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Original Article

Anaesthesia Section

Posterior Quadratus Lumborum Block versus Transversus Abdominis Plane Block with Bupivacaine and Dexmedetomidine for Postoperative Analgesia following Caesarean Delivery: A Randomised Clinical Study

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ABSTRACT

Introduction: Pain management after caesarean delivery is vital for the early recovery of the mother. In the absence of long-acting opioids, fascial plane blocks such as the Quadratus Lumborum Block (QLB) and Transversus Abdominis Plane (TAP) block significantly prolong the duration of analgesia and increase maternal comfort.

Aim: To compare the number of rescue analgesic boluses required in the 24-hour postoperative period between the QLB and TAP block groups.

Materials and Methods: This study was a prospective, single-blind, randomised clinical trail conducted in the Department of Anaesthesiology at a teritary care teaching Hospital, Chennai, Tamil Nadu from March 2021 to March 2022 on 94 patients (47 in each group) scheduled for elective Lower Segment Caesarean Section (LSCS) and were randomised into two groups: Group T and Group Q. Patients in Group T received a TAP block, while patients in Group Q received a QLB. The primary outcome assessed was the number of rescue analgesic boluses used in 24 hours. Secondary outcomes assessed included the time to initial onset of pain, time to the first request for analgesia, total amount of rescue analgesic consumption for 24 hours, and postoperative pain scores. The Chi-square test and Fisher-Freeman-Halton Exact test were utilised to compare the categorical variables.

Results: Mean rescue bolus doses were significantly lower in Group Q (1.0±0.6 doses) compared to Group T (2.5±0.6 doses) ($p<0.01$). Total rescue analgesic consumption in Group Q (51 mg) was significantly lower than in Group T (127 mg) ($p<0.01$). The time to the initial onset of pain and time to the first rescue analgesia were significantly longer in Group Q (17.9 hours and 18.2 hours, respectively) than in Group T (11.9 hours and 12.2 hours, respectively) ($p<0.01$). Lower pain scores were noted from 12 hours to 24 hours in Group Q compared to Group T.

Conclusion: The QLB with dexmedetomidine reduces the number of rescue boluses in 24 hours and decreases rescue analgesic consumption. The QLB also prolongs the initial onset of pain and the time to the first rescue analgesic, with lower pain scores from 12 to 24 hours compared to the TAP block group.

Keywords: Caesarean section, Pain scores, Postoperative pain, Rescue analgesia

INTRODUCTION

Pain management is critical during caesarean deliveries. Inadequate pain treatment during the perioperative phase can result in delayed recovery and hinder the ability to resume daily functional activities, as well as increase the risk of thromboembolic complications, breastfeeding difficulties, poor mother-child attachment, and postpartum depression [1]. Traditionally, postoperative pain is managed with intravenous opioids like tramadol and Non steroidal Anti-Inflammatory medications (NSAIDs) such as acetaminophen and ketorolac. Although other methods, such as epidurals, have been utilised to ease postoperative pain in patients undergoing caesarean deliveries, there is an increased chance of epidural haematoma in pregnant patients compared to the general population due to increased blood volume and engorged veins in the epidural space [2].

Patient Controlled Analgesia (PCA) is more effective than standard pain management approaches. Although PCA has higher patient satisfaction, opioids have been found to increase the risk of postoperative nausea, vomiting, and drowsiness [3]. Multimodal Analgesia (MMA) is the standard of care for postoperative pain management, with the goal of optimising analgesia, avoiding side effects, and reducing opioid use [4]. Ultrasound-guided (USG) regional anaesthesia has proven increasingly beneficial in recent years due to its accurate deposition of local anaesthetic, rapid action, low complication rates, and high success rates [5]. In obstetric anaesthesia, truncal blocks such as the TAP and QLB are increasingly employed to enhance analgesic outcomes while avoiding long-acting neuraxial opioids like morphine [6].

