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RESEARCH ARTICLE
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POSTOPERATIVE PAIN RELIEF IN CAESAREAN SECTION: A COMPARATIVE STUDY OF TRANSVERSALIS FASCIA PLANE BLOCK, QUADRATUS LUMBORUM BLOCK AND ILIOINGUINAL ILIOHYPOGASTRIC NERVE BLOCK.

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ABSTRACT

BACKGROUND:
Caesarean delivery is the most commonly performed abdominal surgery in the world, and it can be associated with severe postoperative pain.Poor postoperative pain control may delay functional recovery, impair mother–baby interaction, complicate breastfeeding, delays mobilisation and increase the risk of persistent postsurgical pain. Current practices for post-cesarean delivery analgesia include neuraxial opioids and/or local anaesthetics and nonopioid analgesics, such as nonsteroidal anti-inflammatory drugs and acetaminophen, regional blocks[1].

KEY WORDS: Quadratus lumborum (QL) block,Transversalis fascia plane block(TFPB),(ILIH) Ilioinguinal-Iliohypogastric Nerve Block, VAS and dynamic VAS.

OBJECTIVE:
This study aims to compare analgesic efficacy of transversalis fascial plane block (TFPB) vs quadratus lumborum block (QLB) vs Ilioinguinal Iliohypogastric (ILIH) block in women undergoing caesarean section under neuraxial anesthesia.

MATERIALS AND METHODS:
An observational single blinded study was done on 90 parturients who were divided into 3 groups - T,Q,I of 30 each. Group T received transversalis fascial plane block (TFPB),Group Q received quadratus lumborum block (QLB), Group I received Ilioinguinal Iliohypogastric (ILIH) block with 0.25% levobupivacaine and 8 mg dexamethasone - 30ml on right and left side.

RESULTS:
- The total analgesic demand in the first 24h was reduced in the Quadratus lumborum(QL) group(0.74 ± 0.24)compared to that of the Transversalis fascia plane block(TFPB) group and (ILIH) Ilioinguinal-Iliohypogastric Nerve Block group. The patient's postoperative resting and dynamic

VAS ratings were similar, except for the first hour ratings.
- QL had prolonged analgesic effect at 24hrs when compared to TFPB and ILIH block with an effect lasting for 19-24hrs. The mean±standard deviation of time for first analgesic request for QL block was (21.28 ± 2.46) hrs, TFPB (20.1±2.28) hrs, ILIH (16.57±2.45) hrs.

CONCLUSION: The three blocks- ILIH, TFPB, QL block provide reliable postoperative analgesia after caesarean section,but the QL block provides prolonged and better quality of analgesia compared to other two blocks.

INTRODUCTION:

- Caesarean delivery is the most commonly performed abdominal surgery in the world, and it's associated with severe postoperative pain. Poor postoperative pain control may delay functional recovery, impair mother–baby interaction, complicate breastfeeding,delays mobilisation and increase the risk of persistent postsurgical pain[2]. Current practices for post-cesarean delivery analgesia include neuraxial opioids and/or local anaesthetics and nonopioid analgesics, such as nonsteroidal anti-inflammatory drugs and acetaminophen and regional blocks. The practice of regional nerve block techniques for postoperative pain management is rising, and demonstrated a decrease requirement of supplementary analgesia[3].

