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Comparative Efficacy of Transmuscular and Intramuscular Quadratus Lumborum Blocks in Postoperative Analgesia for Caesarean Sections: A Randomized Study

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Abstract: ***Background: The increasing prevalence of Lower Segment Caesarean Section surgery highlights the need for effective postoperative pain management. Severe pain associated with this surgery often requires analgesics, impacting maternal consciousness and bonding. This study investigates the comparative efficacy of transmuscular and intramuscular quadratus lumborum blocks in postoperative analgesia for Caesarean sections. Employing a randomized control trial design, the research evaluates pain intensity, opioid consumption, and potential side effects in patients receiving these two types of blocks. The findings aim to enhance understanding of optimal pain management strategies in post-Caesarean patients, potentially impacting clinical practices in obstetric surgery. Methods: In a double-blinded randomized controlled trial (RCT), 100 patients scheduled for elective lower segment Caesarean section surgery under spinal anesthesia were selected. They were evenly distributed into two groups, with 50 patients in each group. Group I, referred to as the TQLB group, received a transmuscular injection, while Group 2, known as the IQLB group, received an intramuscular injection of 0.375% Ropivacaine (20 ml) bilaterally. Results: In the Intramuscular Quadratus Lumborum Block (IQLB) group, the time for the first rescue analgesia ranged from 480-960 minutes, with a mean (± SE) of 716.60 ± 16.97 minutes and a median of 720 minutes. Meanwhile, in the Transmuscular Quadratus Lumborum Block (TQLB) group, it ranged from 720-1200 minutes, with a mean (± SE) of 964.80 ± 16.07 minutes and a median of 960 minutes. The mean time for the first rescue analgesia was comparatively higher in the TQLB group. Regarding rescue analgesia, in the IQLB group, 12 (24.0%) patients received 200 mg over 24 hours, whereas in the TQLB group, only 5 (10.0%) received the same dosage. Throughout all periods, the mean Visual Analog Scale (VAS) score was lower in the TQLB group compared to the IQLB group, except at 960 minutes, which may be attributed to the earlier requirement of rescue analgesia in the IQLB group. Conclusion: The transmuscular Quadratus Lumborum block demonstrated a longer duration of analgesia, reduced Visual Analog Scale (VAS) scores, and lower requirements for rescue analgesics compared to the intramuscular Quadratus Lumborum block. However, the intramuscular Quadratus Lumborum block was noted for better ease of performance. Importantly, there were no differences between the two groups concerning adverse reactions, indicating both methods were comparable in terms of safety.***

Keywords: quadratus lumborum block, visual analogue scale, rescue analgesia, adverse reactions, lower segment caesarean section, Postoperative Analgesia, Transmuscular Approach, Intramuscular Approach.

1. Introduction

According to IASP[1] (International Association for Study of Pain) pain is defined as "unpleasant sensory or emotional experience associated with actual or potential tissue damage".

Abdominal surgeries like lower segment Caesarean sections are associated with moderate to severe postoperative pain and distress.

Quadratus lumborum (QL) blocks provide a better alternative to pharmacological methods of analgesia because it provides safety, preserves consciousness, avoids respiratory depression which may lead to airway instrumentation, avoids post operative nausea and vomiting and provides faster recovery and profound post operative analgesia.[2]

Post-operative analgesia is necessary after lower segment Caesarean sections to prevent unwanted complications such as venous thromboembolism, respiratory complications, delayed ambulation and prolonged hospital stay. The pain can also disrupt mother child bonding.[3] There are various other modalities available for post operative analgesia.

Ultrasound-guided Quadratus Lumborum block (QL) is considered as one of the novel techniques in providing analgesia following upper and lower abdominal surgeries.[4] QL block, originally described by Blanco[5] in 2007, is the first quadratus lumborum block (QLB1) which aims to deposit local anaesthetic at the anterolateral aspect of the QL muscle. In the type 2 QL Block, also known as posterior QL block, local anaesthetic (LA) is injected in between the QL and erector spinae muscles, i.e. on the posterior surface of QL muscle.[6] Børglum et al. further refined the original block done by Blanco using a transmuscular approach. In this type 3 QL or Transmuscular (TQLB) QL block, the LA is injected in the fascial plane between the QL and psoas major (PM) muscles.[7] In the type 4 QL block, the drug is given intramuscularly (IQLB). It was first described by Murouchi in the year 2016.[8] It is relatively easier to perform than the other variants of QL blocks.[9]

There are some possible disadvantages to the block techniques such as positioning of the patient, injury to nearby structures, accidental administration of LA in the blood vessels, inconsistent level of block, etc. The use of ultrasound guidance for performing quadratus lumborum block increases the success rate, reduces the local

anaesthetic doses needed and reduces the chances of complications. It also facilitates in administering the block in a shorter period of time.[11]

Limited information exists about one QL block approach prevailing over another. Although different QL block approaches have been investigated in the adult population, this is the first randomized study comparing the postoperative analgesic effects of transmuscular and intramuscular approaches in post-caesarean patients. The significance of this research lies in its potential to improve postoperative pain management for patients undergoing Caesarean sections. Effective pain control is crucial for patient recovery and satisfaction. By identifying the more efficacious technique between transmuscular and intramuscular quadratus lumborum blocks, this study contributes to enhancing patient care in obstetrics and may influence future anesthesia protocols.

2. Materials and Methods

After obtaining Research Ethics Board approval and written informed consents, one hundred parturients aged 18-45 years, with American Society of Anesthesiology (ASA) physical status II, undergoing elective lower segment caesarean section were recruited in this randomized double blind prospective study conducted in the department of Anaesthesiology, Regional Institute of Medical Sciences, Imphal, Manipur, India, over a period of two years. The sample size was calculated using the formula for comparison of two proportions, based on a previous study done by Hussein MM[4], the sample size was calculated to be 47.96 and rounded it to 50 per group considering 5% dropout. Hence, the total sample size was 100. Patients with history of diabetes, hypertension, neuropathy, peripheral nerve injury, active local site infections, patients on anticoagulants or bleeding disorders (platelet count <50,000/microliter, prothrombin time > 14sec, International normalized ratio (INR) > 1.5) and patients with history of hypersensitivity to amide group of local anaesthetic agents were excluded from the study.

