

COMPARATIVE STUDY OF POSTERIOR AND TRANSMUSCULAR APPROACHES OF ULTRASOUND GUIDED QUADRATUS LUMBORUM BLOCK FOR POSTOPERATIVE ANALGESIA IN PRIMIGRAVIDA PATIENT UNDERGOING ELECTIVE LOWER SEGMENT CESAREAN SECTION

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Abstract

Background: Lower segment cesarean section (LSCS) is one of the foremost common surgical procedures performed in gynaecology and obstetrics within the world. Effective management of postoperative pain is imperative to permit the newly delivered parturients to care for their newborn infant and help for early ambulation which may reduce the risk of thromboembolism. Quadratus Lumborum Block (QLB) is one of the abdominal wall block technique used to anesthetize thoracolumbar nerves. And it has been described to provide adequate postoperative analgesia. **Materials and Methods:** This study was conducted on 40(20 patients in each group) primigravida patients of ASA II between age 20-30 years undergoing elective lower segment cesarean section under spinal anesthesia. Patients received either posterior approach (Group A) or transmuscular approach (Group B) Quadratus Lumborum Block. Time elapsed to first request for rescue analgesic were documented as primary outcome, quoted as duration of analgesia. The secondary outcomes recorded were VAS score at rest, cumulative postoperative intravenous opioid consumption and incidence of postoperative nausea and vomiting. **Result:** Our study demonstrated a statistically significant difference between groups according to time to first rescue analgesic in hours with p value <0.05. VAS score from T1 to T24 also showed significant difference. Cumulative postoperative 24 hour opioid consumption was greater in group A compared to group B. And there was no statistical difference in both groups with respect to incidence of postoperative nausea and vomiting. **Conclusion:** This current study showed that transmuscular approach of block achieves better postoperative pain management compared to posterior QL block.

INTRODUCTION

Lower Segment Cesarean section (LSCS) is one of the foremost common surgical procedures performed in gynecology and obstetrics within the world, which is in a relentlessly expanding trend.^[1] Effective management of postoperative pain is imperative to permit the newly delivered mothers to care for their newborn infants. In expansion, effective postoperative analgesia helps the parturient for early ambulation which may decrease the hazard for thromboembolism.^[1] Opioids are still considered as

the foundation of the postoperative analgesia, whereas they are related with critical unfavorable impacts such as nausea, vomiting and pruritis which may diminish the in general patient satisfaction. In addition, it too has potential chance for opioid misuse and delayed maternal respiratory depression make need to develop opioid sparing techniques. The Quadratus Lumborum Block (QLB) is one of the abdominal wall block techniques used to anesthetize thoracolumbar nerves. The QLB technique was depicted at first by Blanco et al.^[2] In 2007. QLB under ultrasound has been popularized in regional

anesthesia over the last few years given the vast number of indications in a variety of abdominopelvic surgeries in pediatrics and adults. It moreover has been appeared to have opioid sparing effects and prolonged post-operative analgesia than more conventional procedures like Transverse Abdominis Plane (TAP) block.^[3,4] It has picked up expanding consideration for its potential capability to provide both visceral and somatosensory torment alleviation. It was detailed that this impact was probably due to the more extensive spread of the local anesthetic beyond the transverse abdominis plane into the paravertebral plane.^[5] At the minute, a few approaches for QLB have been detailed concurring to the position of the needle tip and the approach of the needle; primary among them are - lateral (QLB type 1), posterior (QLB type 2), trans muscular anterior, QLB-TM /QLB-3). In posterior QLB approach, targets local anesthetic to the posterior aspect of the quadratus lumborum muscle, between this muscle and the overlying erector spinae muscle group. The transmuscular QLB, also referred to as the anterior QLB, requires the block needle to transverse the muscle belly of quadratus lumborum and targets local anesthetic to anterior aspect of the quadratus lumborum muscle, where it borders psoas muscle.^[6] In this study, we intend to compare the postoperative pain relieving impact of posterior and transmuscular ultrasound guided approaches of QLB for Lower segment Cesarean section.

MATERIALS AND METHODS

This is a prospective randomized controlled double-blinded clinical study. The study was performed after approval of the institutional ethical committee in GMERS Medical college, Junagadh. We took informed written consent from all parturient for participating in the study and for portraying the block technique. Study was conducted on 40 (20 patients in each group) primigravida patients of ASA grade II age between 20-30 years undergoing elective Lower segment Cesarean section under spinal anesthesia.