- ***Anatomy and Innervation of the Uterus and Related Structures:***
- The lower anterolateral abdominal wall has four muscles: the rectus abdominis, external oblique, internal oblique and transverse abdominis muscles.All the muscles, cutaneous tissue, and skin are mainly supplied by thoracoabdominal, iliohypogastric, and ilioinguinal nerves.The thoracoabdominal nerves are derived from the anterior rami of the thoracic spinal nerves (T6–T12). At the mid-axillary line, they each give off a branch the thoracic spinal nerves (T6–T12). At the mid-axillary line, they each give off a branch called the lateral cutaneous branch of the spinal nerve, which supplies the lateral abdominal wall.The iliohypogastric and ilioinguinal nerves are the terminal branches of the anterior anterior ramus of the L1 spinal nerve. The internal pelvic organs are innervated by the autonomic, sympathetic, and parasympathetic nervous systems. The hypogastric plexus (T10–L1) is the main autonomic nervous system of the pelvis.
- The iliohypogastric nerve provides sensory innervation to the skin in the inguinal region. The ilioinguinal nerve provides sensory innervation to the skin of the labia majora and medial thigh. Iliohypogastric and ilioinguinal nerve blocks can be provided under landmark or ultrasound-guided techniques[4].
- There are two components of Caesarean Delivery pain. The first is somatic pain from the skin incision, and the second is visceral pain from the exteriorization and straining of the uterus. The anterior branches of the T10–L1 (particularly T12–L1) spinal nerves should be blocked for somatic pain, and the superior/inferior hypogastric plexus branches should be inhibited for visceral pain. While neuraxial anesthesia/analgesia can relieve both types of pain, abdominal wall blocks are usually only effective for somatic pain, visceral pain after caesarean section caused by uterine incision and peritoneal origin will be inhibited by a block such as Quadratus lumborum block and transversalis fascia plane block depending on the volume and concentration of the drug given.
- TFPB selectively blocks the anterior branches of the T12 and L1 spinal nerves as well as the subcostal, ilioinguinal-iliohypogastric nerves[5].
- The QL block is an interfascial plane block like the TAP block but has the potential for more diffuse analgesia. This is because of the injection of a local anaesthetic into the thoracolumbar fascia (TLF), which connects with the back muscle and lumbar paravertebral region. The local anaesthetic injected adjacent to the QL muscle and posterior to the transversalis fascia may spread to the thoracic paravertebral space along the TLF to block the somatic nerves, which are posterior to the arcuate ligaments of the diaphragm, and the lower level of the thoracic sympathetic trunk[6].
- The objectives of the study are to compare the

1)Visual Analogue Scale (VAS) during rest.

2) Dynamic visual analog scale(DVAS) score with movement at 4, 6, 12 and 24 hours after surgery.
3)Time to make the first analgesic request/VAS score of 5 or more considered to give rescue analgesia.
4)Total number of analgesic doses (1gm paracetamol i.v) in 1st 24hrs.

MATERIALS AND METHODS:

An observational single blinded study was conducted from August 2023 to July 2024 . After receiving informed written consent, the present investigation was carried out on 90 parturients at Narayana Medical College and Hospital in Nellore. This study was carried out with the participation of all patients who provided written informed consent.

Sample size: 90 women (Three groups of 30 each).

Sample size calculation

Sample size was calculated using the formula:

$n=【2x(Z\alpha+Z\beta)^2(\sigma^2)】 \div 【(X1-X2)^2】$

The sample size was calculated using the above formula, assuming a significance level of 0.05($\alpha=1.96$) and power of the study of 80% ($\beta=0.84$)