Prior research has demonstrated that incorporating dexmedetomidine into fascial plane blocks can significantly prolong the duration of pain relief [7]. There are few studies in the literature that compare QLB to TAP blocks in postoperative caesarean analgesia [8,9]. However, there is a lack of studies comparing bupivacaine with dexmedetomidine in QL and TAP blocks; hence, the present study was designed to compare bupivacaine with dexmedetomidine in QL and TAP blocks [10,11]. The primary objective of present study was to determine the number of rescue analgesic boluses needed by both groups within 24 hours following surgery. Secondary outcomes included the time to initial rescue analgesia, the duration of analgesia, the total amount of rescue analgesic consumed, and the postoperative pain score. Authors also compared haemodynamic changes in Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Heart Rate (HR), and Oxygen Saturation (SpO_2) between the two groups.

MATERIALS AND METHODS

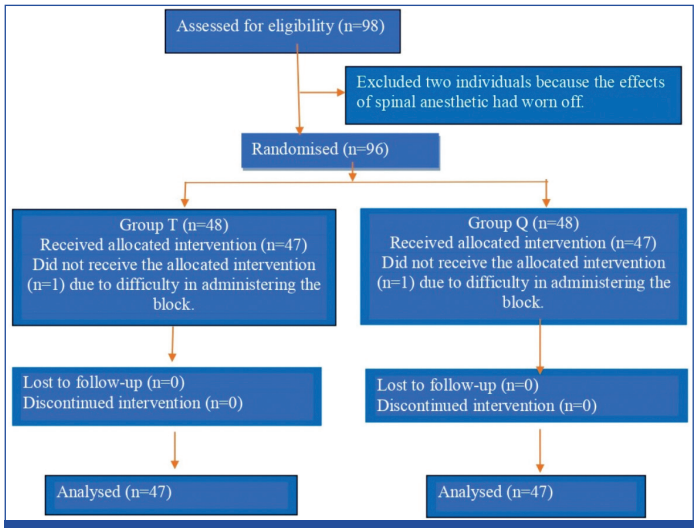
This study was a prospective, single-blind, randomised clinical trial conducted in a tertiary care teaching Hospital in the Department of

Anaesthesiology in Chennai, Tamil Nadu, India, from March 2021 to March 2022. The Institutional Ethics Committee (IEC/20/OCT/159/44) and the Clinical Trial Registry of India (CTRI/2021/01/030289) approved the present study.

Inclusion criteria: In present study, parturients aged between 18 and 40 years with a singleton pregnancy, having a gestational age of at least 37 weeks, who were undergoing LSCS under subarachnoid block were included. All study participants received information about the procedure, and written consent was obtained before the start of the study.

Exclusion criteria: Patients who refused consent, those who had an emergency LSCS, individuals with allergies to the study drugs, anatomical abnormalities at the block site, and any signs of wound or infection at the block site were excluded from the study. Additionally, patients with a spinal level below T10 at the beginning of the block were excluded from participating in the study.

Sample size calculation: The sample size was calculated using N Master software and was based on a pilot study that indicated a 25% increased requirement for the number of tramadol boluses in the TAP block group compared to the QLB group, with a power of 80% and an alpha error of 5%. The calculated sample size was 86 (43 in each group), and considering a potential dropout rate of 10% during the trial, we included 94 patients in this study. The study comprised 47 patients in the TAP block group (Group T) and 47 patients in the QLB group (Group Q), who were randomly assigned to receive the allocated intervention [Table/Fig-1]. The TAP block group received 25 mL of 0.125% bupivacaine combined with 0.5 mcg/kg of dexmedetomidine on one side, with an identical dosage administered on the contralateral side. The QLB group received 25 mL of 0.125% bupivacaine with 0.5 mcg/kg of dexmedetomidine on one side, followed by the same dosage on the opposite side. The total dose administered in the TAP or QLBs was 50 mL of 0.125% bupivacaine with 1 mcg/kg of dexmedetomidine.