Calculation of sample size: We have used data from a previous similar kind of study to calculate the sample size. Using MedCalc software, taking in consideration- time to first postoperative analgesia(minutes) in posterior group 34.56 (Standard deviation) and in transmuscular group 102.49 (Standard deviation), sample size comes to 18 in each group at alpha error 0.01 & beta error 0.01. So with addition of 20% non-response rate sample size comes to 20 in each group. So required final sample size will be 20+20= 40.

Patients were randomly allocated using sealed envelope into two groups. Group A: In this group of patients, received ultrasound guided posterior QLB; using 20 ml of 0.25% Ropivacaine at the end of Cesarean section. Group B: In this group of patients, received ultrasound guided transmuscular QLB; using 20 ml of 0.25% Ropivacaine at the end of Cesarean section.

Inclusion criteria

1. Primigravida patients posted for elective Cesarean section surgeries under spinal anaesthesia only.
2. Age between 20-30 years.
3. Patients giving informed written consent
4. ASA physical status II.

Exclusion criteria

1. Patients posted for emergency lower segment cesarean section
2. Allergy to local anesthetics
3. Inability to cooperate for the procedure like as in Intellectual disability
4. Active infection at the injection site
5. Pre-existing neural deficits along with the distribution of block
6. Known coagulopathies
7. Patients on antithrombotic drugs
8. Patients who has current acute or chronic pain conditions
9. ASA -III, IV, V physical status

Study Procedure

After getting Institutional ethical committee approval from GMERS Medical college, Junagadh and informed written consent, 40 primigravida patients were arbitrarily allocated in two groups. Inside the operation theatre, within the preop room, patient were adequately explained about the study that we were conducting and how she is a vital part of it. And we had explained her about visual analogue scale(0-no pain to 10- maximal pain).

Intravenous access was secured and IV fluids started. Patients were monitored with electrocardiography, noninvasive blood pressure and pulse oximetry measurement. Intravenous infusion commenced with Ringer's Lactate solution to replace the fluid loss owing to 8 hr fasting. Patients were given oxygen through nasal cannula (@4L/ min). Patients in both groups had received inj. glycopyrolate 0.01mg/kg and inj. ondansetron 0.15mg/kg as a premedication. Patients in Group A received ultrasound guided posterior QLB at the end of Cesarean section operation. And patients in group B received ultrasound guided transmuscular QLB. The setup for both the blocks is same. The patient is positioned in lateral decubitus position with a pillow under the hip with the side to be injected uppermost. A curvilinear probe with a frequency of 2 to 6 Hz is used to perform the block. Placed the ultrasound probe horizontally just cranial to the iliac crest. The "Shamrock sign" made visible (3 muscles- the psoas muscle, the QLM and erector spinae, cluster around transverse process to resemble a shamrock).

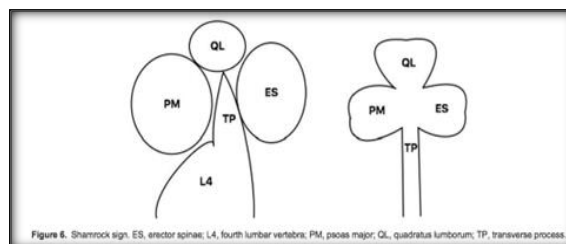


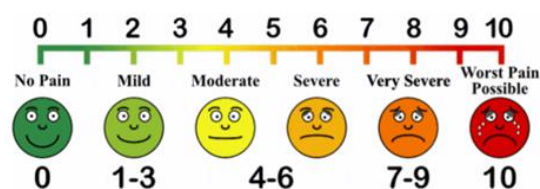
Figure 6. Shamrock sign. ES, erector spinae; L4, fourth lumbar vertebra; PM, psoas major; QL, quadratus lumborum; TP, transverse process.

The posterior QLB required the local anesthetics to be injected more posterior on the QLB, between the muscle and the thoracolumbar fascia. The needle insertion point is anterior to the probe. Advanced the needle, in-plane, in a slightly shallower trajectory to reach a point on the dorsal surface of the QLM. The aim was to deposit the local anesthetics between the QLM and the thoracolumbar fascia, which separates the muscle from the latissimus dorsi or the paraspinous muscle. The same procedure were repeated on both sides for all patients.