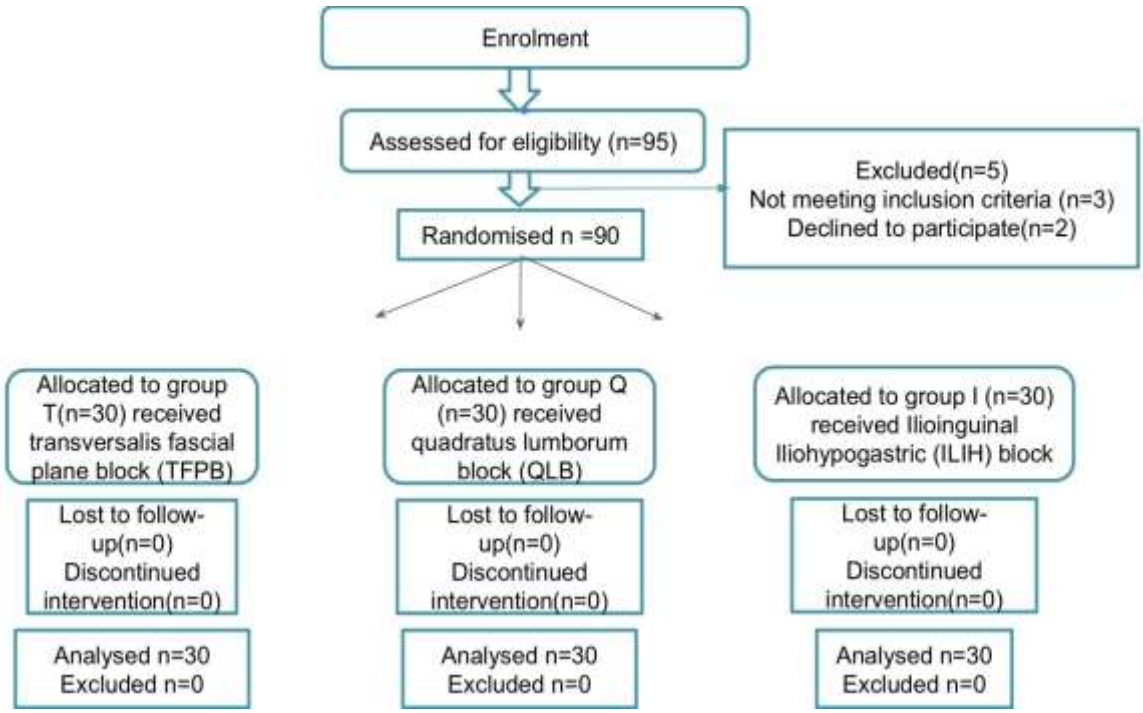
Each group needed at least 28 individuals, but for greater validation, 30 parturients were chosen for each group.

INCLUSION CRITERIA:

1)Parturients undergoing caesarean section.
2)ASA grade II and III.
3)Age between 18 to 40 yrs.
4)Valid informed/explained consent.

EXCLUSION CRITERIA

1)Parturients own refusal for participation.
2)ASA Grade lV.
3)Known history of coagulation disorders.
4)Inflammatory / infective skin lesions at the site of giving block.



PROCEDURE:

- Before the lower segment caesarean section operation, all cases were clinically assessed and underwent routine laboratory investigations. After the patient arrived at the operation theatre, a peripheral IV line was secured via a 20-gauge cannula. Routine monitoring was also established, including non-invasive blood pressure, heart rate, pulse oximetry, and ECG. The IV infusion was started before spinal anesthesia. Spinal anesthesia was administered in the sitting position. Using an aseptic technique, a 25-gauge Quincke needle was inserted through a midline approach into the L2–L3 or L3–L4 interspace. Anaesthesia was established with a single bolus of 0.5% hyperbaric bupivacaine 10 mg and buprenorphine 60 mcg. The level of sensory blockade was assessed regularly by the level of touch sensation before surgical incision (T6 was considered adequate).After surgery with linear high-frequency probe,
- **In group I**, the ultrasound probe was placed medial to the lateral one-third of the line joining the umbilicus and the anterior superior iliac spine (ASIS, with a part of the probe sitting on the ASIS. The ASIS, iliacus muscle, internal oblique, transverse abdominis, and the ILIH nerves between them were identified. After appreciating the sonoanatomy, the ILIH nerves were approached from the medial to lateral direction with a 100 mm needle by an in-plane technique and 30 mL of 0.25% levobupivacaine and dexamethasone 8 mg was injected all around and the drug spread was appreciated. If the nerves could not be clearly identified the drug was administered in the plane between the internal oblique and transversus abdominis muscle. The same procedure was repeated on the other side.
- **In group T** ultrasound guided bilateral transversalis fascia plane block was administered in supine position under strict aseptic precautions. The linear probe was placed transversely between the iliac crest and costal margin. External oblique, internal oblique and transversus abdominis muscles are identified and posterior transversus aponeurosis is traced. A 20 guage spinal needle was introduced in an in-plane approach until it passes through the tail of transverse abdominis muscle where the aponeurosis can be distinguished as a separate layer. After negative aspiration 30 mL of 0.25% levobupivacaine and dexamethasone 8 mg was given in group T.
- **In group Q**, for the QL block,A wedge was placed beneath the buttocks to facilitate probe movement, thereafter the probe was placed transversely between the iliac crest and costal margin. External oblique, internal oblique and transversus abdominis muscles were identified.Then, the transducer probe was moved posteriorly until appreciation of posterior transversus aponeurosis,Quadratus lumborum muscle,the lumbar interfascial triangle covering the paraspinal muscle between the latissimus dorsi and QL muscles. A 20 gauge spinal needle was inserted in the plane anterolaterally to posteromedially. The needle tip was further progressed until it was inside the thoracolumbar fascia's middle layer. A total of 30 mL of 0.25% levobupivacaine and dexamethasone 8 mg was given in group Q on both sides.
- In all the three groups Visual Analogue Scale (VAS) during rest and Dynamic visual analog scale(DVAS) score with movement at 4, 6, 12 and 24 hours after surgery was noted.
- Time to make the first analgesic request was noted or VAS score of 5 or more was considered to give rescue analgesia,rescue analgesic given was paracetamol i.v 1gm infusion.
- Total number of analgesic doses in 1st 24 hrs was noted.