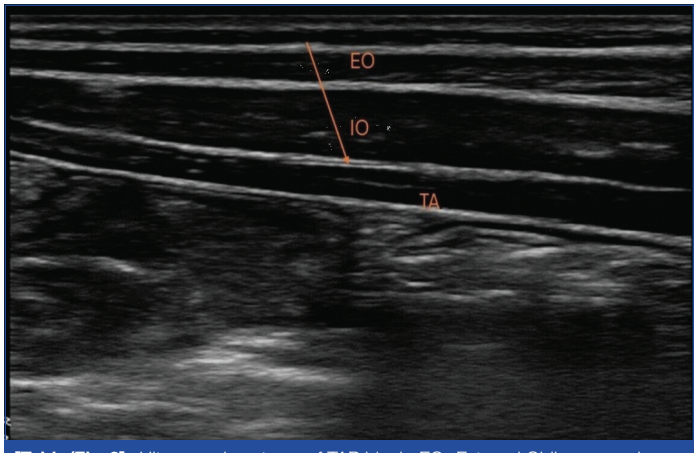
[Table/Fig-1]: Consolidated Standards of Reporting Trials (CONSORT) flow chart.

Study Procedure

In present study, a total of 98 patients were screened; two were deemed ineligible and eliminated from the study. The remaining 96 patients were randomly assigned to either Group T or Group Q. One patient in each group was excluded after randomisation due to difficulty in administering the block [Table/Fig-1]. Patients in Group T received a TAP block on both sides under USG, while participants in Group Q received a bilateral USG QLB. All study participants were randomised using computer-generated block randomisation. The concealment of the allocation sequence was done using the sealed envelope technique. All outcome assessors were blinded to the type of block received. Group allocation was blinded to the Anaesthesiologists in the Post-anaesthesia Care Unit (PACU) and the nurses involved in postoperative care and pain score assessment.

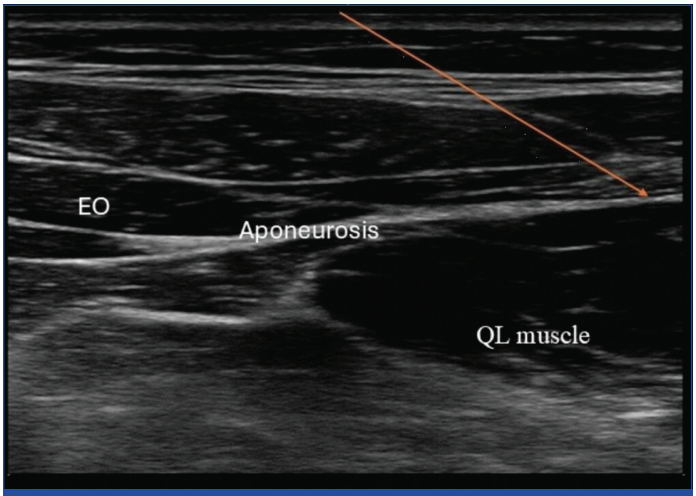
According to Institutional protocol, all study participants received intravenous (i.v.) pantoprazole 40 mg and i.v. metoclopramide 10 mg, 30 minutes before elective LSCS. Before the surgical procedure, all study participants were transported to the operating room, and initial monitoring tools such as pulse oximetry, electrocardiography, and non invasive blood pressure were connected. Oxygen was administered via a Hudson mask at a flow rate of six liters per minute. All patients received spinal anaesthesia while sitting, using a 27G Pencan needle inserted at the L3-L4 interspace. Total 10 mg of 0.5% heavy bupivacaine was administered. Subsequently, the parturients were transferred to a supine position with a 15-degree elevation of the right gluteal region. Intravenous fluids such as crystalloids, intravenous ephedrine, and phenylephrine were given to treat hypotension according to the underlying clinical situation. An intravenous phenylephrine bolus of 20-40 mcg was administered for hypotension when the HR was above 60 beats per minute. Intravenous ephedrine 6 mg was given when the HR was below 60. A LSCS was conducted using a Pfannenstiel incision following a T6 sensory block, which was evaluated based on the absence of cold sensation.