A computer-generated randomization chart was used, and patients were assigned to one of the two groups (Group TQLB, n=50), receiving ultrasound-guided QL block transmuscularly using 0.375% Injection (Inj.) Ropivacaine (20 ml) bilaterally, and Group IQLB (n=50), receiving ultrasound-guided QL block intramuscularly using 0.375% Inj. Ropivacaine (20 ml) bilaterally. Both the patient and the primary investigator were blinded. Only the anaesthesiologist performing the block knew the type of block given to the patient. The principal investigator, blinded to the group allocation, conducted the postoperative follow-up. Data were collected and noted in a predesigned proforma.

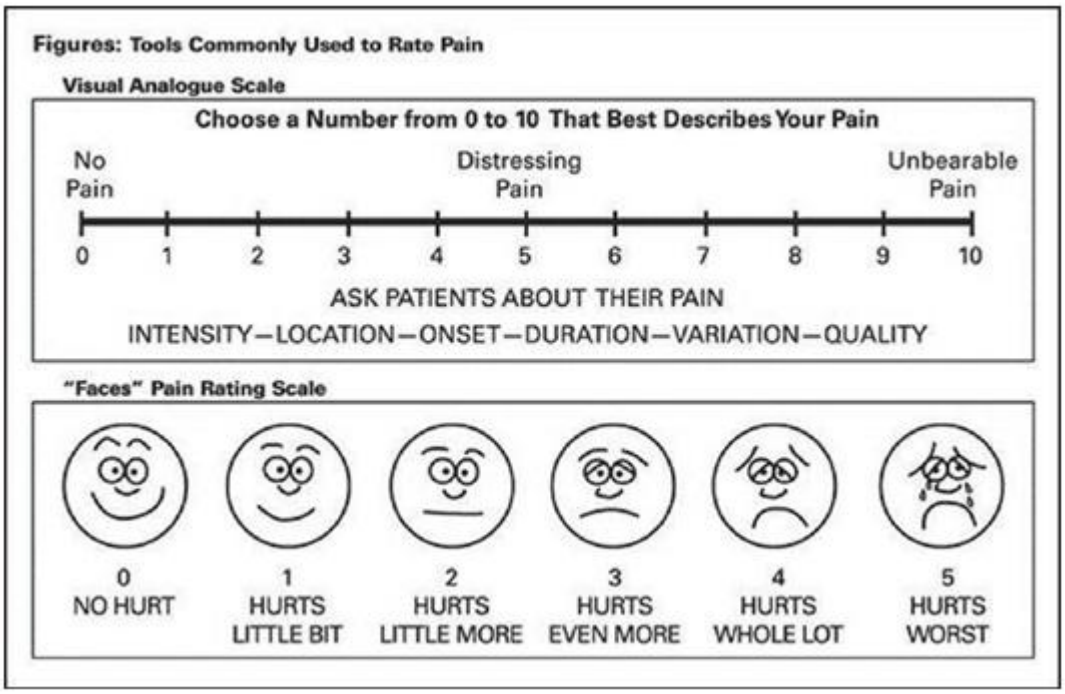
3. Procedure and Data Collection

A day before the surgery, eligible parturients underwent preoperative assessment. All patients included in this study fasted for 6 hours before the caesarean section. In the preoperative holding area, intravenous access was established, and patients were preloaded with 10 ml/kg of Ringer's Lactate solution over 30 minutes before being transferred to the operating room. Upon arrival at the operation theatre, patient's heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and oxygen saturation (SpO2) were monitored. All participants received spinal anaesthesia with 2 mL hyperbaric 0.5% bupivacaine. After completing the surgical procedure, participants were transferred to the post-anaesthesia care unit (PACU), where the block was administered. Throughout the procedure, patients were monitored with three-lead ECG, pulse oximetry, and non-invasive blood pressure.

Ultrasound guided Transmuscular Quadratus Lumborum (TQLB) procedure:
The patient was positioned laterally, with the anesthetized side facing upwards. Skin preparation involved the use of povidone iodine and isopropyl alcohol. The ultrasound probe and transducer were covered with sterile drapes and a sterile tegaderm sheath, respectively. A curvilinear transducer was placed transversely at the abdominal flank above the iliac crest. The transducer was adjusted until the QL muscle, identified by its attachment to the lateral edge of the transverse process of the L4 vertebra, was visualized. The Shamrock sign, where the L4 transverse process acts as the stem and the three muscles (QL, psoas major (PM), and erector spinae) form the three clovers, was then identified.

Using an 18 G epidural needle inserted in-plane to the transducer (lateral edge), the needle's tip was advanced through the QL muscle, penetrating the fascia of the QL muscle. A small amount of saline was injected to confirm the correct position of the tip in the interfascial plane between the QL and PM muscles. Subsequently, 20 mL of 0.375% ropivacaine was injected on both sides.

Ultrasound guided Intramuscular Quadratus Lumborum (IQLB) block procedure:
The patient was positioned laterally, with the anesthetized side facing upwards. Skin preparation involved the use of povidone iodine and isopropyl alcohol. Sterile drapes covered the ultrasound probe, and a sterile tegaderm sheath covered the transducer. Placing the curvilinear probe on the flank, slightly cephalad to the iliac crest, allowed for the observation of the quadratus lumborum muscle. The tip of an 18G epidural needle was advanced until it penetrated the fascia of the quadratus lumborum muscle. To confirm the correct position of the needle tip, a small amount of saline was injected intramuscularly. Subsequently, 20 mL of 0.375% ropivacaine was injected on both sides.



Operative definitions:

Time to rescue analgesia: The time interval between the block administration and the first dose of analgesia given at the request of the patients after surgery.

