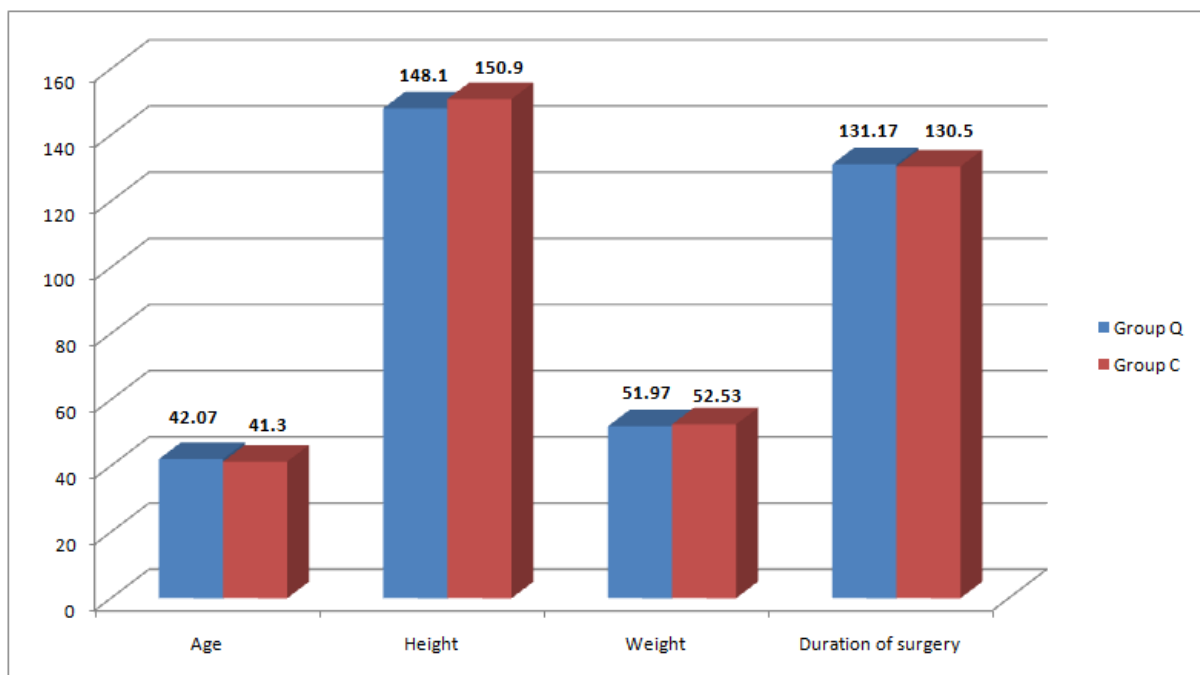
All recorded data were tabulated and statistically analysed by appropriate statistical test. The data collected was analysed, continuous variables were presented as mean with standard deviation (SD) and categorical variables were presented as frequency and percentages. Student's t-test was used for testing the significance of mean in both the groups. Qualitative data was analysed using Chi- square test. All the statistical results were considered significant at p value  $< 0.05$ .

3. RESULTS

**TABLE1:Demographic Characteristics**

Variable	Group Q	Group C	Group Q Vs. Group C
	Mean ± SD	Mean ± SD	P-value
Age	42.07 ± 16.92	41.30 ± 14.51	0.851
Height	148.10 ± 9.49	150.90 ± 7.27	0.205
Weight	51.97 ± 9.21	52.53 ± 8.34	0.804
Duration of surgery	131.17± 12.91	130.50±10.45	0.827