Following cord clamping, all patients received three units of oxytocin as a bolus, followed by eight units per hour as an infusion for two hours, according to Institutional protocol. After the completion of surgery, the sealed envelope was opened by anaesthesiologists not participating in the study, and the study drug was prepared according to the allocation sequence. The present study drug was handed over to the consultant anaesthesiologists performing the block, and all blocks were performed by three senior anaesthesiologists who had more than 10 years of experience in USG nerve blocks or fascial plane blocks. The TAP block or QLB was conducted after the completion of the surgical procedure in the operating room under USG, depending on the allocation. Patients assigned to the TAP block group were positioned in a supine position with a lateral tilt of 30 degrees. The bedside USG machine's linear transducer (HFL 38 x/13-6 MHz) (Sonosite R ultrasound system, Sonosite INC, Bothell, WA, USA) was positioned on the lateral abdominal wall, specifically between the iliac crest and lower costal margin in the mid-axillary line. The abdominal wall was visualised by aligning the external oblique, internal oblique, and transversus abdominis muscles in a linear fashion. The needle was introduced using an in-plane technique until it reached the fascial plane located between the internal oblique and transversus abdominis muscles [Table/Fig-2]. The needle location was verified through negative aspiration upon reaching the plane, and a dosage of 25 mL of 0.125% bupivacaine and 0.5 mcg/kg dexmedetomidine was delivered [8,9]. A similar technique was used on the contralateral side. Patients assigned to receive a QLB were positioned laterally, and a linear USG probe was placed on the patient's flank above the iliac crest. The probe was positioned near



[Table/Fig-2]: Ultrasound anatomy of TAP block. EO- External Oblique muscle, IO- Internal Oblique muscle. TA is Transverse Abdominis muscle. Arrow indicates site of drug deposition in TAP block.

the umbilicus, and the muscular layers of the abdominal wall were identified. To visualise the aponeurosis of the transversus abdominis muscle, the transducer was repositioned posteriorly. Subsequently, the lumbar interfascial triangle was located, enveloping the paraspinal muscle in a posterior direction. Under USG, the needle was advanced in an anteroposterior direction through the muscle layers of the abdominal wall. The needle tip was inserted into the transversus aponeurosis, specifically between the QL muscle and the paraspinal muscle [Table/Fig-3]. Following confirmation of the needle location through negative aspiration, a dosage of 25 mL of 0.125% bupivacaine and 0.5 mcg/kg dexmedetomidine was delivered. A similar procedure was performed on the other side. The total dose of bupivacaine for all patients did not exceed 2 mg/kg body weight in both the TAP and QLB groups. Patients were then moved to the PACU after surgery and fascial plane block.



[Table/Fig-3]: Showing ultrasound anatomy of QL block. EO is External Oblique muscle, QL is Quadratus Llumborum muscle. Arrow indicates siteo of drug deposition.

Over a 2-hour period, the HR, non invasive blood pressure, SpO_2, and pain score were measured using a Visual Analogue Scale (VAS) in the PACU. After two hours, all patients were relocated to the postoperative ward, where their vital signs, including systolic and DBPs, HR, SpO_2 levels, and pain intensity were assessed using the VAS score. All study participants were given 1 g of intravenous paracetamol every eight hours according to our protocol. A VAS score of 0 indicated no pain, while a score of 10 indicated the most severe pain. The time to the initial analgesic requirement was noted and defined as the time from the completion of block delivery (denoted as 'Time 0') to the time of the first rescue analgesic administration. The rescue analgesic i.v. tramadol 50 mg, was provided when the VAS score was equal to or greater than 4. The primary outcome was the total number of tramadol bolus doses required within the first 24 hours following the procedure. The secondary outcomes included the time to the initial onset of pain (VAS ≥4), postoperative pain scores, the time to the first rescue analgesic requirement, and postoperative rescue analgesic consumption for 24 hours. The time to the first rescue analgesia was defined as the time between block administration and the first administration of tramadol as a rescue analgesic for postoperative pain.

STATISTICAL ANALYSIS

The gathered data were analysed using version 23.0 of the Statistical Package for the Social Sciences (SPSS) developed by International Business Machines Corporation (IBM), the gathered data were analysed. The demographic characteristics of the study participants were used to categorise them into two groups. Data were presented in the form of absolute numbers, percentages, means, standard deviations, and medians with interquartile ranges. The ordinal scale known as the VAS was employed to compare pain assessments between the two groups. Normal distribution was assessed using the Shapiro-Wilk test. An independent t-test was used to compare the means of two sets of normally distributed continuous data. Non normally distributed continuous variables were compared between groups using the Mann's-Whitney U test. A non parametric test called the χ^2 (Chi-square) test and Fisher-Freeman-Halton Exact test were utilised to compare categorical variables. Statistical significance was considered at a probability value of ≤0.05 for each of the statistical tests mentioned above.