Study variables:

1) Independent variables:

- Age in completed years
- Sex
- Weight in kilogram
- Height in centimetre
- ASA II

2) Dependent variables:

- Time to first rescue analgesia in minutes (using VAS score)
- Side effects after injecting Inj. 0.375% ropivacaine

Statistical analysis:

Continuous data were summarised in Mean ± SE (standard error of the mean) whereas discrete (categorical) in number (n) and percentage (%). Continuous two independent groups were compared by independent Student's t test. Continuous groups were also compared by repeated measures two factor (Periods x Groups) analysis of variance (ANOVA) and the significance of mean difference within (intra) and between (inter) the groups were done by Newman-Keuls post hoc test after ascertaining normality by Shapiro-Wilk's test and homogeneity of variance between groups by Levene's test. Discrete (categorical) groups were compared by chi-square (χ^2) test. A two-tailed (α=2) $P < 0.05$ was considered statistically significant. Analyses were performed on SPSS software (Windows version 22.0).

4. Results

A total of 100 participants, who were randomized into two groups TQLB (n=50) and IQLB (n=50), received their intended interventions post operatively and analyzed for outcome measures. The demographic parameters such as age, weight, height and BMI between two groups were comparable (P>0.05) and did not affect the study outcome, as shown in table 1.

Table 1: Demographic characteristics of two groups

Demographic characteristics	IQLB (n=50) (%)	TQLB (n=50) (%)	t value	*P* value
Age (years)	28.26 ± 0.93	28.98 ± 0.97	0.53	0.595
Weight (kg)	69.44 ± 0.90	69.64 ± 0.99	0.15	0.882
Height (cm)	158.12 ± 0.81	158.88 ± 0.79	0.67	0.503
BMI (kg/m^2)	27.83 ± 0.38	27.68 ± 0.47	0.24	0.812

Demographic age, weight, height and BMI of two groups were summarised in Mean ± SE and compared by Student's t test (t value). **IQLB:** intramuscular quadratus lumborum block, **TQLB:** transmuscular quadratus lumborum block, and **BMI:** body mass index.

Outcome measures

1) Number of rescue analgesia needed in 24 hrs

The number of rescue analgesia needed in 24 hrs of two groups (IQLB and TQLB) is summarised in Table 2. In IQLB group, 38 (76.0%) patients received 1 rescue analgesia and rest 12 (24.0%) patients received 2 rescue analgesia in 24 hrs. In contrast, in TQLB group, 45

(90.0%) patients received 1 rescue analgesia and rest 5 (10.0%) patients received 2 rescue analgesia in 24 hrs. The need of 1 rescue analgesia in 24 hrs was 14.0% higher in TQLB group as compared to IQLB group. Conversely, the need of 2 rescue analgesia in 24 hrs was 14.0% lower in TQLB group as compared to IQLB group (Table 2 and Fig. 1).

Comparing the frequency (%) of number of rescue analgesia needed in 24 hrs (1 and 2) of two groups, χ^2 test showed insignificant ($P > 0.05$) difference in number of rescue analgesia needed in 24 hrs between the two groups (χ^2=3.47, P = 0.062) i.e. did not differ significantly (Table 2 and Fig. 2)

Table 2: Frequency distribution of number of rescue analgesia needed in 24 hrs of two groups

Number of rescue analgesia needed in 24 hrs	IQLB (n=50) (%)	TQLB (n=50) (%)	X^2 Value	*P* value
1	38 (76.0)	45 (90.0)	3.47	0.062
2	12 (24.0)	5 (10.0)		

The frequency distribution of number of rescue analgesia needed in 24 hrs of two groups were summarised in number (n) and percentage (%) and compared by χ^2 test (χ^2 value). **IQLB:** intramuscular quadratus lumborum block and **TQLB**: transmuscular quadratus lumborum block.

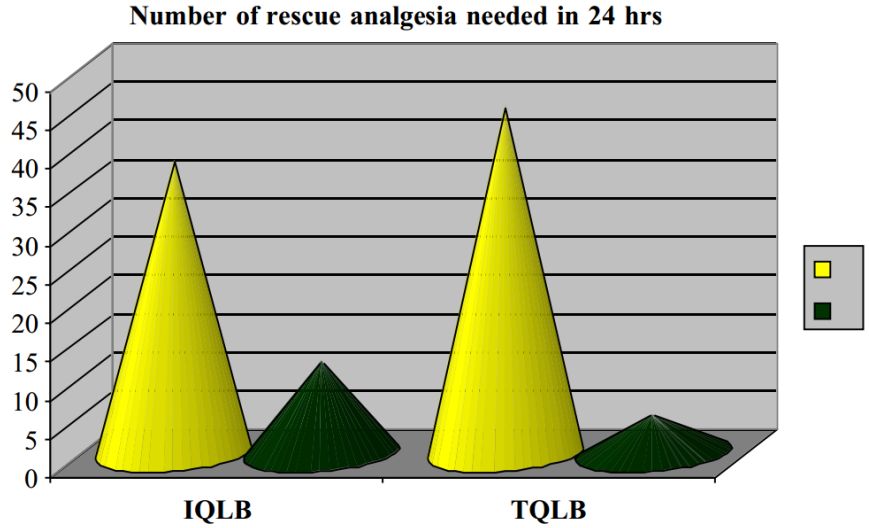


Figure 1: Frequency distribution of number of rescue analgesia needed in 24 hours of two groups.

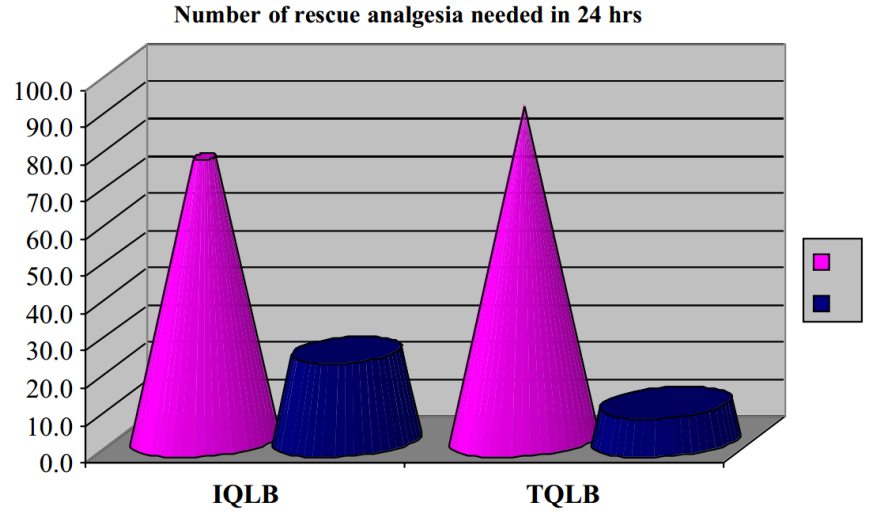


Figure 2: Comparison of frequency of number of rescue analgesia (%) needed in 24 hours of two groups.