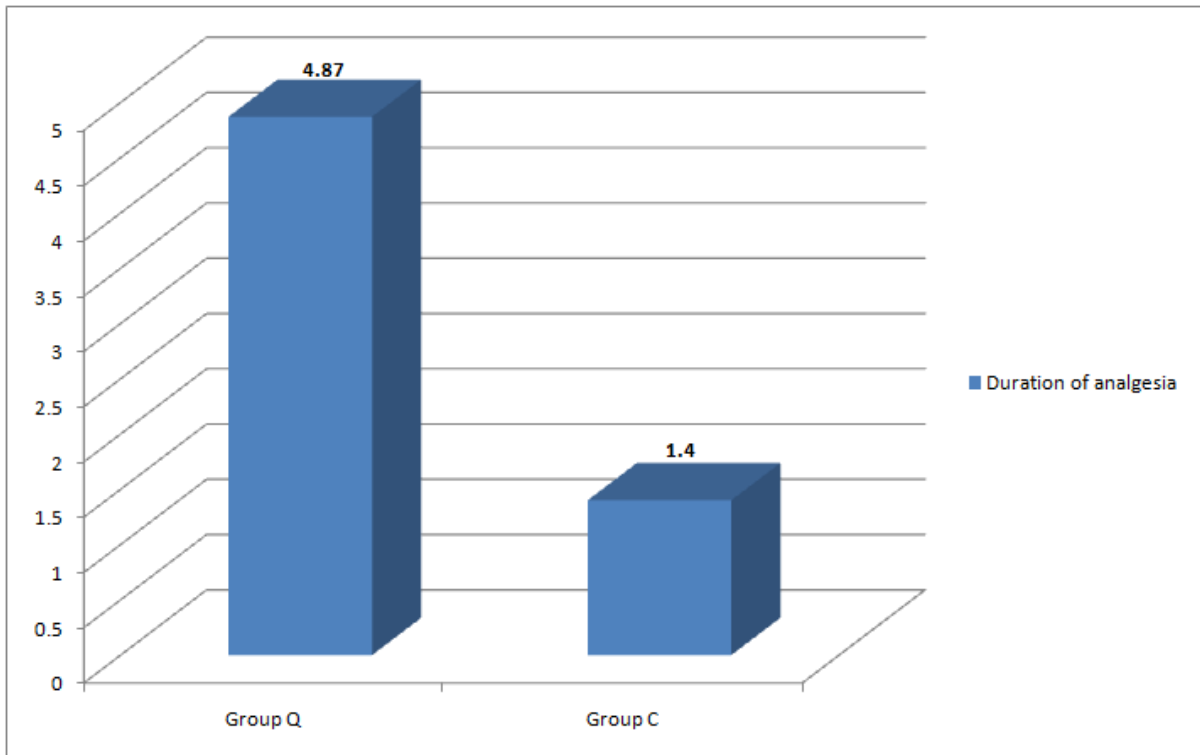
The above table 1 shows the mean age (in years), mean height (in cm), mean weight (in kg) and sex distribution and duration of surgery in both the groups.there was no significant difference in the demographic parameters and duration of surgery.



**TABLE 2:TIME OF FIRST REQUEST TO RESCUE ANALGESIC (HRS AFTER SURGERY)**

	Group Q QLB Mean±SD	Group C Control Mean±SD	P values

			<b>Group Q vs Group C</b>
<b>Duration of analgesia</b>	4.87±1.01	1.40±0.50	<0.0001

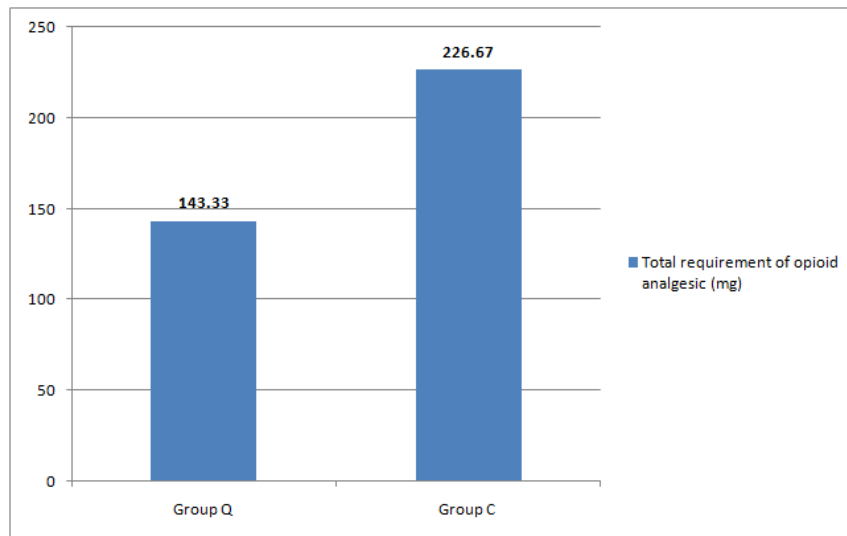


The above table 2 shows that time of first request to rescue analgesic for Group Q is (4.87±1.01), Group C (1.40±0.50) showing that there is a significant difference on comparing Group C with Group Q (p value < 0.001).