RESULTS

In present study, both groups were comparable in demographic characteristics such as age, BMI, and surgical duration [Table/Fig-4]. The mean total number of rescue analgesic doses needed in Group Q was (1 dose), which was comparatively lower than in Group T (2.5 doses) (p<0.01) [Table/Fig-5]. The mean total amount of rescue analgesic tramadol consumption was significantly higher in the TAP block group (127.6±30.9 mg) than in the QLB group (51.06±32.1 mg) (p<0.01) [Table/Fig-5]. The duration of effective analgesia was observed to last longer in the group that received a QLB (17.9 hours) compared to the group that received a TAP block (11.9 hours) (p<0.01) [Table/Fig-5]. Specifically, Group T required its initial rescue analgesic dose 12.2 hours after block administration, whereas Group Q required it 18.2 hours (p<0.01). Group T predominantly required three analgesic doses for 26 patients (55.3%) in total, while Group Q predominantly required one rescue analgesic dose for 31 patients (65.95%) [Table/Fig-6]. Postoperatively, the QL group had a substantially lower demand for analgesics than the TAP block group (p<0.01) [Table/Fig-6]. Both groups had comparable VAS scores up to 12 hours. From 12 to 24 hours, Group Q had significantly lower median VAS scores compared to Group T, and this difference was statistically significant (p<0.01) [Table/Fig-7]. The present study found that the average HR was considerably lower in the QLB group compared to the TAP block group from four hours to 24 hours [Table/Fig-8]. There was a significant decrease in average SBP from one hour to 24 hours in the QLB group compared to the TAP block group [Table/Fig-9]. The study found that the average DBPs were considerably lower in the QLB group compared to the TAP block group between two and 24 hours [Table/Fig-10]. There was no significant difference in SPO_2 between both groups throughout the study period [Table/Fig-11].

Parameters	Group T	Group Q	p-value
Age in years Mean±(SD)	29.09±4.9	28.3±3.4	0.39
BMI (kg/m^2) Mean±(SD)	28.7±1.9	28.8±3.3	0.89
Surgery duration in min Mean±(SD)	117.2±5.7	119.2±5.1	0.07

[Table/Fig-4]: Comparison of demographic characters between both groups. Unpaired t-test was used to compare difference between both groups

Parameters	Group T (mean±SD)	Group Q (mean±SD)	Mean difference 95% CI	Effect size	t-value	p-value
Mean total number of analgesic doses required	2.5±0.6	1.0±0.6	1.5 (1.25-1.75)	2.4 α	11.7	<0.01*
Total amount of mean rescue analgesic consumption in mg	127.6±30.9	51.06±32.1	76.6 (63.6-89.5)	2.4 α	11.7	<0.01*
Mean time to initial onset of pain in hour	11.9±2.7	17.9±4.4	-6 (-7.5--4.5)	1.6 α	-7.8	<0.01*
Mean time to first rescue analgesia in hour	12.2±2.6	18.2±4.3	-6 (-7.4 --4.6)	1.6 α	-8.1	<0.01*

[Table/Fig-5]: Comparison of postoperative data between both groups. An unpaired t-test was used to compare the differences between both groups; *Indicates a significant difference between both groups; α Indicates effect size is larger and more than 0.8

Dose-number of patients	Group T (n=47%)	Group Q (n=47%)	p-value
0 dose- Number of patients- 8	0	8 (100%)	<0.01*
1 dose- 33	2 (93.9%)	31 (6.1%)	<0.01*
2 doses- 25	18 (72%)	7 (28%)	<0.01*
3 doses- 27	26 (96.3%)	1 (3.7%)	<0.01*
4 doses- 1	1 (100%)	0	<0.01*

[Table/Fig-6]: Comparison of number of analgesic doses between the groups.
The Fisher-Freeman-Halton Exact test was used to compare the differences between both groups; *Indicates a significant difference between both groups

