

## COMPARISON BETWEEN ULTRASOUND-GUIDED QUADRATUS LUMBORUM BLOCK AND TRANSVERSUS ABDOMINIS PLANE BLOCK FOR POSTOPERATIVE PAIN MANAGEMENT IN LOWER ABDOMINAL SURGERIES

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### Abstract

**Background:** Ultrasound-guided transversus abdominis plane (TAP) block has been commonly employed for pain relief in lower abdominal surgeries. We have compared the efficacy of quadratus lumborum vs transversus abdominis plane block for postoperative pain relief after lower abdominal surgeries. **Materials and Methods:** A prospective, randomized, comparative study was done on 80 patients undergoing mesh repair for bilateral inguinal hernias. A total of 80 patients was subdivided into Group 1 (Transversus Abdominis Plane Block, n=40) and group 2 (Quadratus Lumborum Block, n=40). Under strict aseptic precautions, TAP block and QL block 2 (posterior QL) were performed. We have monitored the duration of surgery, time of first analgesic requirement, and total VAS score for pain. **Result:** The duration of surgery with mean duration for both groups at 105 minutes and a p-value of 0.9581 were statistically insignificant. However, the duration of performing the TAP block was significantly less (p-value = 0.0001) than the QL block. The VAS scores for the 1st and 2nd postoperative hour were 0 for both blocks. VAS scores at post-operative hours 2, 4, and 8 were significantly less in Group 2. The total VAS score for 24 hours recorded at 0,1,2,4,6,8,12 and 24 hours of the postoperative period was significantly less for Group 2 (p value= 0.0001) than Group 1. **Conclusion:** This study concludes that the quadratus lumborum block provides a longer duration of analgesia, which is evident by the time for the requirement of first analgesia. Therefore, QL block can be adopted as an alternative technique for managing postoperative pain.

## INTRODUCTION

The use of ultrasound-guided nerve blocks has become integral to postoperative pain management in modern-day practice unless there is a contraindication. Ultrasound-guided transversus abdominis plane (TAP) block has been commonly employed for pain relief in lower abdominal surgeries.<sup>[1,2]</sup> Since transversus abdominis plane block is limited to the somatic sensory blockade, the introduction of quadratus lumborum block (QLB) has provided a different approach in terms of technique and covering both somatic as well as visceral pain. Quadratus lumborum block may provide analgesia over a longer period and more dermatomes.<sup>[3,4]</sup>

This study focuses on further understanding these two different types of blocks. The nerve plexus, muscle and fascial planes can be exactly located for drug delivery with ultrasound. It also helps visually guide the block needle to target nerves or fascial planes, thus prompting fewer attempts with a higher success rate of the block. The use of ultrasound also helps markedly reduce the volume of local anaesthetic drugs used and lowers the risk of side effects. We have compared the efficacy of quadratus lumborum vs transverse abdominis plane block for postoperative pain relief after lower abdominal surgeries.

## MATERIALS AND METHODS

It was a prospective, randomized, comparative study on 80 patients undergoing mesh repair for bilateral inguinal hernias in the Department of Anaesthesiology in tertiary care hospital. The approval of the Institutional Ethical Committee was obtained. A total of 80 patients were subdivided into two groups: Group 1- Transversus Abdominis Plane Block, n=40, and Group 2 Quadratus Lumborum Block, n=40. Written informed consent was obtained from all patients.

### Inclusion Criteria

18-40 years of age and male patients undergoing hernioplasty for bilateral inguinal hernia, ASA Grade 1,2,3 was included.

### Exclusion Criteria

Patient refusal, patients with coagulopathy, patients with local skin infections over the abdominal wall, chronic preoperative opioid consumption, allergy or contraindication to using any of the drugs, previous abdominal surgery, ASA grade 4 and 5, and psychiatric illness were excluded.

Patients were taken to the operation theatre after confirming 8 hours of preoperative fasting status and a brief preoperative review examination. The anaesthetic management of all the patients was standardized.

Standard monitors including NIBP, ECG, and Pulse Oximeter were attached and baseline vitals were recorded. I.V. line was secured with an 18G IV cannula and 0.9% normal saline was started. Spinal anaesthesia was given for all patients using 3ml of 0.5% injection of Bupivacaine with 0.5ml (50 mcg) of fentanyl.

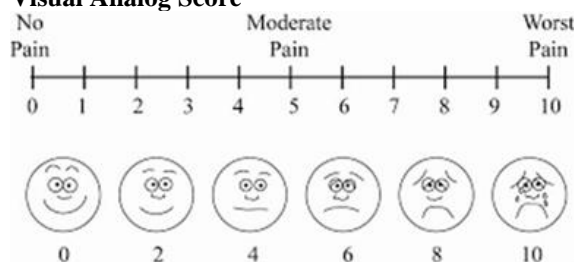
Under strict aseptic precautions, TAP block and QL block 2 (posterior QL) were performed both in the supine position at the end of surgery in their respective groups using 0.125% injection bupivacaine at 0.4ml/kg. A high-frequency linear probe was used for the TAP block, whereas a low-frequency curvilinear probe was used for the quadratus lumborum block.

Parameters monitored were the duration of surgery (surgery lasting more than 2 hours were excluded), time of requirement of the first analgesia (This also provides the duration of analgesia given by either of the two blocks) and the total VAS score for pain.

In the postoperative period, Visual Analogue Scale (VAS) was recorded at 0,1,2,4,8,12 and 24 hours of the postoperative period. A patient with a score of  $\geq 4$  out of 10 points (where 0, none; 10, very severe) was administered intramuscular Tramadol at 2mg/kg in both groups. The time of requirement of 1st dose of rescue analgesic was noted and it was taken as the duration of analgesia provided in the two blocks. The total doses of analgesic required in 24 hours

were also noted and compared between the two groups.

