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Comparison of Transversus Abdominis Plane Block and Quadratus Lumborum Block for Analgesia In Elective Caesarean Section: A Comparative Study

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ABSTRACT

Background*: Effective post-operative analgesia after caesarean section (CS) is important because it facilitates early amelioration, ambulation and expedites breastfeeding. The Quadratus lumborum (QL) block is a posterior abdominal wall block not commonly practised. Very few studies have been conducted to compare the analgesia between TAP block and QL block in caesarean section under spinal anaesthesia in the Indian population. So, in our study we will compare the analgesic efficacy of QL block with TAP block in elective caesarean section under spinal anaesthesia.*

Materials and Methods*: In this prospective, double blinded, single hospital study, 72 patients scheduled for elective CS were randomised to receive ultrasound guided TAP block (n=36) or QL block (n=36) bilaterally with 0.2% ropivacaine. The primary objective was to compare the duration of analgesia and secondary objectives included comparison of total analgesic dose required over a period of 24 hours and comparison of the severity of post operative pain assessment via numerical rating score (NRS). The statistical analyses were done using PSW software version 21.0. Data were compared using chi-square test and student's t-test.*

Results: *The duration of analgesia was higher in the QL group (mean± SD:716.7 ± 113.1mins) than the TAP group (mean ± SD: 426.4 ± 245.6 mins) with p value <0.001. The QL group had significantly less analgesic demand (p value < 0.001) at2, 4, 6, 12, 24 post caesarean hours. The NRS score was significantly reduced in the QL group.*

Conclusion: *The QL block provided prolonged and effective analgesia in comparison to TAP block upto 24 hours post caesarean section.*

KEYWORDS: Caesarean section, quadratus lumborum block, transversus abdominis plane block.

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I. INTRODUCTION

Effective post-operative analgesia after caesarean section (CS) is important because it facilitates early amelioration, ambulation and expedites breastfeeding. It prevents various undesirable side effects such as respiratory complications, venous thromboembolism, and increased hospital stay.[1]

Multimodal analgesia techniques have been applied in post operative pain management, such as NSAIDs, opioids, regional anaesthesia etc. Amongst these, regional anaesthesia is widely practised nowadays and gaining popularity. Various truncal blocks are used for analgesia for caesarean section such as transversus abdominis plane block, rectus sheath block, erector spinae block, quadratus lumborum block etc.

The transversus abdominis plane (TAP) block involves injecting local anaesthetic into the plane between Transversus abdominis and Internal oblique, which block the sensory nerve supply to the anterior abdominal wall. TAP block is an easy and most commonly done procedure for post-operative analgesia, as already been established in many studies[2,3,4]

The Quadratus lumborum (QL) block is a posterior abdominal wall block which permits spread of local anaesthetic agent around the quadratus lumborum muscle into a triangular space known as a lumbar interfascial triangle which lies beside the middle layer of the thoracolumbar fascia.[5] It is gaining popularity for post operative pain relief following caesarean section.

This study aims to compare quadratus lumborum block and transversus abdominis block in patients undergoing elective caesarean section under spinal anaesthesia with primary objective to compare the duration of analgesia and secondary objective to compare the total number of analgesic doses required over a period of 24 hours and to compare the severity of post operative pain assessment via numerical rating score (NRS) scale.

II. MATERIAL AND METHOD

This prospective, randomised, patient and observer blinded, single hospital study was carried out after prior permission and approval from the Hospital Ethical Committee after fulfilling the norms (No.MC/190/2007/Pt-11/July-2021/TH-22) and after obtaining informed and written consent from the participants of the study. This study was registered with Clinical Trial Registry-India (Registration no: CTRI/2022/08/044599).

Sample size calculation was done considering level of significance to be 5% and power of study to be 80%. Based on a previous study[1], considering the mean (Standard deviation) to be 15.1+/- 2.12 hours, to detect a difference of 90 minutes in the duration of analgesia between two groups, 31 patients are needed in each group. Considering dropout rate of 15%, there will be 36 patients in each group with a total sample size of 72 patients.

The study was carried out in parturients between the age of 18 to 35 years, scheduled for elective caesarean section under spinal anaesthesia with ASA physical status 2, and a normal singleton pregnancy with a gestational period of minimum 37 weeks. Exclusion criteria were allergy to study drugs, infection at the site of block, known coagulopathy or patients on anticoagulation therapy, pregnancy induced hypertension, gestational diabetes mellitus, foetal distress, cardiac disease, kidney disease and patients with morbid obesity. Written and informed consent was obtained from each patient.

