

Comparison of ultrasound-guided transversus abdominis plane (TAP) block and quadratus lumborum (QL) block in inguinal hernia surgery

INTRODUCTION

Inguinal hernia repair is a common surgical procedure, but it is often accompanied by acute to chronic postoperative discomfort. Pain relief is not just a humanitarian priority, but it is also a vital tool for reducing morbidity and mortality.

Postoperative pain is associated with many negative outcomes like fear, anxiety, patient discomfort, cardiovascular events, pulmonary atelectasis, poor wound healing and ventilation problems which can lead to postoperative complications, delayed rehabilitation and a reduced level of function and quality of life.^[1]

The main goal in postoperative pain management is to keep drug doses as low as possible to reduce adverse effects. The transversus abdominis plane (TAP) and quadratus lumborum (QL) blocks are two relatively novel regional anaesthesia techniques that provide analgesia in various abdominal surgeries to the parietal peritoneum and muscles of the lower abdominal wall and can form a part of the multimodal analgesic approach leading to a quick recovery.^[2]

Ultrasonography has gained popularity among anaesthesiologists, especially for performing regional anaesthesia.^[3] Regional nerve blocks are now much easier to perform mainly because of ultrasonographic guidance.^[4] Conventional approaches to the classical type of TAP block can create satisfactory somatic analgesia with no blockade of visceral pain.^[5] The QL block is a new abdominal wall block technique that provides good post-operative analgesia. A more posterior technique, in which the local anaesthetic is administered adjacent to the QL muscle, has been found to produce deeper blockade and hence better analgesia.^[6] Keeping this in mind, we conducted the study with the primary objective of determining the duration of postoperative analgesia using the visual analogue scale (VAS) score and total doses of rescue analgesia. Our secondary objectives were to note

the haemodynamic changes, sedation score, patient satisfaction score, surgeon satisfaction score and drug side effects.

METHODS

This prospective, randomised study was undertaken in a tertiary care hospital after receiving approval from the Institutional Ethics Committee (IEC) with the goal of determining the duration of postoperative analgesia using the VAS score. To participate in the study, written informed consent was obtained from the patients, and randomisation was done using computer-generated random numbers. The procedure was carried out by anaesthesiologists having experience in ultrasound-guided regional anaesthesia. The study included male patients between the age of 18 to 60 years who were undergoing elective inguinal hernia repair procedures and had an American Society of Anesthesiologists (ASA) physical status I or II. Those with an allergy to the study drug, infection at the operation site, neurological and coagulation diseases as well as those who refused to participate were excluded. The study was conducted from March 2021 to August 2021.

The primary outcome was calculated on the basis of duration of analgesia using the VAS score, keeping in view at most 5% risk, with minimum 85% power and 5% significance level (significant at 95% confidence interval) ($\alpha = 0.05, \beta = 0.85$) for comparison of quantitative and continuous data. A minimum of 30 male patients in each group with a total of 60 patients were included in this study.

The study participants were clinically assessed, evaluated and investigated according to the standard hospital protocol and proforma. Prior to surgery, all the patients were explained how to use the VAS to rate their pain.

When the patient entered the operating room, his consent and fasting status was checked. The minimum mandatory monitors were attached. An intravenous (I.V.) line was secured and preloading was done with I.V. fluids. The patient was placed on his side in the lateral decubitus position. Strict aseptic measures were taken. A Quincke needle of 25G was introduced in L2-3 or L3-4 subarachnoid space using the midline approach and 3 mL of 0.5% heavy bupivacaine was injected. Surgery was allowed to be performed after an adequate level of analgesia

was obtained. After two-segment regression occurred at the end of surgery, patients were randomly divided into two groups of 30 each to receive either TAP block or QL block.