Time for 1st rescue analgesia

The time for 1st rescue analgesia of two groups (IQLB and TQLB) is summarized in Table 3. In IQLB group, the time for 1st rescue analgesia ranged from 480-960 min with mean (± SE) 716.60 ± 16.97 min and median 720 min whereas in TQLB group it ranged from 720-1200 min with mean (± SE) 964.80± 16.07 min and median 960 min. The mean time for 1st rescue analgesia was comparatively higher in TQLB group as compared to IQLB group (Table 3 and Fig. 3).

Comparing the requirement of mean time for 1st rescue analgesia of two groups, Student's t test showed significantly different and higher (25.6%) mean time for 1st rescue analgesia of TQLB group as compared to IQLB group (716.60 ± 16.97 vs. 964.80 ± 16.07, mean

difference=247.20 ± 23.37, t=10.58, $P < 0.001$) (Table 3 and Fig. 4).

Table 3: Time for 1st rescue analgesia (in min) of two groups

IQLB (n=50)	TQLB (n=50)	Mean difference	t value	*P* value
717. 60 ± 16.97	964.80 ± 16.07	247.20 ± 23.37	10.58	< 0.001

The time for 1st rescue analgesia of two groups were summarised in Mean ± SE and compared by Student's t test (t value). **IQLB:** intramuscular quadratus lumborum block and **TQLB:** transmuscular quadratus lumborum block.

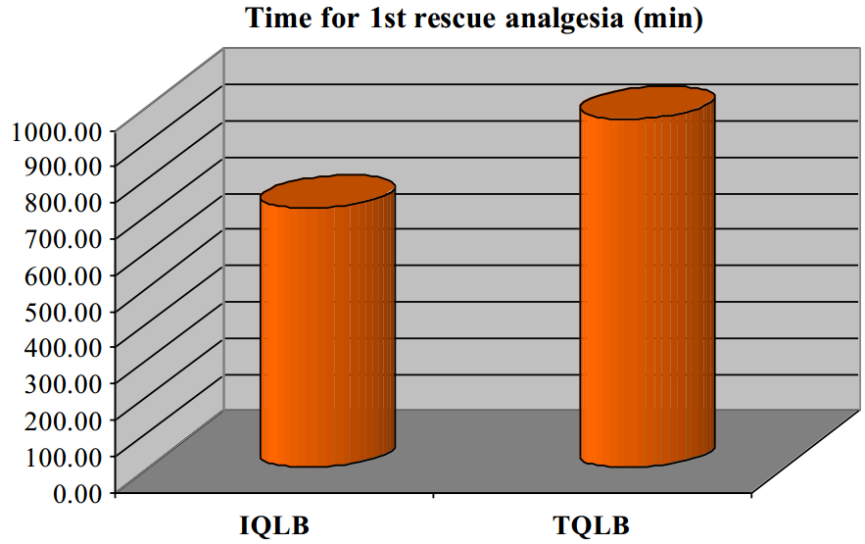
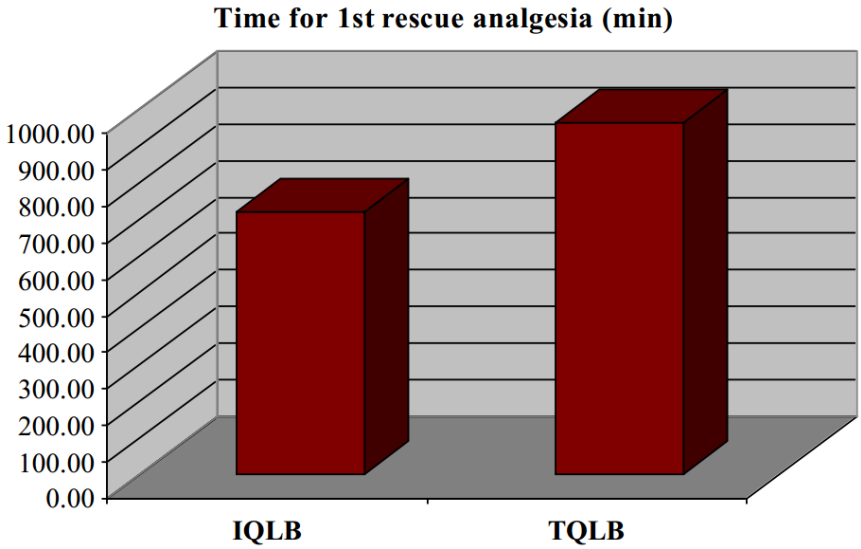


Figure 3: Mean time for 1st rescue analgesia of two groups.



***$P < 0.001$- as compared to IQLB

Figure 4: Comparison of mean time for 1st rescue analgesia of two groups.

Total dose of rescue analgesia over 24 hours

The total dose of rescue analgesia (Inj. Tramadol hydrochloride in mg) over 24 hrs of two groups (IQLB and TQLB) is summarized in Table 4. In IQLB group, 38 (76.0%) patients received 100 mg rescue analgesia and rest 12 (24.0%) patients received 200 mg rescue analgesia over 24 hrs. In contrast, in TQLB group, 45 (90.0%) patients received 100 mg rescue analgesia and rest 5 (10.0%) patients received 200 mg rescue analgesia over 24 hrs. The need of 100 mg rescue analgesia over 24 hours was 14.0% higher in TQLB group as compared to IQLB group. Conversely, the need of 200 mg rescue analgesia over 24 hrs was 14.0% lower in TQLB group as compared to IQLB group (Table 4 and Fig.5).