The transmuscular QLB is performed in the lateral position with a posterior insertion point. The needle is inserted posterior to the probe. It involved identifying where the QLM meets the psoas muscle as it attaches to the transverse process of L4. The direction of needle trajectory is anterolateral. The needle advanced through the posterior lamina of the thoracolumbar fascia, the belly of the QL, the anterior layer of fascia investing the QLM until it reaches the endpoint (between the psoas muscle and the QLM). This is the location for local anesthetic deposition. Procedure will be repeated again on the other side too. Patients were shifted to the post anesthetic care unit (PACU) after giving the block. At the 1st,2nd,4th,6th,8th,12th and 24th postoperative hours, the VAS score was recorded at rest, the time elapsed to first request for rescue analgesic and total analgesic drug requirement were be noted and compared between 2 groups. Patients were given 100mg iv infusion of Inj Tramadol when VAS score at rest is more than 4 at any time patient complaining of pain. In any case of reported nausea and or vomiting, Inj Ondansetron 4mg iv were administered. Patient will be closely observed for any complications till 24 hours. The time elapsed to first request for rescue analgesic were documented as the primary outcome, quoted as the duration of analgesia. The secondary outcomes recorded were pain score (VAS score) at rest cumulative postoperative intravenous opioid consumption (in milligram morphine equivalents) and incidence of postoperative nausea/vomiting. The advantage of QLB compared to other abdominal wall blocks is the fact that the passage of the needle and the site of local anesthetic application are very distant from the peritoneal cavity, visceral abdominal organs and large blood vessels. So, injuring it by

needle trauma is rare. A possible complications that can occur with transmuscular QLB is unwanted femoral nerve block. Though rare, local anesthetic systemic toxicity (LAST) can also happen. As the QLB performance involves manipulation of fascia where blood vessels exit from the paravertibral space, caution should be taken in people receiving anticoagulant therapy due to the possible risk of hematoma. All resuscitation equipments and drugs were kept ready inside the operation theatre.

After data tabulation in Microsoft Excel descriptive and analytic statistics were performed for the two study groups using Epi info software. P value of less than 0.05 will be considered significant. Independent Students' t-test will be carried out to compare time to first request for rescue analgesia, VAS score and cumulative postoperative opioid consumption. And incidence of postoperative nausea and vomiting (PONV) will be compared between the groups using Chi-square test.



RESULTS

The results of the present study are demonstrated in the following tables.

The 2 groups were comparable with respect to demographic variables. The mean age of Group A was 22.7 and that of Group B was 23. p value was calculated using t- test. There was no significant difference between two groups. [Table 1]

[Table 2] shows the comparison of time to first rescue analgesia in hours . There was a significant difference between 2 groups. The mean in group A was 5.5 hours and that of B was 10 hours. T-test were used for this result.

There was a significant difference between VAS score from T1 to T 24. Result acquired using t-test. There was a statistically significant difference between 2 groups from T1 to T24. [Table 3]

Table 1: Demographic distribution of patients.

Variables	Group A		Group B		P value
	Mean	SD	Mean	SD	
Age (years) (mean+/-standard deviation)	22.7	6.12	23	5.68	0.349
BMI (Kg/M2) (mean +/- standard deviation)	22.85	0.98	23.25	1.67	0.1392
Gestational age (weeks) (mean +/-standard deviation)	38.8	0.6	38.5	0.5	0.0940

*BMI= Body mass index

Table 2: Time to first request for rescue analgesia

	Group A		Group B		P value
	Mean	SD	Mean	SD	
Time to first request for rescue analgesia(hours)	5.5	5.43	10	8	0.0449

Table 3: VAS score at rest

VAS at rest	Group A		Group B		P value
	Mean	SD	Mean	SD	
1 hr	2.05	0.26	1.7	0.22	0.0299
2 hr	3.2	0.48	2.05	0.05	< 0.00001
4 hr	3.65	0.24	2.9	0.52	0.000427
6 hr	3.75	0.62	3.1	0.41	0.006746
8 hr	2.8	1.64	2	0.95	0.0322
12 hr	2.4	0.67	1.75	1.04	0.0323
24 hr	2.1	0.52	1.4	0.25	0.000984

Table 4: Cumulative postoperative opioid consumption (no of doses)

	Group A		Group B		P value
	Mean	SD	Mean	SD	
24 hours	0.4	0.5026	0.1	0.3078	0.0285