For the TAP block, strict aseptic measures were taken, and with the patients in the supine position, a linear transducer of 5–12 MHz was placed in the axial plane on the midaxillary line between the subcostal margin and the iliac crest by the anaesthesiologist. The three layers of abdominal wall muscles were visualised: external oblique, internal oblique and transversus abdominis muscle. After identifying the TAP, the B Braun stimuplex needle was guided through the subcutaneous tissue, external oblique and internal oblique. When the needle reached the plane between the internal oblique and the transversus abdominis, a “pop” was felt. The location of the needle was verified and a 20-mL syringe filled with the study drug (10 ml of ropivacaine 0.75%) was diluted with 10 mL of normal saline, and dexmedetomidine 1 µg/kg was injected in this plane after careful aspiration to exclude vascular puncture.

Similarly, for the QL block, after taking strict aseptic measures, with the patients in the lateral decubitus position, a linear transducer of the same frequency was placed between the iliac crest and costal margin. The external oblique, internal oblique and transversus abdominis muscles were identified, the probe was moved posteriorly and fixed to the area of the triangle of Petit until the identification of QL muscle was confirmed. Upon identifying the QL muscle with the ultrasound probe, the patient’s skin was penetrated with the B Braun stimuplex needle using an in-plane technique. The needle tip was advanced at the anterolateral border of the QL muscle. The same amount and concentration of the study drug were injected between the QL muscle and the thoracolumbar fascia.

VAS scores were assessed postoperatively at every 1-h interval for the first 4 hours, then 2 hourly for the next 6 hours and then 4 hourly till 24 hours. When the VAS score was >3, rescue analgesia in the form of intramuscular diclofenac sodium 75 mg was given. Time to first rescue analgesia and total doses of rescue analgesic were noted over 24 hours. Injection tramadol 100 mg was administered if the patient still felt pain after the diclofenac injection.

Raw data were recorded in a Microsoft Excel spreadsheet and analysed using Statistical Package

for Social Sciences (SPSS version 24.00 Armonk, NY: International Business Machines Corp.). The continuous variables were expressed as mean with standard deviation (mean ± SD). Numbers and percentages were used to express all categorical variables. The Chi-square test was used to examine categorical variables. The independent sample *t*-test was used to examine normally distributed continuous data. Finally, the *P* value was calculated to determine the significance levels. A *P* value of >0.05 was considered non-significant, a *P* value of 0.01 to 0.05 was considered to be significant and a *P* value <0.001 was considered as highly significant. The results were then analysed and compared with the previous studies.

RESULTS

All the 60 patients randomised were included and analysed for the study [Figure 1]. The demographic data were comparable between the two groups in terms of age, ASA grade, weight and duration of surgery as well as heart rate, blood pressure and oxygen saturation.

The time to first rescue analgesia was longer in the QL group which was demanded at 10.20 ± 2.11 hours as compared to the TAP group in which the first rescue analgesia was given at 6.45 ± 1.58 hours. The difference in the two groups was found to be statistically significant ($P < 0.001$) [Figure 2].

The VAS score for both the groups showed a significant difference at the 6th, 10th, and 16th postoperative hours ($P < 0.001$) [Table 1].

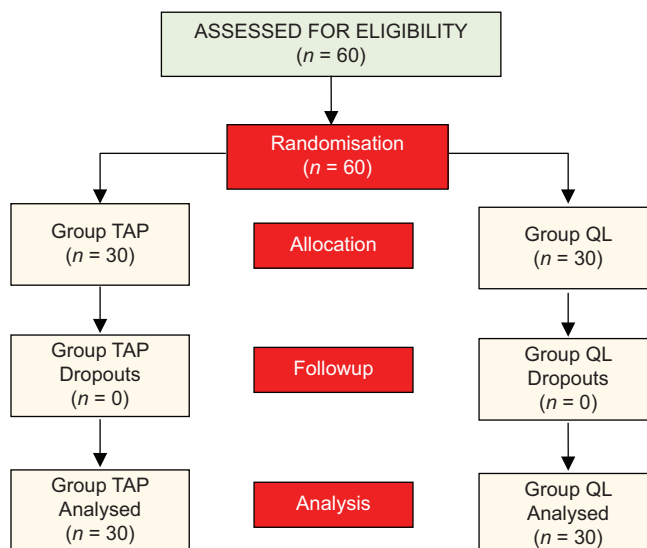


Figure 1: Consolidated standards of Reporting Trials (CONSORT) diagram. n: Number of patients