Data analysis:

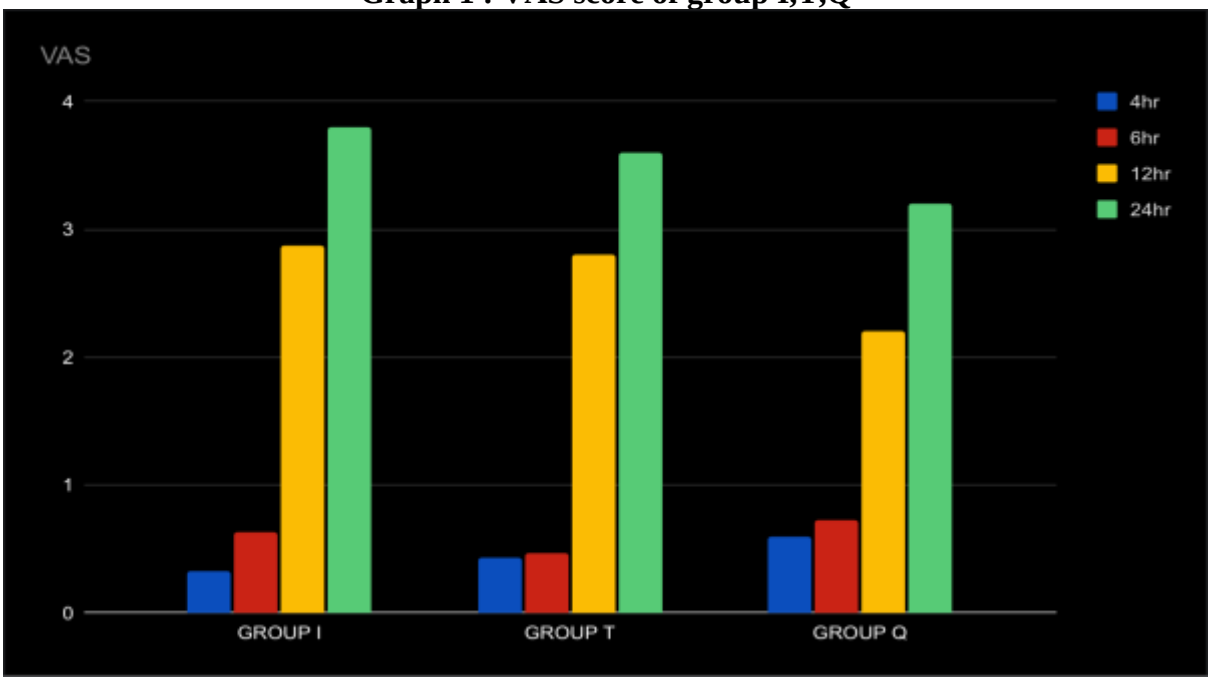
- MS Excel SPSS version 25 software was used to analyse all the data.
- Continuous variables were presented as mean and standard deviation.
- Statistical difference between the study groups was determined by ‘Student t Test’.
- F values were calculated for three block comparison.
- P value <0.05 considered as statistically significant.
- Demographic data (age,asa status) was comparable in all the three groups.