1 dose = 100 Mg Tramadol IV infusion

Table 5: Incidence of postoperative nausea/vomiting

	Group A	Group B	P value
PONV in 24 hours	3	4	0.677318

When compared to Group A, Group B displayed significantly lower opioid consumption. The above result was obtained by using ANOVA test. [Table 4] There was no significant difference between the incidence of postoperative analgesia. This result was obtained using Chi-square test. [Table 5]

DISCUSSION

With expanding USG utilization and improving the success rate of truncal blocks have become an imperative component of multimodal analgesia care. Ultrasound guided QLB block has become the most recent popular method of postoperative pain relieving method after abdominal surgeries. There are studies which shows the superiority of QLB over transversus abdominis plane block.^[7-9] There are different types of QLB according to the needle position. The popularly described approaches are lateral, posterior and anterior/transmuscular. The needle tip's injection position has a critical effect on the pain relieving adequacy of QLB. A recent cadaver study demonstrated that if needles are misplaced, and if provided to patients, they would not offer postoperative pain relieving impact, even if they were conducted by an expert anaesthetist with wealthy encounter in cadaver regional anaesthesia. This study was done with QL1 and QL2 blocks.^[10-14] Thus we can conclude that needle position can altogether change the efficacy of QLB. In this study we were trying to compare the analgesic efficacy of ultrasound guided posterior and transmuscular approaches.

This study demonstrated that there was a highly statistically significant difference between groups according to time to first postoperative analgesia (in hours) of Tramadol 100 Mg iv infusion with a p value of 0.0449. Group B, that is posterior QL block showed 10 hours of postoperative analgesia compared to Group A; anterior QL block which only had a mean of 5.5 hours. The same results were reflected in VAS score assessment too. There was a statistically significant difference between groups

according to VAS score at T1 to T24 with p value <0.05. When compared to group A, group B showed significantly lower opioid consumption in 24-hour postoperative period. Our results indicated that ultrasound guided QL3 block (transmuscular/ anterior) has superior analgesic effects after lower segment cesarean section relative to that of QL2 (posterior). There was no significant difference in the incidence of postoperative nausea/vomiting.

In this study QL block was performed in lateral position and we were expecting discomfort from the patients as it is uncomfortable for parturients to lie in the lateral posture following surgery. We avoided supine posture and via anterolateral route because some earlier studies shows that this method could have increased risk of needle misplacement and thus more challenging to use. We thus concluded that, although QL2 would be helpful in reducing pain, it is an unsatisfactory method after LSCS because of needle misplacement issues and anatomical variations. According to our research the block giver should proceed with caution while executing this block.

Because the QL3 block is unaffected by alteration in connective tissue architecture, it is significantly more effective than QL2 block. The quadratus lumborum can provide a clear and distinct end point for the QL3 block needle tip, in addition to anesthetic diffusion that occurs both posteriorly and lateral to the psoas muscle. Moreover, anesthesia with QL3 block mostly penetrates in to the thoracic paravertebral space and posterior to arcuate ligaments. QL3 block is a deeper nerve block than QL2 block and thus complications like hemorrhage and organ damage can be seen in prevalence more compared to QL2 block. But very rarely this kind of serious complications occurs after QLB. And our study demonstrates no such complications.

The results of our study are in accordance with that found out by a study by Ahmed salah et al, which also showed that type 3 QL block is superior to type 2 QL block.^[7]

Yetik et al.'s investigation revealed the same outcome: patients who received QLB 3 had considerably reduced VASR and VASD (resting visual analog scale, dynamic visual analog scale) scores, with the exception of the T0 hour. The QL3 group also required less PCA, consumed less tramadol, and had a longer time span before needing an analgesic. Additionally, the QL3 group's patient satisfaction was noticeably greater.^[8] In a similar study done by Ahmed et al similar results were formulated. The study was done in patients undergoing unilateral hernia repair surgery. The block duration in the QLB-3 group was noticeably longer than in the QLB-2 group (20.1 + 6.2 h versus 12.0 + 4.8 h, respectively). The QLB-3 group saw a statistically significant reduction in their VAS score both immediately and 12 hours after surgery. For the initial analgesic request and for postoperative morphine use, the QLB-3 group demonstrated a statistically significant delay in their requests.^[10,15]

CONCLUSION

The current study found out that quadratus lumborum block plays a significant effect in the treatment of postoperative pain following lower segment cesarean delivery. QL3/transmuscular block is the superior approach and showed analgesic efficacy better to QL2/posterior approach.

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