Seventy-two patients meeting the inclusion criteria and consenting to participate in the study were divided into two groups – A and B, by a computer-generated random selection using block randomisation with blocks of variable sizes. Group A (n=36): Patients received bilateral ultrasound guided Transversus Abdominis Plane block with 0.2 ml/kg 0.2% Ropivacaine. Group B (n=36): Patients received bilateral ultrasound guided Quadratus Lumborum block with 0.2 ml/kg 0.2% Ropivacaine. Concealment of allocation was done by opaque sealed envelope technique.

The patients were explained in detail about the procedure of the study during pre-anaesthetic check-up. The patients were kept nil orally for 8 hours preoperatively. On the day of operation, a designated resident not involved in the study opened the sealed envelopes, once the patient was shifted to the operation theatre. Standard monitoring in the form of measurement of baseline heart rate, ECG, non-invasive arterial blood pressure and peripheral oxygen saturation(spo2) was done. An intravenous infusion line was secured prior to the application of proposed block and Ringer's lactate was started.

Once the patient was in the operating room, before giving spinal anaesthesia, the patient was placed in supine position with around 15-degree lateral tilt using wedge under the right buttock. A designated resident, who was not involved in the study performed the block as per group allocation.

Under all aseptic and antiseptic precautions, the abdomen was cleaned with povidone iodine and spirit. Thereafter, ultrasound guided Transversus Abdominis Plane block or Quadratus Lumborum block, according to group allocation, was performed by an experiencedanaesthesiologist not involved in the study based on group allocation.

For the TAP block[2], the 6 – 13 MHz linear array probe was placed between iliac crest and costal margin on the lateral abdominal wall in the mid axillary line. Probe was aligned, rotated, and tilted in such a way that clear optimized image of three muscle layers- external oblique, internal oblique and transversus abdominis were obtained and transversus abdominis plane block was identified. After skin infiltration with 2% lignocaine, a 20-gauge spinal needle was inserted in the mid axillary line. On the ultrasound machine screen, needle tip and shaft were identified and the needle tip was progressed until it was in between the plane of internal oblique and transversus abdominis. A total of 0.2 ml/kg 0.2% Ropivacaine was injected after hydro dissection. The same procedure was repeated on the other side as well.

For the QL block[2], with the patient positioned in the lateral position, the curvilinear probe of 2-5 Hz frequency was placed in the midaxillary line between the iliac crest and the costal margin, moving the probe posteriorly until the three abdominal muscle layers –External oblique, Internal oblique and Transverses Abdominis got tapered and Quadratus Lumborum muscle appeared. The fascia transversalis was noted as a hyperechoic layer that separates the muscle layers from the fat and the abdominal contents below. Then, the transducer probe was moved posteriorly until appreciation of the lumbar interfacial triangle. After skin infiltration with 2% lignocaine, a 20-gauge spinal needle was inserted until it was deposited in the posterior

aspect of Quadratus Lumborum muscle in the plane between the Quadratus Lumborum muscle and the Erector Spinae, Latissimus dorsi, Serratus Posterior muscles, in between the layers of Thoracolumbar fascia, in the lumbar interfacial triangle (LIFT). A total of 0.2 ml/kg 0.2% Ropivacaine was then injected after hydrodissection. The spread of injectate was observed ultrasonographically. The same procedure was repeated on the other side also.

After the blockwas performed, spinal anaesthesia was administered by another junior resident anaesthesiologist not involved with study. 2.2ml of hyperbaric bupivacaine 0.5% was administered intrathecally if the patient's height was ≥ 150 cm or 2.0 ml was used if patient's height was < 150 cm, with inj. buprenorphine 0.2ml (60 µg) as per our institutional protocol at a rate of 0.2 ml/sec.

Duration of analgesia[2] was designated as the primary outcome and defined as the time from injection of drug administration to the first dose of rescue analgesia.

Other parameters evaluated were included in the secondary outcomes. Analgesia was assessed at 2, 4, 6, 12, 24 post-operative hours by another resident not involved in the study using a pre-validated non-invasive pain scoring system i.e., Numerical Rating Scale. In NRS scale, patients are asked to circle the number between 0 to 10 that fits best to their pain intensity. 0 represents "no pain at all" whereas 10 represents "the worst pain ever possible''. Intravenous tramadol 50 mg stat was used as rescue analgesic, when NRS score was more than 4 or at patient's request.