**TABLE 3: TOTAL REQUIREMENT OF TRAMADOL AS RESCUE ANALGESIC (Mg)**

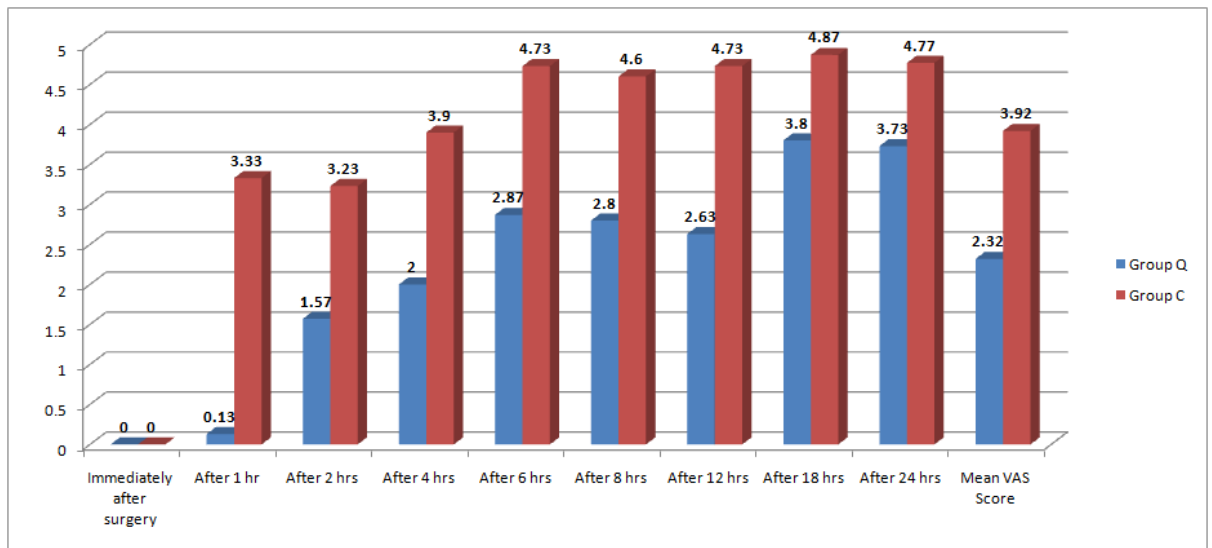
Variable	Group Q	Group C	Group Q Vs. Group C
	Mean±SD	Mean±SD	P value
<b>Total requirement of opioid analgesic (mg)</b>	143.33±62.61	226.67±63.97	<0.0001

The above table 3 shows that the total tramadol requirement in first 24hrs postoperatively was (143.33±62.61) mg in Group Q, and (226.67±63.97) mg in Group C. Tramadol requirement was higher in Group Q compared to Group C which was statistically significant, (p value < 0.0001)



**TABLE4:Post operative vas score at different time intervals**

VAS	Group Q	Group C	Group Q Vs. Group C
	Mean±SD	Mean±SD	P value
Immediately after surgery	0.00±0.00	0.00±0.00	-
After 1 hr	0.13±0.35	3.33±0.96	<0.0001
After 2 hrs	1.57±0.73	3.23±0.90	<0.0001
After 4 hrs	2.00±0.59	3.90±0.48	<0.0001
After 6 hrs	2.87±1.01	4.73±0.83	<0.0001
After 8 hrs	2.80±1.00	4.60±0.56	<0.0001
After 12 hrs	2.63±0.72	4.73±0.74	<0.0001
After 18 hrs	3.80±0.61	4.87±0.90	<0.0001
After 24 hrs	3.73±0.91	4.77±0.90	<0.0001
Mean VAS Score	2.32±1.55	3.92±1.71	<0.0001



From table 4 it is evident that VAS score was higher in group C compared to group Q at all the time intervals and difference was statistically significant. ( $p < 0.0001$ ). Also 24 hrs mean VAS score was higher in Group C.

**TABLE 5: PATIENT SATISFACTION SCORE**

Patient Satisfaction Scale		Group		Total
		Group Q	Group C	
<b>Highly Dissatisfied</b>	N	0	5	5
	%	0.0%	16.7%	5.6%
<b>Dissatisfied</b>	N	2	15	18
	%	6.7%	50.0%	20.0%
<b>Neither Dissatisfied Nor Satisfied</b>	N	5	5	13
	%	17%	16.7%	14.4%
<b>Satisfied</b>	N	9	5	28
	%	31.3%	16.6%	31.1%
<b>Highly Satisfied</b>	N	14	0	26
	%	45%	0.0%	28.9%
<b>Total</b>	N	30	30	90
	%	100.0%	100.0%	100.0%

The above table 5 shows that, percentage of highly satisfied patients was, 45% and 00% in, Group Q and Group C respectively on patient satisfaction scale. None of the patients were highly dissatisfied in Group Q as compared to Group C. The highly dissatisfied patients were 16.7% (5 patients) in Group C. The difference in the patient satisfaction score between Group C and Group Q was statistically significant ( $p$  value  $< 0.0001$ ).

#### 4. DISCUSSION

Nerve blocks are simple and effective analgesic technique which are quite in use in the modern era. Optimal dynamic analgesia is the key to enhanced recovery in such patients. In the last decade there has been a shifting trend from thoracic epidural analgesia which was



considered as the gold standard analgesic technique for long. This was due to the associated difficulty in ambulation, hypotension, excessive fluid administration and other complications of neuraxial technique.