### Visual Analog Score



After collecting the data, all the variables are examined for outliers and non-normal distributions. The Categorical variables are expressed as Frequency and Percentage. The Quantity variables are expressed as mean and standard deviation. Descriptive statistics are used to evaluate baseline characteristics. Student's t-test was used to calculate the p-value. Discrete variables were analyzed using the Chi-Square test and Mann-Whitney U test with a  $P < 0.05$  considered statistically significant. The statistical analysis was performed using the statistical software package SPSS 20.0.

## RESULTS

The sample size for this study was 80, divided randomly into two groups: Group 1 (TAP block) and Group 2 (QL block). All the blocks performed were successful.

Demographic parameters, i.e., age and sex (only male patients were included), showed no significant differences in the two groups. The duration of surgery with mean duration for both groups at 105 minutes and a p-value of 0.9581 was statistically insignificant. However, the duration of performing the TAP block was significantly less (mean = 6.7 mins; p-value = 0.0001) than the QL block (mean = 9.45).

The VAS scores for the 1st and 2nd postoperative hour were 0 for both blocks. VAS scores at post-operative hours 2,4, and 8 were significantly less in Group 2. The total VAS score for 24 hours recorded at 0,1,2,4,6,8,12 & 24 hours of the postoperative period was significantly less for Group 2 (mean = 21.52, p value= 0.0001) compared to Group 1 (mean=26.7). Group 2 (mean=3.75; p-value = 0.0001) also showed significantly less requirement for rescue analgesia. The time for the first rescue analgesia was also found to be longer in Group 2 (mean = 5.7 hours; p-value = 0.0001). Group 1 had a mean duration of 4.55 hours. This signifies that the duration of analgesia provided by the QL block was longer [Table 1].

**Table 1: Distribution of various demographic and clinical parameters among groups 1 and 2**

Variables	Mean $\pm$ SD		p-value
	Group 1	Group 2	
Age	50.8 $\pm$ 4.63	50.4 $\pm$ 8.89	0.8014

Duration of surgery	105±8.91	105±8.04	0.9581
Duration of performing block	6.7±1.32	9.45±1.76	0.0001
VAS score at 2nd hour	1.67±0.61	0.7±0.64	0.0001
VAS score at 4th hour	4.1±1.03	2.1245±1.24	0.0001
VAS score at 6th hour	3.5±1.3	4.05±1.03	0.0458
VAS score at 8th hour	4.8±1.15	2.95±1.29	0.0001
VAS score at 12th hour	5.4±1.12	4.92±0.72	0.0253
VAS score at 24th hour	7.22±0.89	6.77±0.86	0.0241
Total VAS score	26.7±2.26	21.52±2.44	0.0001
Number of rescue analgesia	3.75±0.54	3.3±0.46	0.0001
Time for first rescue analgesia	4.55±0.904	5.7±0.96	0.0001

## DISCUSSION

Since its first description in 2007 by Blanco et al, the quadratus lumborum block has steadily gained popularity in being deployed as a technique for postoperative pain management. TAP block, on the other hand, has been relatively more established for the same purpose. However, a direct comparison between the techniques is still rare.<sup>[5]</sup>

Okusz et al,<sup>[6]</sup> compared the two blocks in children undergoing lower abdominal surgeries, concluding that the quadratus lumborum block provided longer duration and more effective analgesia than the TAP block. Murouchi et al,<sup>[7]</sup> compared the intramuscular QL block with the lateral TAP block for laparoscopic surgery. Compared to the TAP block, the QL block resulted in widespread and long-lasting analgesia after laparoscopic ovarian surgery. Blanco et al. compared spinal anaesthesia in addition to either the anterior or posterior QL block versus using only spinal anaesthesia for caesarean sections. The QL block after the caesarean section was effective and provided satisfactory analgesia in combination with a typical postoperative analgesic regimen. They also compared the posterior QL block with the TAP block, where the posterior QL block was found more effective in reducing morphine consumption and demands than the TAP block.<sup>[5]</sup>

Quadratus lumborum block is a fascial plane block and does not target a single nerve. The posterior QL block we used in this study can cover dermatomes from T7 to L1 (some studies suggest even up to T4). A New York Society of Regional Anaesthesia study suggested that QL block provides somatic and visceral pain analgesia. In contrast, the effect of TAP block is limited to bodily pain. Although the spread of local anaesthetic drugs in QL block is still controversial, the thoracolumbar fascia is believed to play an important role. The thoracolumbar fascia consists of 3 layers. The anterior layer is anterior to the quadratus lumborum muscle. The middle layer lies between the erector spinae and the quadratus lumborum muscle. The posterior layer encases the erector spinae. The anterior layer also blends medially with the fascia of the psoas major and laterally with the transversalis fascia. Injection between the anterior layer and quadratus lumborum can spread cranially under the lateral arcuate ligament to the endothoracic fascia and reach the

lower thoracic paravertebral space posterior to the endothoracic fascia. A triangular structure called the lumbar interfascial triangle (LIFT) is the injection target for the QL2 block (quadratus lumborum 2). Besides serving as a portal for the spread of local anaesthetic to the thoracic paravertebral space, the fascia also contains a dense network of sympathetic fibres and mechanoreceptors that contribute to the effects of the quadratus lumborum block.<sup>[8-11]</sup>

## CONCLUSION

This study concludes that the quadratus lumborum block provides a longer duration of analgesia which is evident by the time for the requirement of first analgesia. The significant reduction in total VAS score (for 24 hours) and number of rescue analgesia for QL block compared to TAP block also suggests that QL block affords a better quality of analgesia. Therefore QL block can be adopted as an alternative technique for managing postoperative pain.

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