III. RESULT

For this study 114 patients were screened for inclusion criteria. Out of these,72 eligible patients were randomised into 2 groups using block randomisation with blocks of unspecified sizes. The flow of patients in the study is shown in the consort flow diagram (Figure 1)

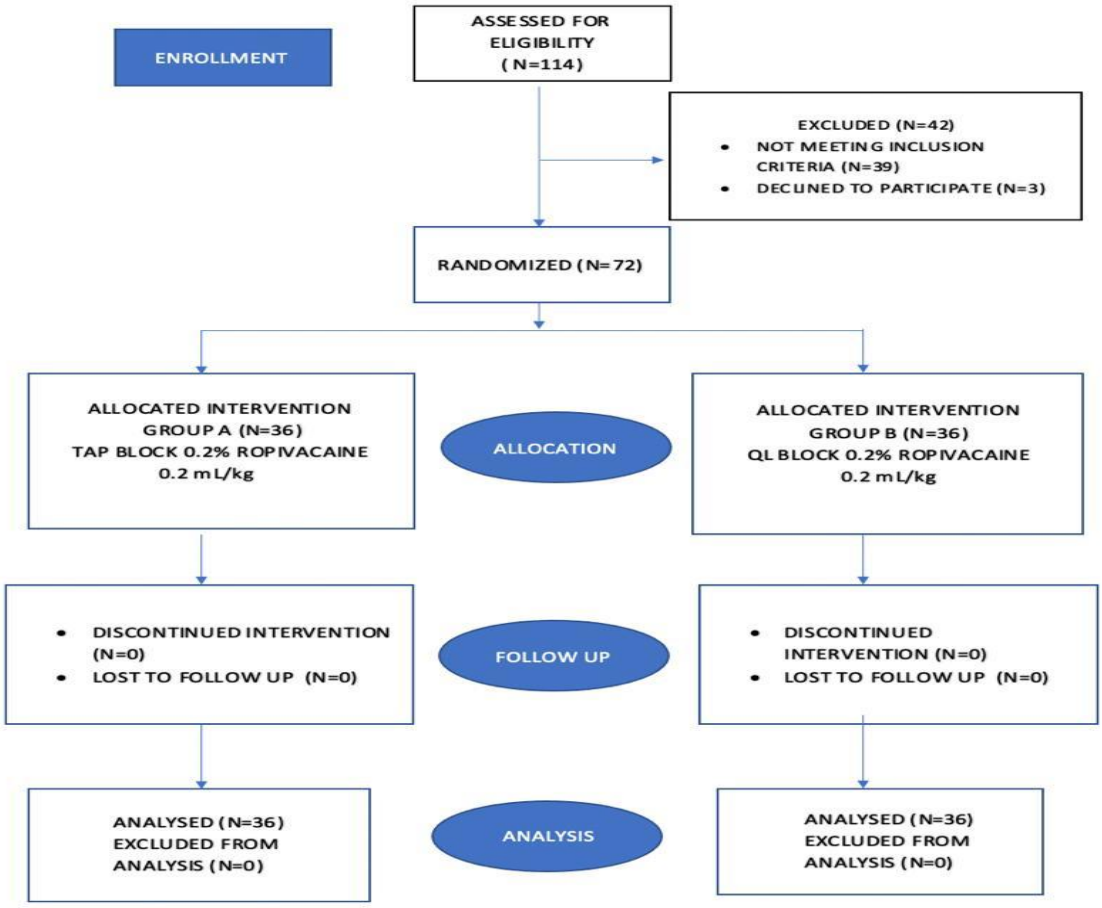

FIGURE 1: Consort flow diagram

The two groups were comparable in terms of demographic parameters and surgical times, as shown in the table below.