REUSLTS

Table 1: VAS score of group I,T,Q

VAS	GROUP I (n=30)		GROUP T (n=30)		GROUP Q (n=30)		F VALUE	P VALUE
Time	Mean	SD	Mean	SD	Mean	SD		
4 hrs	0.33	0.28	0.43	0.50	0.60	0.50	2.23	0.11
6 hrs	0.63	0.31	0.47	0.49	0.73	0.45	2.23	0.10
12hrs	2.87	0.71	2.80	0.73	2.20	0.61	2.92	0.06
24hrs	3.80	0.67	3.60	0.76	3.20	0.81	4.99	0.01

Graph 1 : VAS score of group I,T,Q

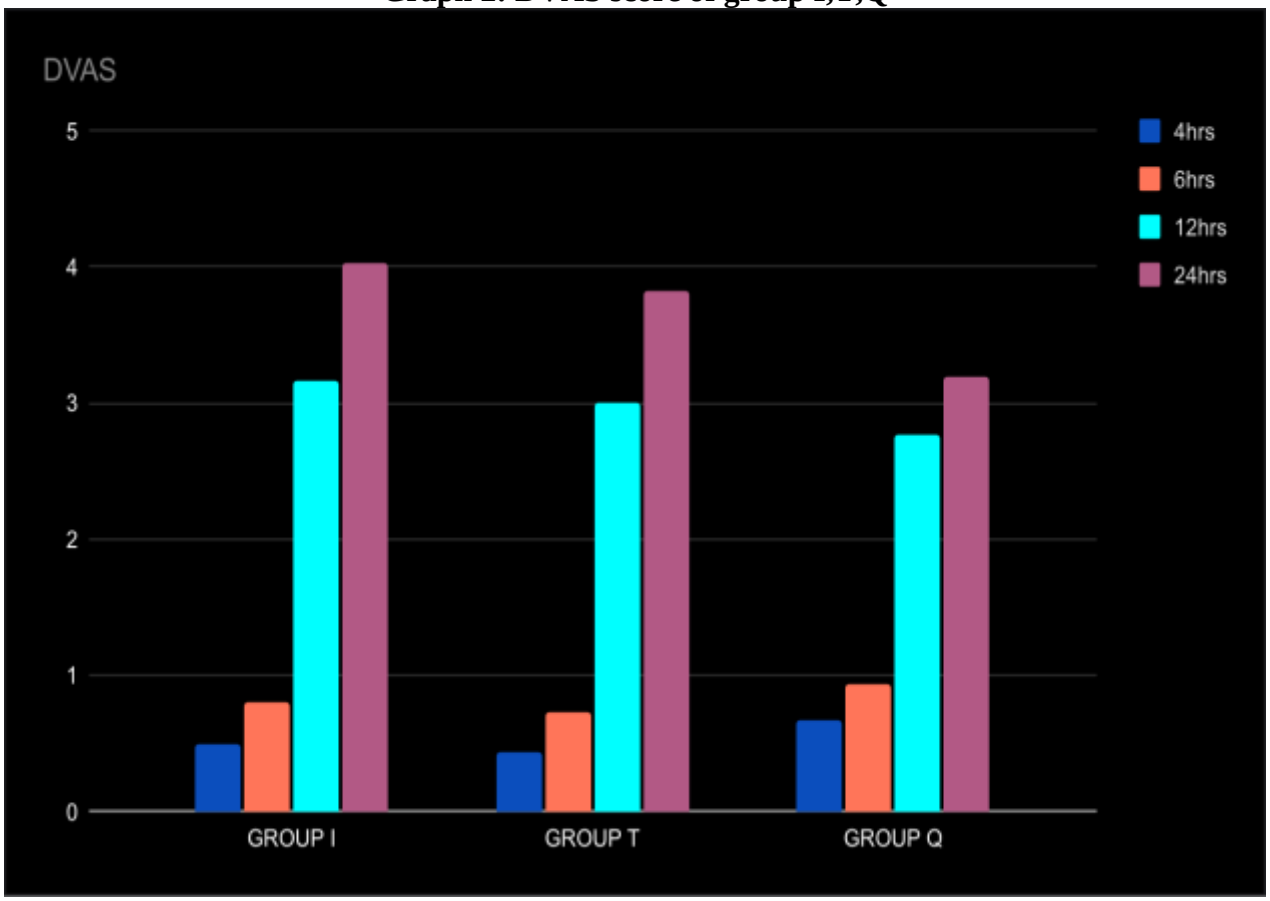


In our study for the VAS score of three groups, f value is greater at 12 and 24hrs and there is statistically significant difference between group Q (3.20±0.81)and other groups at 24hrs ($p<0.01$).

Table 2 : DVAS score of group I,T,Q

DVAS	GROUP I		GROUP T		GROUP Q		F VALUE	P VALUE
Time	Mean	SD	Mean	SD	Mean	SD		
4hrs	0.50	0.51	0.43	0.50	0.67	0.48	1.75	0.18
6hrs	0.80	0.42	0.73	0.45	0.93	0.52	1.46	0.24
12hrs	3.17	0.74	3.00	0.68	2.17	0.70	2.42	0.04
24hrs	4.03	0.56	3.83	0.75	3.20	0.73	1.50	0.12