Time interval	Group T	Group Q	p-value
Baseline-Median (IQR)	0 (1-0)	0 (1-0)	0.86
30 min- Median (IQR)	0 (0-0)	0 (0-0)	0.84
1 hour- Median (IQR)	0 (0-0)	0 (0-0)	0.81
2 hour- Median (IQR)	0 (0-0)	0 (0-0)	0.92
4 hour- Median (IQR)	0 (0-0)	0 (0-0)	0.70
8 hour- Median (IQR)	0 (0-0)	0 (0-1)	0.81
12 hour- Median (IQR)	2 (4-0)	0 (1-0)	<0.01*
16 hour- Median (IQR)	4 (4-4)	1 (1-0)	<0.01*
20 hour- Median (IQR)	4 (4-4)	1 (1-0)	<0.01*
24 hour- Median (IQR)	4 (4-2)	1 (2-1)	<0.01*

[Table/Fig-7]: Comparison of pain scores between both groups.
Mann's-Whitney U test used to compare between both the groups; *Indicates a significant difference between both groups

Time interval	Heart rate in beats per min		Mean difference (95% confidence interval of difference)	p-value
	Group T (n=47) (Mean±SD)	Group Q (n=47) (Mean±SD)		
Baseline	82.3±6.4	84.1±7.9	1.8 (-4.7 1.1)	0.22
30 min	79.9±6.9	81.2±7.5	1.3 (-4.25 1.65)	0.38
1 hour	76.6±4.9	77.1±8.5	0.5 (-3.3 2.3)	0.69
2 hours	75.7±4.9	76.2±6.9	0.5 (-2.9 1.9)	0.68
4 hours	78.1±5.5	75.3±7.2	2.8 (0.17 5.4)	0.04*
8 hours	77.2±5.8	73.6±7.0	3.6 (0.9 6.2)	<0.01*
12 hours	82.9±7.8	72.4±5.8	10.5 (7.6 13.3)	<0.01*
16 hours	91.3±4.6	72.7±6.9	15.3 (16.1 21)	<0.01*
20 hours	89.5±4.0	74.1±10.2	15.4 (12.2 18.5)	<0.01*
24 hours	87.3±4.8	74.2±10.1	13.1 (9.8 16.3)	<0.01*

[Table/Fig-8]: Heart Rate (HR) comparison between both groups.
An unpaired t-test was used to compare the differences between both groups; *Indicates a significant difference between both groups

Time interval	Mean Systolic Blood Pressure (SBP) in mmHg		Mean difference (95% confidence interval of difference)	p-value
	Group T (n=47) (Mean±SD)	Group Q (n=47) (Mean±SD)		
Base line	114.3±5.4	114.7±9.2	0.4 (-3.4 2.6)	0.79
30 min	117.9±5.7	115.4±7.4	2.5 (-0.2 5.2)	0.06
1 hour	116.6±6.6	108.3±8.7	8.3 (5.1 11.4)	<0.01*
2 hours	118.3±5.4	109.4±7.0	8.9 (6.3 11.4)	<0.01*
4 hours	117.5±6.4	109.9±7.2	7.6 (4.8 10.3)	<0.01*
8 hours	117.7±6.6	108.3±6.8	9.4 (6.6 12.1)	<0.01*
12 hours	120.4±6.8	108.5±5.8	11.9 (9.3 14,4)	<0.01*
16 hours	123±6.3	106.4±6.7	16.6 (13.9 19.2)	<0.01*
20 hours	121.4±6.2	101.5±7.5	19.9 (17 22.7)	<0.01*
24 hours	122.2±7.2	106.6±8.6	15.6 (12.3 18.8)	<0.01*

[Table/Fig-9]: Comparison of mean Systolic Blood Pressure (SBP) between both groups.
An unpaired t-test was used to compare the differences between both groups; *Indicates a significant difference between both groups