Table 1: Demographic variables

Demographic parameters	Group A	Group B
age	25.6±4.1	25.3±4.1
Weight (kg)	55.75±4.89	54.03±5.59
Height (m)	1.55±0.34	1.54±0.40
Duration of surgery (mins)	43.8±5	43.9±5.1

As per the primary outcome, duration of analgesia was significantly prolonged in Group QL as compared to Group TAP (716.7±245.6 mins vs 426.4±113.1 mins, p value < 0.001) (Figure 2)

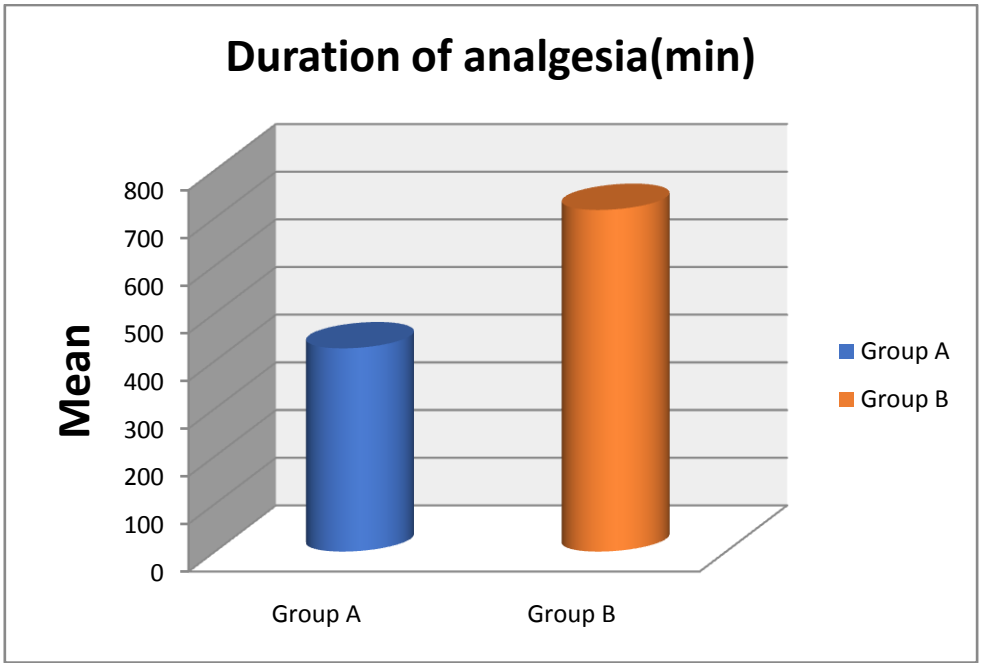

FIGURE 2: Distribution of duration of analgesia in both the groups

On comparing the NRS score between the two groups, it was found that at 2nd post-operative hour, there was statistical difference of NRS score between group A and group B. However, statistical difference of NRS scores was highly significant at 6th post operative hours, with group B demonstrating significantly lower pain score values. This difference was lost beyond the 12th post operative hour i.e., NRS at 12th and 24th hours were comparable between the two groups (figure 3)