Comparing the frequency (%) of total dose of rescue analgesia needed over 24 hours (100 mg and 200 mg) of two groups, χ^2 test showed similar ($P > 0.05$) total dose of rescue analgesia over 24 hours between the two groups (χ^2=3.47, $P = 0.062$) i.e., did not differ significantly (Table 4 and Fig.6).

Table 4: Frequency distribution of total dose of rescue analgesia (Inj. Tramadol hydrochloride in mg) over 24 hrs of two groups

Total dose of rescue analgesia	IQLB (n=50) (%)	TQLB (n=50) (%)	$\chi 2$ value	P value
100 mg	38 (76.0)	45 (90.0)	3.47	0.062
200 mg	12 (24.0)	5 (10.0)		

The frequency distribution of total dose of rescue analgesia over 24 hrs of two groups were summarised in number (n) and percentage (%) and compared by χ^2 test (χ^2 value). **IQLB:** intramuscular quadratus lumborum block and **TQLB**: transmuscular quadratus lumborum block.

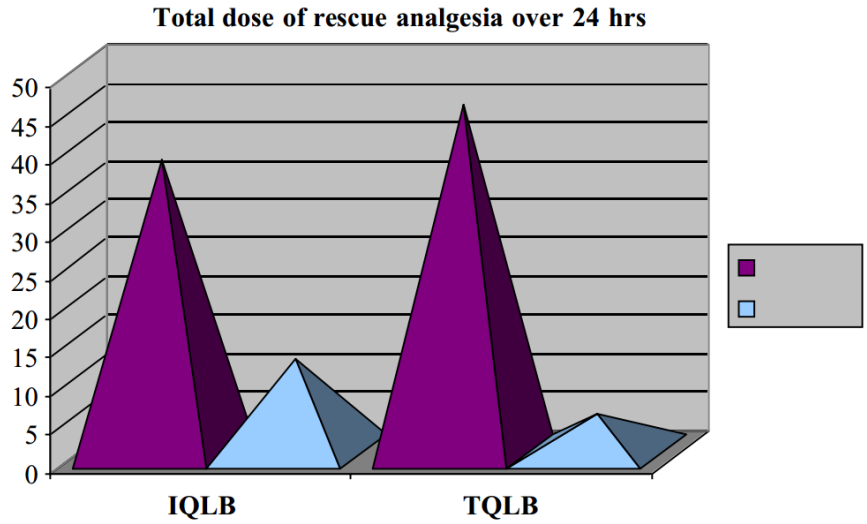


Figure 5: Frequency distribution of total dose of rescue analgesia over 24 hrs of two groups.

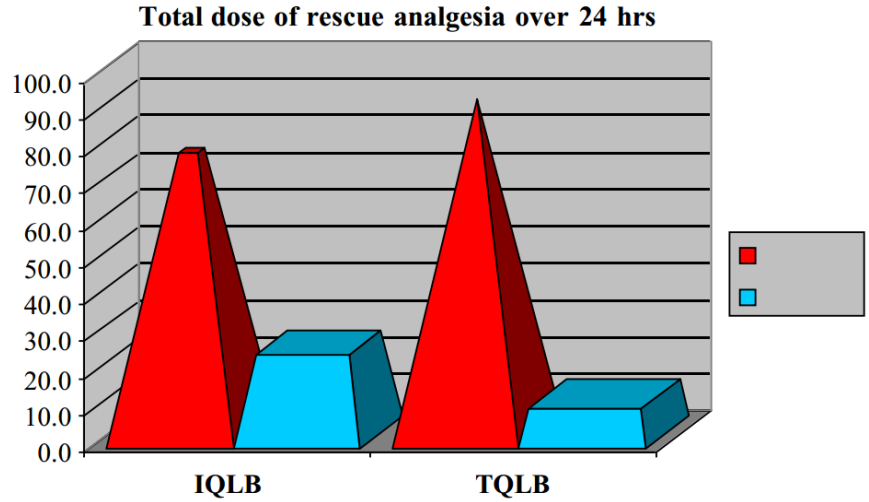


Figure 6: Comparison of frequency of total dose of rescue analgesia (%) over 24 hrs of two groups.

Pain

The pain (VAS score) of two groups (IQLB and TQLB) were assessed from 120 min to 1440 min and summarized in Table 5. In IQLB group, the VAS score increased linearly from 120 to 720 min then decreases whereas in TQLB group it shows linear increase up to 960 min. However, at all periods, the mean VAS score was lower comparatively in TQLB group as compared IQLB group except at 960 min (Table 5 and Fig.7).

For each group, comparing the mean VAS score between the periods (i.e., intra group), Newman-Keuls test showed significantly ($P < 0.001$) different and higher VAS score from 120 to 720 min in IQLB group and 120 to 960 min TQLB group.

Similarly, for each period, comparing the mean VAS score between two groups (i.e., inter group), Newman-Keuls test showed significantly ($P < 0.05$ or $P < 0.001$) different and lower VAS score at 360, 600 and 720 min in TQLB group as compared to IQLB group (Table 5 and Fig.8). In contrast, at 960 min, it was found significantly ($P< 0.001$) different and higher in TQLB group as compared to IQLB group. However, at other periods, it was found similar ($P > 0.05$) between the two groups i.e., did not differ significantly.

Table 5: Pain (VAS score) of two groups over the periods

Time period (min)	IQLB (n=50)	TQLB (n=50)	Mean difference	*P* value
120	0.00 ± 0.00	0.00 ± 0.00	0.00	1.000
240	0.16 ± 0.08	0.04 ± 0.04	0.12	0.389
360	1.32 ± 0.14	0.44 ± 0.12	0.88	< 0.001
480	2.12 ± 0.07	1.84 ± 0.08	0.28	0.185
600	2.36 ± 0.11	1.92 ± 0.05	0.44	< 0.034
720	3.20 ± 0.15	2.20 ± 0.09	1.00	< 0.001
960	2.24 ± 0.12	3.56 ± 0.12	1.32	< 0.001
1200	2.36 ± 0.11	2.24 ± 0.09	0.12	0.665
1440	2.08 ± 0.06	2.20 ± 0.09	0.12	0.825

The pain (VAS score) of two groups over the periods were summarised in Mean ± SE and compared by ANOVA followed by Newman-Keuls post hoc test (*P* value).