In our study, the duration of analgesia was  $4.87 \pm 1.01$  hours in Group Q, and  $1.40 \pm 0.50$  hours in Group C (Table- 10). The difference between Group Q and Group C was found to be statistically significant ( $p$  value  $< 0.0001$ ).

Our study is in accordance with Shereen E et al;<sup>(18)</sup>(2021), they compared Quadratus lumborum for post operative analgesia in patients undergoing open Nephrectomy. They found that time for first rescue analgesia was significantly higher in Quadratus lumborum Group ( $281.2 \pm 18.5$ ) mins, compared to control group ( $60.2 \pm 8.2$ ) mins ( $p$  value  $< 0.0001$ ).

Similar results were observed by Bakshi A et al;<sup>(19)</sup>(2018), in a study on comparison of Quadratus lumborum and Erector spinae plane block for post operative analgesia in caesarean section parturients under spinal anaesthesia, the time to first rescue analgesia in group QLB was  $12.56 \pm 3.38$  hrs (95% CI :11.29,13.82) and in ESPB group was  $11.90 \pm 2.49$  hrs (95% CI:10.97,12.83)  $P=0.19$  log rank test. These results were statistically comparable, but the higher duration of analgesia can be attributed to the volume and local anaesthetic used (0.375% Ropivacaine 20 ml + 4 mg Dexamethasone both sides).

### TOTAL ANALGESIC REQUIREMENT

The total tramadol requirement in first 24 hrs. post operatively was ( $143.33 \pm 62.61$ ) mg in Group Q, ( $130 \pm 46.61$ ) mg in Group E and ( $226.67 \pm 63.97$ ) mg in Group C. Tramadol requirement was higher in group C as compared to group Q and group E which was statistically significant. ( $p$  value  $< 0.0001$ ) while between the group Q and group E difference was statistically not significant. (table 11)

Our results are in accordance with a study by Tulgar S et al;<sup>(20)</sup>(2018), in which they concluded that post operative Tramadol consumption was higher in control group ( $226 \pm 35.89$ ) mg as compared with QLB group ( $137 \pm 38.12$ ) mg with a statistically significant difference ( $p$  value  $< 0.0001$ )

Elkomy M et al ;<sup>(21)</sup>(2021), in their study found that the cumulative Morphine consumption Median (IQR) in QLB group 6(3-7) mg and in ESPB group 3(3-7) mg was comparable with no statistically significant difference between both the groups ( $p$  value-0.179). The difference in amount of rescue analgesic can be due to the different opioid being used and the surgery being performed under regional anaesthesia

In a study by Jared A et al; <sup>(22)</sup> (2020), the cumulative Morphine consumption in the QLB group was  $3.40 \pm 1.42$  mg.

In a study by R Joshi et al;<sup>(23)</sup>(2022), they concluded that the total Tramadol requirement in QLB group was  $47.32 \pm 34.9$  mg and in a study by Onay M et al;<sup>(50)</sup>(2022), The ESPB and QLB 2 groups showed similar total morphine consumption ( $20.95 \pm 12.40$  mg and  $25.05 \pm 13.60$  mg,  $p=0.870$ ) and morphine demands ( $37.85 \pm 29.43$  and  $41.15 \pm 31.75$ ,  $p=1.000$ ), respectively

### VAS SCORE (visual analogue score)

We found that the VAS score in first 24 hrs assessed at (0,1,2,4,6,8,12,24 hrs) postoperatively was higher in control group compared to QLB group and ESPB group and was statistically significant. But there was no statistically significant difference between both the study groups (Table-9). The mean VAS score at 24 hrs in QLB group was  $2.32 \pm 1.55$  and in ESPB group was  $2.23 \pm 1.52$  whereas in control group was  $3.92 \pm 1.71$  and the statistical

analysis showed significantly higher VAS score in control group when compared to both the study groups.

Our study in accordance with Shereen E et al;<sup>(24)</sup>(2021), they found that VAS score at rest and during movement in all the time intervals was higher in control group compared to interventional group. Similar results were also observed by RyungKang et al;<sup>(39)</sup>(2021), where they found that there was no significant difference in resting pain scores postoperatively between study groups.

Bakshi et al ;<sup>(19)</sup> (2018), also found that pain scores on all observation time points during rest and on movement were comparable between both the study groups.

In a study by OnayM et al;<sup>(25)</sup>(2022), they found that despite the lower VAS scores at rest and movement in the ESPB group, there were no statistically significant differences between groups.

## 5. CONCLUSION:

From our study it can be concluded that Quadratuslumborum block is an effective method for analgesia in open urosurgical procedures.

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