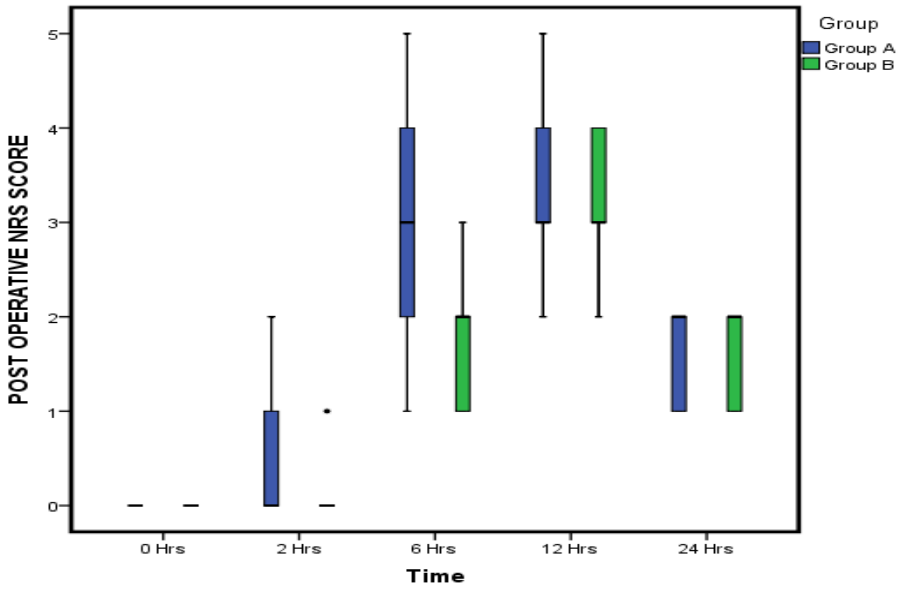

FIGURE 3: Distribution of NRS score at various time intervals

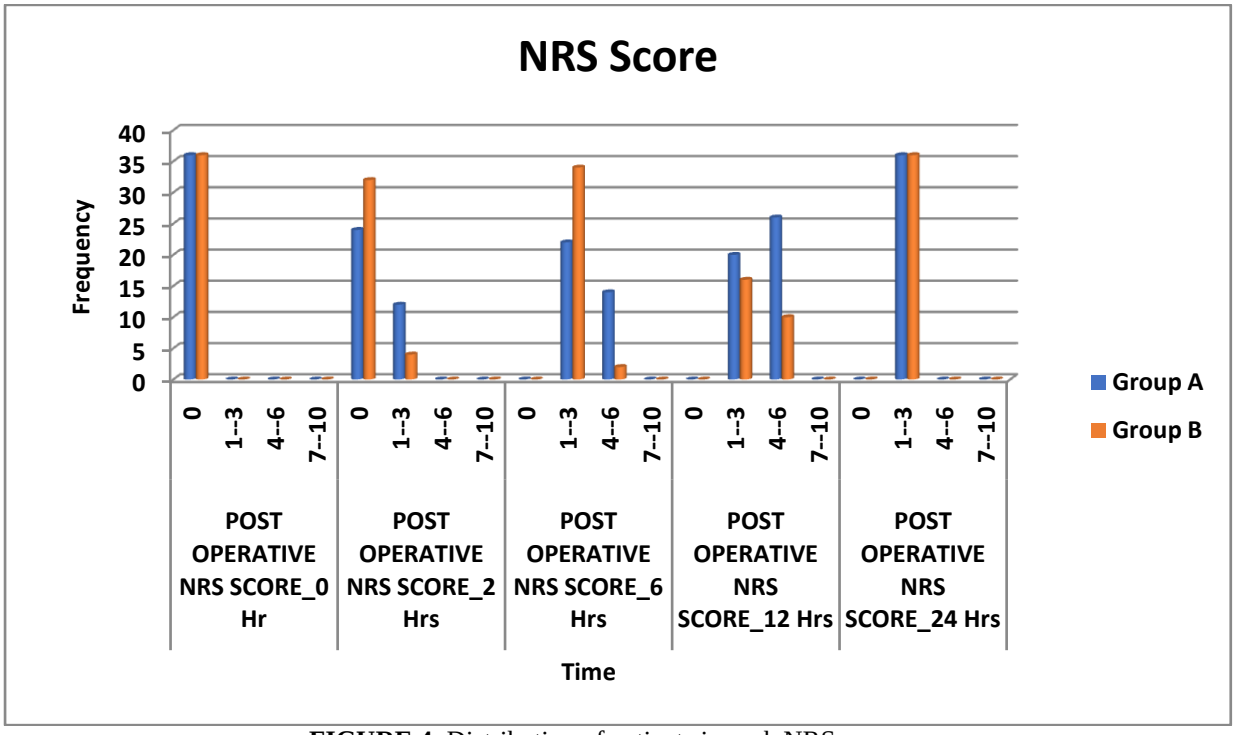

FIGURE 4: Distribution of patients in each NRS group

In our study we divided the NRS SCORE of patients into 3 pain groups:

- 0-3 NRS – no pain/mild pain
- 4-6 NRS – moderate pain
- 7-10 NRS – severe pain

All patients in 1st 2 hours postoperatively were in group 0-3 NRS.
At 6 hours, 38.8% patients in group A complained of moderate pain whereas only 0.05% patients in group B were in moderate pain group. Thus, the difference between the two groups were statistically highly significant at 6th post operative hours.
At 12th and 24th post operative hours, the difference between the two groups were not significant. (Figure 4)
In Group QL, the requirement for analgesia over 24 hours reduced significantly as compared to Group TAP (figure 5).