Time interval	Mean Diastolic Blood Pressure (DBP) in mmHg		Mean difference (95% confidence interval of difference)	p-value
	Group T (n=47) (Mean±SD)	Group Q (n=47) (Mean±SD)		
Base line	67.7±4.4	69.6±8.8	1.9 (-4.7 0.9)	0.18
30 min	69.6±4.6	68.1±7.8	1.5 (-1.1 4.1)	0.25
1 hour	68.3±5.2	67.0±7.3	1.3 (-1.2 3.8)	0.31
2 hours	68.0±4.0	65.7±5.9	2.3 (0.2 4.3)	0.03
4 hours	68.5±4.3	65.7±5.7	2.8 (0.7 4.8)	<0.01*
8 hours	68.1±4.1	64.2±5.5	3.9 (1.9 5.8)	<0.01*
12 hours	71.7±6.4	63.6±5.8	8.1 (5.5 10.6)	<0.01*
16 hours	72.0±7.6	63.6±5.5	8.4 (5.6 11.1)	<0.01*
20 hours	71.6±6.0	63.7±5.1	7.9 (5.6 10.1)	<0.01*
24 hours	71.7±5.7	63.3±6.3	8.4 (5.9 10.8)	<0.01*

[Table/Fig-10]: Comparison of mean Diastolic Blood Pressure (DBP) between both groups.
An unpaired t-test was used to compare the differences between both groups; *Indicates a significant difference between both groups

Time interval	Mean Oxygen Saturation (SpO_2)		Mean difference (95% confidence interval of difference)	p-value
	Group T (n=47) (Mean±SD)	Group Q (n=47) (Mean±SD)		
Baseline	99.96±0.20	99.94±0.25	0.02 (-0.07 0.11)	0.65
30 min	99.87±0.45	99.89±0.37	0.02 (-0.19 0.15)	0.80
1 hour	99.81±0.61	99.83±0.56	0.02 (-0.26 0.22)	0.86
2 hours	99.74±0.74	99.68±0.84	0.06 (-0.26 0.39)	0.69
4 hours	99.66±0.81	99.64±0.87	0.02 (-0.32 0.36)	0.90
8 hours	99.47±1.0	99.60±0.9	0.13 (-0.53 0.27)	0.52
12 hours	99.36±1.11	99.49±1.0	0.13 (-0.56 0.30)	0.55
16 hours	99.23±1.20	99.30±1.16	0.06 (-0.55 0.42)	0.79
20 hours	99.11±1.27	99.26±1.17	0.15 (-0.65 0.35)	0.55
24 hours	98.98±1.33	99.19±1.21	-0.21 (-0.73 0.31)	0.41

[Table/Fig-11]: Oxygen Saturation (SpO_2) comparison between both groups.
An unpaired t-test was used to compare the differences between both groups; *Indicates a significant difference between

DISCUSSION

In present study, the primary outcome assessed was the total number of rescue analgesic tramadol boluses required over 24 hours. The QLB group reported a significantly lower total mean of rescue analgesic bolus doses (1 dose) compared to the mean rescue analgesic bolus doses in the TAP block group (2.5 doses). The decreased doses of rescue analgesics in the QLB group may be due to the predominant spread of bupivacaine and dexmedetomidine to the paravertebral space. Similarly, Jadon A et al., reported that a lesser number of median rescue analgesic doses were required in the QLB group (0 doses) than in the TAP block group (1.5 doses) within 24 hours [10]. In their study, Verma K et al., found that within 72 hours, the number of rescue opioid doses was much lower in the QLB group (1 dose) than in the TAP block group (7 doses) [11].

In present study, mean rescue analgesic tramadol consumption was significantly lower in the QLB group (51.06±32.1 mg) than in the TAP block group (127.6±30.9 mg) (p<0.01). This may be due to the predominant spread of local anaesthetic to the paravertebral space in the QLB group. The meta-analysis by Wang Y et al., also revealed that the QLB group consumed less postoperative analgesic than the TAP block group [12]. Alansary AM et al., found that the amount of pethidine used as a rescue analgesic was lower in the QLB group (68.3 mg) compared to the TAP block group (120 mg) [13]. Bilgin S et al., found no significant difference in the rate of rescue analgesic use between the QLB group and the TAP block group within nine hours [14]. Bilgin S et al., also observed a significant reduction in the administration of rescue analgesic morphine in the

QLB group compared to the TAP block group during the 14-24 hour period [14].