IQLB: intramuscular quadratus lumborum block and **TQLB:** transmuscular quadratus lumborum block.

Pain (VAS score)

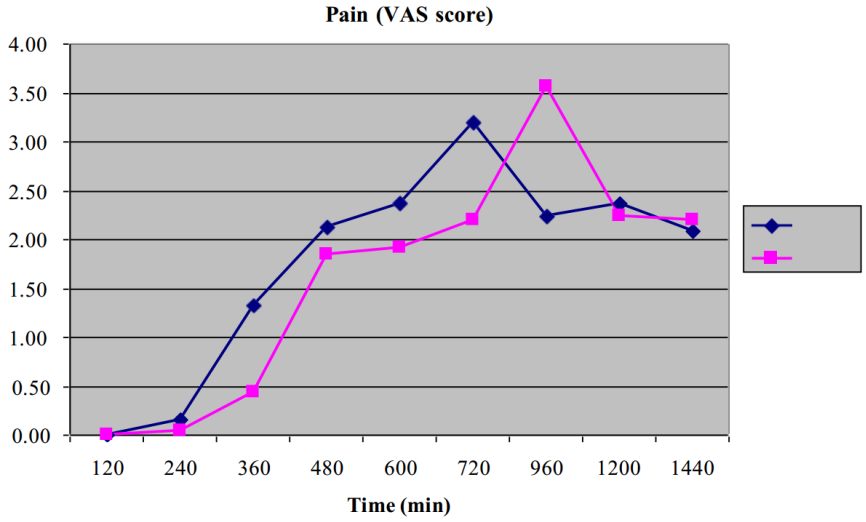
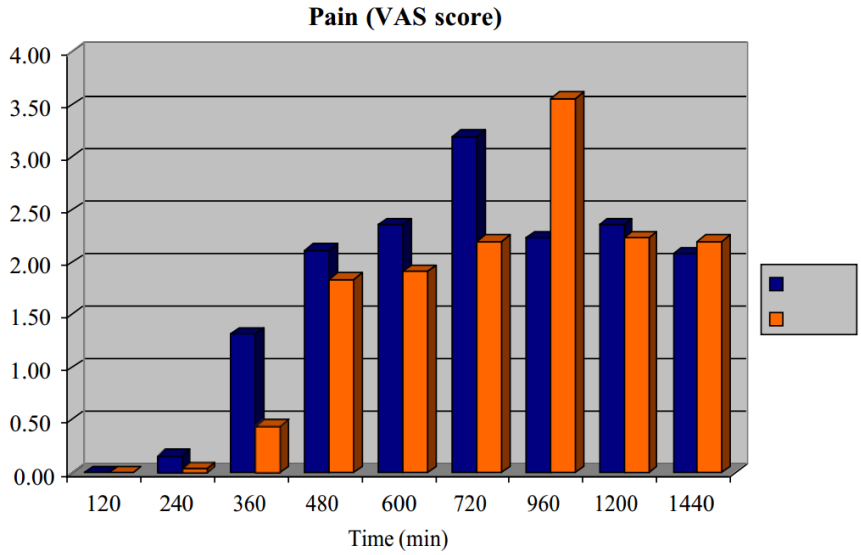


Figure 7: Mean VAS score of two groups over the periods.



$^{ns}P > 0.05$ or $^{*}P < 0.05$ or $^{***}P < 0.001$- as compared to IQLB

Figure 8: For each period, comparisons of mean VAS score between the two groups.

Side effects

The treatment related side effects of two groups were also noted. However, no side effects were found in both the groups suggesting both the blocks (IQLB and TQLB) are safe in the management of post-operative pain in patients undergoing lower segment Caesarean sections.

5. Discussion

Truncal blocks are commonly employed for postoperative pain management in abdominal surgeries. Blanco et al. first described the Quadratus Lumborum Block (QLB) in 2007, and since then, its popularity has steadily increased, especially with the advent of ultrasound in regional anesthesia, enabling more effective and safe procedures.

QLB offers several advantages, including superior analgesic effects and reduced opioid use. Evidence suggests potential enhanced coverage for visceral pain, especially with the anterior and possibly posterior QLB approaches.[12]

A recent 2018 review underscores the outstanding analgesic effects of QLB, impacting both rest and movement and facilitating early postoperative mobilization.

There are four approaches to performing Quadratus Lumborum Block:

1) QL1 or lateral QLB involves depositing local anesthetic lateral to the QL muscle.
2) QL2 or posterior QLB entails injecting posterior to the QL muscle, within the "lumbar interfacial triangle."
3) QL3, described by Børglum et al. in 2013, involves injecting local anesthetic between the psoas major (PM) muscle and the QL muscle, termed transmuscular/anterior QL block.
4) QL4 or intramuscular QLB (IQLB) was first reported by Murouchi in 2016, involving direct injection of local anesthetic into the QL muscle.

The Quadratus Lumborum Block (QLB) exhibits a broad distribution of local anesthetic, leading to extensive sensory inhibition spanning from T7 through L1 in most cases. This characteristic makes QLBs suitable for providing postoperative analgesia in abdominal and pelvic region surgeries.[13, 14]

According to a study by the New York Society of Regional Anaesthesia, QL block is noted for providing analgesia for both somatic and visceral pain, while the effect of Transversus Abdominis Plane (TAP) block is limited to somatic pain. The spread of the local anesthetic drug in QL block remains a subject of discussion, with the thoracolumbar fascia believed to play a crucial role.

The thoracolumbar fascia comprises three layers: the anterior layer, located anterior to the quadratus lumborum muscle; the middle layer, situated between the erector spinae and the quadratus lumborum muscle; and the posterior layer, which encases the erector spinae. The anterior layer blends medially with the fascia of the psoas major and laterally with the transversalis fascia.