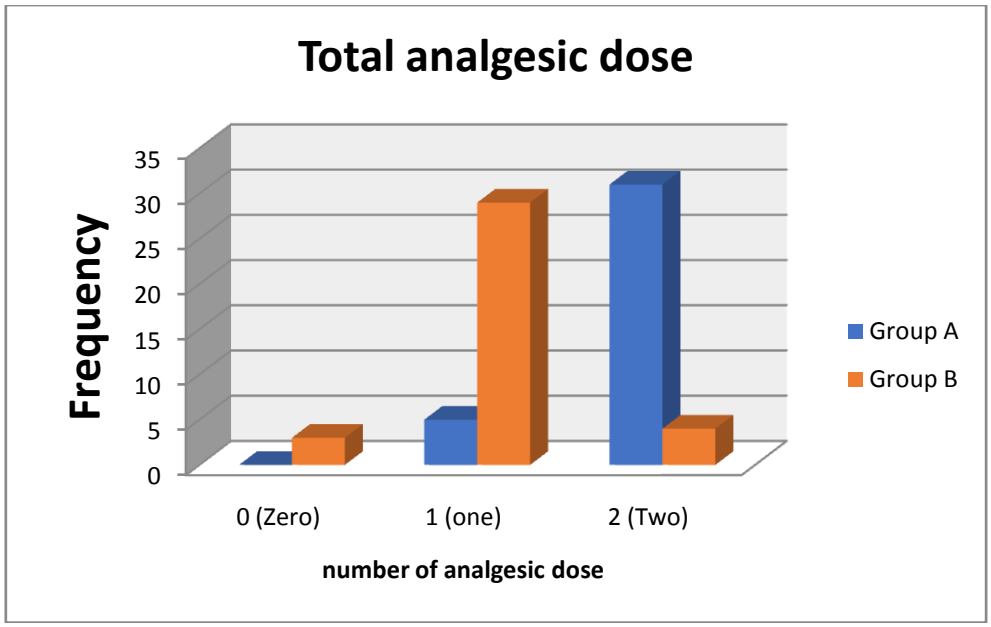

FIGURE 4: Distribution of use of rescue analgesia in both the groups

IV. Discussion

In our study, the duration of analgesia observed in group A (group receiving bilateral Transversus Abdominis Plane block) was 426.4 ± 113.1 minutes and in group B (group receiving bilateral type 2 Quadratus Lumborum block) it was 716.7 ± 245.6 minutes. The difference between the two groups was highly significant. This finding of our study is consistent with the findings of **Kalpana Verma et al.**[1]**in 2019** who also studied the analgesic efficacy of transversus abdominis plane block and quadratus lumborum block in caesarean delivery. The time to first analgesic request in their study was found to be 13.3± 1.21 hours in the transversus abdominis (TAP) group, while it was 68.77 ± 1.74 hours in the quadratus lumborum (QL) group. Similar findings were also noted by **R Blanco et al.**[3]**in 2016** who conducted a trial of quadratus lumborum block and transversus abdominis plane block for post operative pain relief in caesarean delivery. Similar findings were also noted by **Naglaa Khalil Yousef et al.**[2] **in 2018** comparing ultrasound guided bilateral TAP block versus bilateral QL block in patients undergoing total abdominal hysterectomy and observed that duration of post operative analgesia was higher (15.1±2.12 hour) in QL group than in TAP group (8.33±4 hour).

This shows that Quadratus Lumborum block produces long-lasting analgesia than the Transversus Abdominis plane block in patients undergoing caesarean section under spinal anaesthesia.

Naglaa Khalil Yousef et al.[2] compared ultrasound guided TAP block and QL2 block in patients undergoing total abdominal hysterectomy and post op analgesia was assessed by VAS scale at 30 min, 2, 4, 6, 12, 24 post operative hours. Their result showed VAS score was higher in TAP group than in QL2 group at all the measured time post operatively.

Moreover, inour study, we found that the need for rescue analgesia in the TAP group was significantly higher than QLB group. Similar findings were also found by **Kalpana Verma et al.**[1] where the requirement of rescue analgesia in group QLB was significantly reduced as compared to TAP group.

For analgesia following caesarean section QLB1, QLB2 and transmuscular QLB have been shown to be efficacious[4] . However, QLB2 requires a more superficial point of injection which offers better ultrasonographic resolution, thereby making the approach easier and safer. In our study we performed type 2 or posterior QLB. Similar approaches are also used by **Kalpana Verma et al.**[1] and **R Blanco et al.**[3] who compared TAP block with posterior or type 2 QLB in caesarean section.In our study we have performed both QL2 Block and TAP Block with 0.2 ml/kg 0.2% Ropivacaine bilaterally which is similar to the study done by **Kalpana Verma et al.**[1]

V. Conclusion

The current results showed that QL block produces prolonged duration of analgesia than TAP block in patients with caesarean section under spinal anaesthesia.

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