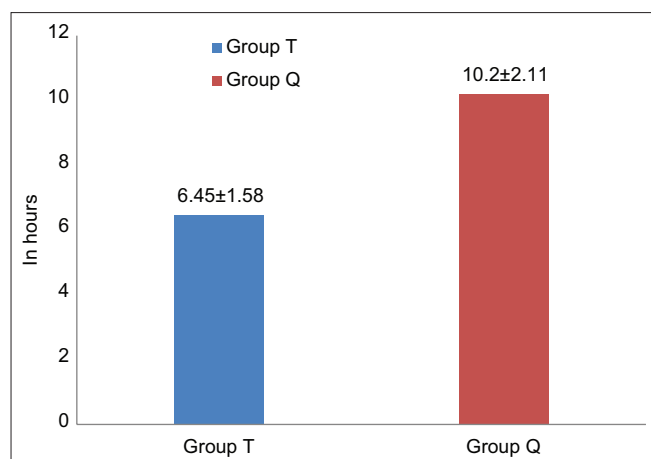


Figure 2: Mean duration of analgesia (hours) (Mean \pm standard deviation)

The mean dose of rescue analgesia in 24 hours was 0.98 ± 0.12 in TAP as compared to 0.72 ± 0.19 in QL group which was found to be statistically significant ($P < 0.001$).

The mean heart rate, respiratory rate, blood pressure, sedation score, surgeon satisfaction score and patient satisfaction scores were statistically non-significant ($P > 0.05$) in both the groups. We did not observe any procedural complications or adverse effects of any drug in both the groups.

DISCUSSION

The present study was conducted to compare the analgesic efficacy of the ultrasound-guided TAP block and QL block for postoperative analgesia in inguinal hernia surgeries. At 6 hours, the VAS score in group TAP was highly significant, so rescue analgesia was given much earlier in TAP group as compared to QL group, in which it was given at 10 hours ($P < 0.001$). Similar findings were observed in a study comparing the TAP and QL blocks for postoperative analgesia in lower abdominal surgeries.^[7] In a study comparing TAP with the QL block in total abdominal hysterectomy, it was found that the duration of postoperative analgesia was longer in the QL group than in the TAP group.^[8] The VAS scores in our study were in line with the results recorded by Verma K *et al.* and Okur O *et al.*^[9,10] Haemodynamic parameters and post-operative side effects did not show any significant differences between the two groups in our study.

CONCLUSION

We conclude on the basis of our study findings that the QL block is superior to the TAP block in terms

Table 1: Comparison of Visual Analogue Scale (VAS) scores						
Time interval (hours)	GROUP TAP		GROUP QL		t	P
	Mean	SD	Mean	SD		
0 h	0.40	0.50	0.33	0.48	0.49	0.30
1 h	0.30	0.47	0.20	0.41	0.90	0.19
2 h	0.43	0.50	0.40	0.56	0.24	0.40
3 h	0.70	0.75	0.87	0.49	-1.76	0.15
4 h	1.60	0.81	1.43	0.57	0.90	0.18
6 h	3.54	0.94	2.07	0.69	4.71	0.00
8 h	2.83	0.75	2.50	0.82	-2.94	0.10
10 h	1.83	1.12	3.21	0.71	-3.28	0.00
12 h	2.30	1.02	2.60	0.72	-1.27	0.10
16 h	3.43	1.33	2.23	0.82	2.73	0.00
20 h	1.60	1.00	1.93	2.18	-0.80	0.22
24 h	0.83	0.87	1.13	0.67	-1.56	0.08

$P > 0.05$: non-significant; () ($P < 0.05$): significant; $P < 0.001$: highly significant)

of better pain control because of longer duration of analgesia, demand for the first rescue analgesia and total consumption of rescue analgesia. It encourages early ambulation and less hospital stay without any significant side effects.

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