The fascia acts as a conduit for the spread of local anesthetic to the thoracic paravertebral space and houses a dense network of sympathetic fibers and mechanoreceptors, significantly contributing to the effects of the Quadratus Lumborum Block (QLB).

In a study conducted by Mostafa Mansour Hussein[4] in October 2018 at Ain Shams University, a comparison was made between the analgesic effects of transmuscular and intramuscular approaches of the QL block in pediatric patients undergoing elective lower abdominal surgery. The results showed that, in the first 24 hours after surgery, 13 patients in the intramuscular QL (IQL) group (48.1%) required rescue analgesia, whereas only five patients in the transmuscular QL (TQL) group (18.5%) needed rescue analgesia. The FLACC (Face, Legs, Activity, Cry, Consolability) score was also consistently lower in the TQL group than in the IQL group at all-time intervals up to 24 hours postoperatively.

The conclusion drawn was that the efficacy of the transmuscular QL approach is superior to the intramuscular QL approach in terms of postoperative analgesia following pediatric lower laparotomy, aligning with the findings in your study. In your study, a similar comparison of the transmuscular and intramuscular approaches to Quadratus Lumborum block was conducted in 100 patients undergoing elective lower segment Caesarean sections, randomized into two equal groups.

In our study, we compared the Quadratus Lumborum block performed through the transmuscular approach versus the intramuscular approach in 100 patients undergoing elective lower segment Caesarean sections, randomized into two equal groups.

In the Intramuscular QLB (IQLB) group, the time for the first rescue analgesia ranged from 480-960 minutes, with a mean (± SE) of 716.60 ± 16.97 minutes and a median of 720 minutes. In contrast, the Transmuscular QLB (TQLB) group had a range of 720-1200 minutes, with a mean (± SE) of ± 16.07 minutes and a median of 960 minutes. The mean time for the first rescue analgesia was comparatively higher in the TQLB group, aligning with findings from a study by Dam M et al, which showed a significant reduction in postoperative opioid consumption and a prolonged time to the first opioid analgesia with preoperative bilateral TQL block.

In the IQLB group, 38 (76.0%) patients received 100 mg rescue analgesia, and the remaining 12 (24.0%) received 200 mg rescue analgesia over 24 hours. Conversely, in the TQLB group, 45 (90.0%) patients received 100 mg rescue analgesia, and the remaining 5 (10.0%) received 200 mg rescue analgesia over 24 hours. This resulted in a reduced total dose of opioids in the TQLB group, as also demonstrated in a study by Tulgar S et al[17], indicating better pain control.

Although a study by Hansen C et al[19] found that preoperative bilateral ultrasound-guided TQL block did not reduce opioid consumption after total laparoscopic hysterectomy, our study suggests a favorable outcome in pain management with the TQLB approach. The mean Visual Analog Scale (VAS) score was consistently lower in the TQLB group, except at 960 minutes, possibly due to the earlier requirement of rescue analgesia by the IQLB

group.

The study by Tamura T[20] indicating that local anesthetic did not spread into the paravertebral space after ultrasound-guided intramuscular Quadratus Lumborum Block (QLB) contrasts with the findings of studies by Carline L et al[21] and Dam M et al[22]. These latter studies demonstrated a consistent spread to lumbar nerve roots achieved through the transmuscular approach, suggesting a potential reason for the better efficacy of transmuscular QLB over intramuscular QLB.

It's noteworthy that no side effects were encountered in both the Intramuscular QLB (IQLB) and Transmuscular QLB (TQLB) groups, reinforcing the safety of both approaches in managing pain for patients undergoing caesarean sections. This aligns with the overall safety profile of QLB, as also indicated by other study done by Murouchi T et al[11], which suggested that Quadratus Lumborum block resulted in widespread and long-lasting analgesic effects with no incidence of local anesthetic systemic toxicity (LAST).

These contrasting findings highlight the importance of continued research to understand the nuances of QLB approaches, including the mechanisms of drug spread and their impact on efficacy in pain management.

However, the study has limitations, including the exclusion of ASA III or IV patients, emergency cases, and the absence of recording dermatomal spread of analgesia. Further research is needed to explore the mechanism and dermatomal extent of analgesia, along with determining the optimal point of drug deposition in Quadratus Lumborum block.

6. Conclusion

The findings of the study underscore the significant contributory role of Quadratus Lumborum Block (QLB) in postoperative pain treatment following caesarean sections. Utilizing ultrasound guidance enhances the safety of the block, reducing the likelihood of complications due to improved image resolution, a longer distance to intra-abdominal viscera, and the presence of adjacent muscles. Implementing the block technique correctly can notably decrease the need for postoperative parenteral analgesics after caesarean sections.

Comparing the two approaches, the transmuscular Quadratus Lumborum block emerges as providing a longer duration of analgesia, lower postoperative Visual Analogue Scale (VAS) scores, and reduced requirements for postoperative rescue analgesics compared to the intramuscular Quadratus Lumborum block in lower segment Caesarean sections.

However, it's noted that the intramuscular Quadratus Lumborum block demonstrated a quicker and easier performance, a factor that may improve with experienced practitioners. This aspect highlights the importance of expertise and experience in optimizing the efficiency of the block procedure.

7. Summary

The demographic parameters, such as age, height, weight, BMI, and duration of surgery, were similar in both groups, and there were no differences in hemodynamic parameters before and after the block performance.

In the Intramuscular Quadratus Lumborum Block (IQLB) group, the time for the first rescue analgesia ranged from 480-960 minutes, with a mean (± SE) of 716.60 ± 16.97 minutes and a median of 720 minutes. In contrast, the Transmuscular Quadratus Lumborum Block (TQLB) group had a range of 720-1200 minutes, with a mean (± SE) of 964.80 ± 16.07 minutes and a median of 960 minutes. The mean time for the first rescue analgesia was comparatively higher in the TQLB group than in the IQLB group.