In the present study, the QLB group had a significantly longer time to the initial onset of pain (17.9 hours) compared to the TAP block group (11.9 hours). Jadon A et al., study demonstrated a significantly longer initial request for analgesia in the QLB group (12 hours) compared to the TAP block group (9 hours) [10]. This may be due to the use of ropivacaine (0.375%) alone in both blocks. The longer duration of action recorded in the present study may be attributed to the addition of dexmedetomidine as an adjuvant in both blocks. The time to the first request for analgesia in the postoperative period was significantly longer in the QLB group (18.2 hours) than in the TAP block group (12.2 hours). Furthermore, Kumar GD et al., conducted a study that revealed that the duration of the first request for analgesia was much longer in the QLB group (447 minutes) compared to the TAP block group (243 minutes) [15]. This may be due to the use of ropivacaine (0.25%) alone in both blocks. Mohamed AN et al., conducted a study that revealed a significantly longer duration until the first request for analgesia in the QLB group (477 minutes) compared to the TAP block group (430 minutes) [16]. Similarly, Alansary AM et al., found that the duration until the first rescue analgesia was much greater in the QLB group than in the TAP block group [13]. Wang K et al., in their meta-analysis, also reported a lesser amount of opioid consumption in the QLB group compared to the TAP block group [7].

The prolonged duration of action with dexmedetomidine in the QL and TAP blocks may be due to its effects at the peripheral, spinal, and supraspinal levels. The peripheral-level action may be attributed to dexmedetomidine's inhibitory effect on delayed rectifier K+ and Na+ currents, resulting in a decrease in neuronal activity [17]. Animal experiments have found that dexmedetomidine prolongs the duration of peripheral nerve block by inhibiting the hyperpolarisation-activated cation current. It is thought that dexmedetomidine works at the peripheral level by slowing down the restoration of resting potential and preventing the conduction of new action potentials. The impact appears to be more prominent in C fibers, which are associated with pain, as opposed to A fibers, which are involved in motor function. Hence, the pain-relieving effect of dexmedetomidine can be more pronounced than the motor response [18].

Dexmedetomidine acts at the spinal level by spreading to the paravertebral space and binding to two receptors in the spinal dorsal horn, which reduces the release and reuptake of excitatory neurotransmitters such as glutamate and substance P. Hyperpolarised interneurons suppress the transmission of pain signals in the ascending spinal pathway, resulting in pain relief. The action at the supraspinal level occurs due to its spread into cerebrospinal fluid via systemic absorption and its interaction with α2A, α2B, and α2C receptors located in the medulla, thereby decreasing the descending noradrenergic pathway in the medulla or reducing sympathetic nerve signals, which achieves the analgesic effect at the central level [17].

The present study showed a notable reduction in pain scores within the QLB group between 12 and 24 hours compared to the TAP block group. Ferguson JE et al., conducted a meta-analysis that revealed the QLB group significantly reduced 24-hour cumulative pain scores compared to the TAP block group [19]. Khanna S et al., conducted a study that reported significantly lower pain scores in the QLB group from 6 to 20 hours [20].

The HR in the QLB group was significantly lower than that in the TAP block group from four to 24 hours. The study also noted significantly decreased mean SBPs from 1 to 24 hours, as well as substantially decreased DBPs between 2 to 24 hours. Comparatively, in a study by Naaz S et al., the QLB group had lower mean arterial pressures and HRs than the TAP block and control groups [21].

Limitation(s)

The postoperative sedation scores were not evaluated between the two groups. The motor deficit that was occasionally observed in the posterior QLB was not assessed in this study. This deficit was predominantly caused by the spread of the local anaesthetic drugs administered in the QLB to the paravertebral space. In this study, there is a chance of confounding the results due to the administration of intravenous paracetamol in both groups.

CONCLUSION(S)

The QLB with dexmedetomidine significantly reduces the number of rescue analgesic doses, the total amount of rescue analgesics administered, and pain scores between 12 and 24 hours, in comparison to the TAP block with dexmedetomidine. The QLB also delays the onset of pain and the time for the initial request for analgesia. The addition of dexmedetomidine in both blocks helps maintain stable haemodynamics in the postoperative period.

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