Graph 2: DVAS score of group I,T,Q

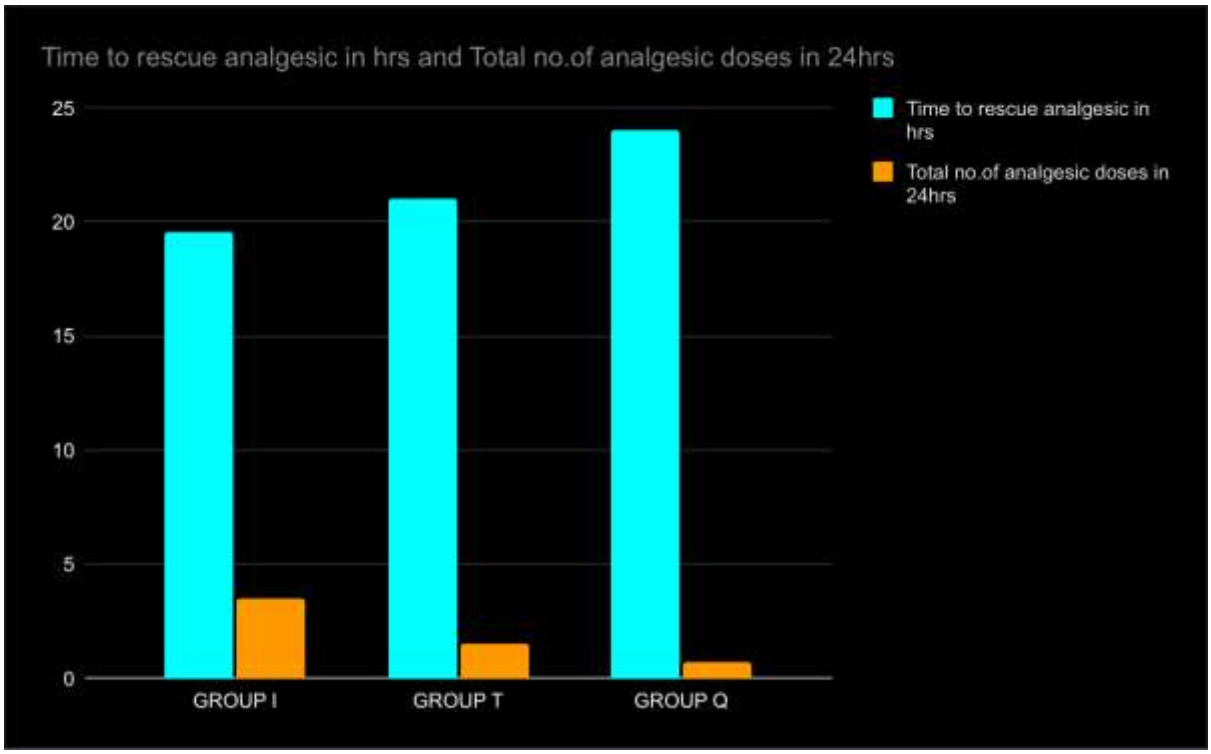


In our study for the DVAS score of three groups, f value is greater at 12hrs and there is statistically significant difference between group Q (p=0.04)and other groups. There is no statistically significant difference in the early hours and at 24 hours but the group Q showed lower DVAS scores at 24hrs(3.20± 0.73).

Table 3: Time to first rescue analgesic request in hours and Total no.of analgesic doses in 24hours.

	GROUP I		GROUP T		GROUP Q		F VALUE	P VALUE
	Mean	SD	Mean	SD	Mean	SD		
Time to first rescue analgesic in hrs	16.57	2.45	20.10	2.28	21.28	2.46	0.11	0.90
Total no.of analgesic doses in 24hrs	2.17	0.65	1.10	0.50	0.70	0.24	0.80	0.43

Graph 3: Time to first rescue analgesic request in hours and Total no.of analgesic doses in 24hours.



In our study there is no statistically significant difference between three groups for 1.Time to first rescue analgesic request in hours, 2.Total no.of analgesic doses in 24hours but group QL took prolonged time for first analgesic request (21.28± 2.46) and less number of analgesic doses in 24hrs(0.70± 0.24).

DISCUSSION:

- Caesarean section is one of the most commonly performed lower abdominal operations in females in the childbearing period. Postoperative maternal pain must be well-controlled for adequate neonatal care, to decrease hospital stay, postoperative complications, and increased patient satisfaction.
- Regional anaesthesia (RA) techniques are gaining more popularity as a part of multimodal analgesia. RA has shown to reduce the opioid consumption postoperatively and its associated side effects such as sedation, pruritis, nausea, and vomiting.