Regarding rescue analgesia, in the IQLB group, 38 (76.0%) patients received 100 mg, and 12 (24.0%) patients received 200 mg over 24 hours. In contrast, in the TQLB group, 45 (90.0%) patients received 100 mg, and 5 (10.0%) patients received 200 mg over 24 hours. The total dose of opioids was lower in the TQLB group, aligning with studies suggesting reduced opioid consumption with this approach.

At all time intervals, the mean Visual Analog Scale (VAS) score was lower in the TQLB group compared to the IQLB group, except at 960 minutes, likely due to the earlier requirement of rescue analgesia by the IQLB group.

Both groups demonstrated no treatment-related side effects, indicating the safety of both Intramuscular Quadratus Lumborum Block (IQLB) and Transmuscular Quadratus Lumborum Block (TQLB) in managing post-caesarean pain. However, it's worth noting that the block performance time was longer in the TQLB group compared to the IQLB group.

References

[1] Merskey H, Bogduk N. Part III: Pain Terms: A Current List with Definitions and Notes on Usage. In: Classification of Chronic Pain, Second Edition, IASP Task Force on Taxonomy. 1994; 209-14.
[2] Xu M, Tang Y, Wang J, Yang J. Quadratus lumborum block for postoperative analgesia after cesarean delivery: a systematic review and meta-analysis. Int J Obstet Anesth. 2020 May; 42:87-98.
[3] Telnes A, Skogvoll E, Lonnée H. Transversus abdominis plane block vs. wound infiltration in Caesarean section: a randomised controlled trial. Acta Anaesthesiol Scand. 2015 Apr; 59(4):496-504.
[4] Hussein MM. Ultrasound-guided quadratus lumborum block in pediatrics: trans- muscular versus intra-muscular approach. J Anesth. 2018 Dec; 32(6):850- 5.
[5] Blanco R. Tap block under ultrasound guidance: the description of a “no pop” technique: 271.Regional Anesthesia and Pain Medicine 32(2007):130.
[6] Blanco R, McDonnell JG. Optimal point of injection:

the quadratus lumborum type I and II blocks. http://www.respond2articles.com/ANA/forums /post/ 1550.aspx. [Accessed November 20, 2020]

[7] Borglum J, Moriggl B, Jensen K, Lønnqvist PA, Christensen AF, Sauter A et al. Ultrasound-Guided Transmuscular Quadratus Lumborum Blockade. BJA, https://doi.org/10.1093/bja/el_9919 (accessed on November 20, 2020).

[8] Murouchi T. Quadratus lumborum block intramuscular approach for pediatric surgery. Acta Anaesthesiol Taiwan. 2016 Dec; 54(4):135-6.

[9] Murouchi T, Iwasaki S, Yamakage M. Quadratus Lumborum Block: Analgesic Effects and Chronological Ropivacaine Concentrations After Laparoscopic Surgery. Reg Anesth Pain Med. 2016 Mar-Apr; 41(2):146-50.

[10] Miller RD, Eriksson LI, Fleisher LA, Jeanine P, Wiener-Kronish JP, Cohen NH, et al, editors. Miller's Anesthesia, 8th Edition. Philadelphia: Elsevier; 2015.

[11] Farooq M, Carey M. A case of liver trauma with a blunt regional anesthesia needle while performing transversus abdominis plane block. Reg Anesth Pain Med. 2008 May-Jun; 33(3):274-5.

[12] Ueshima H, Otake H, Lin JA. Ultrasound-Guided Quadratus Lumborum Block: An Updated Review of Anatomy and Techniques. Biomed Res Int. 2017.

[13] Ueshima H, Yoshiyama S, Otake H. The ultrasound-guided continuous transmuscular quadratus lumborum block is an effective analgesia for total hip arthroplasty. J Clin Anesth. 2016 Jun; 31:35.

[14] Ueshima H, Hiroshi O. Lumbar vertebra surgery performed with a bilateral posterior quadratus lumborum block. J Clin Anesth. 2017 Sep; 41:61.

[15] Akerman M, Pejcˇ ic´ N, Velicˇkovic´ I. A review of the quadratus lumborum block and ERAS. Front Med. 2018; 5:44.

[16] Dam M, Hansen C, Poulsen TD, et al. Transmuscular quadratus lumborum block reduces opioid consumption and prolongs time to first opioid demand after laparoscopic nephrectomy. Regional Anesthesia & Pain Medicine 2021; 46:18-24.

[17] Tulgar S, Kose HC, Selvi O, et al. Comparison of ultrasound-guided lumbar erector spinae plane block and transmuscular quadratus lumborum block for postoperative analgesia in hip and proximal femur surgery: A prospective randomized feasibility study. Anesth Essays Res 2018; 12:825-31.

[18] Hansen CK, Dam M, Steingrimsdottir GE, Laier GH, Lebech M, Poulsen TD, et al.Ultrasound-guided transmuscular quadratus lumborum block for elective cesarean section significantly reduces postoperative opioid consumption and prolongs time to first opioid request: a double-blind randomized trial. Reg Anesth Pain Med. 2019 Jul 14.

[19] Hansen C, Dam M, Nielsen MV, Tanggaard KB, Poulsen TD, Bendtsen TF, et al. Transmuscular quadratus lumborum block for total laparoscopic hysterectomy: a double-blind, randomized, placebo-controlled trial. Reg Anesth Pain Med. 2021 Jan;46(1):25-30.

[20] Tamura T, Kitamura K, Yokota S, Ito S, Shibata Y, Nishiwaki K. Spread of Quadratus Lumborum Block to the Paravertebral Space Via Intramuscular Injection: A Volunteer Study. Reg Anesth Pain Med. 2018 May;43(4):372-7.

[21] Carline L, McLeod GA, Lamb C. A cadaver study comparing spread of dye and nerve involvement after three different quadratus lumborum blocks. Br J Anaesth. 2016 Sep;117(3):387-94.

[22] Dam M, Moriggl B, Hansen CK, Hoermann R, Bendtsen TF, Børglum J. The Pathway of Injectate Spread With the Transmuscular Quadratus Lumborum Block: A Cadaver Study. Anesth Analg. 2017Jul;125(1):303-12.