- **Krishnegowda et al[4]** conducted a Randomised Control Trial on the Efficacy of Bilateral Ilioinguinal-Iliohypogastric Nerve Block and Local Infiltration for Post-Cesarean Delivery Analgesia. group L (postoperative infiltration of incision site with 20 mL of 0.5% ropivacaine), and the group I (postoperative bilateral ILIH block with 10 mL of 0.5% ropivacaine on each side under ultrasound guidance).Group I had a significantly longer duration of analgesia (515.64 ± 82.87 min) compared to group L (280.87 ± 39.47 min).Group I had significantly lower VAS scores compared to the groups L. Group I (1.72 ± 0.68) had lower analgesic demands compared to group L (3.26 ± 0.64). The cumulative analgesic requirement was significantly lower in group I. In our study the duration of analgesia i.e time for first analgesic request was (16.57 ± 2.45)hrs. The analgesic demand in 24hrs was (2.17 ± 0.65). Our study used 30ml of 0.25%levobupivacaine plus 8mg dexamethasone on each side, hence longer duration of analgesia and fewer analgesic requirements in 24hrs when compared to this study.
- **Bilgin et al[7]** Compared ultrasound-guided transversalis fascia plane block and anterior quadratus lumborum block in patients undergoing caesarean delivery, both blocks were administered bilaterally with 25mL of 0.25% bupivacaine and concluded that anterior QLB decreased morphine consumption in the late period (9–24h) compared to TFPB, while pain scores were similar between both groups.

The reduction in morphine consumption was statistically significant, but not clinically significant.Except for the first hour, resting and dynamic NRS scores were comparable between the groups. The first-hour resting and dynamic NRS scores were lower in the TFPB group (resting NRS, anterior QLB group, median [interquartile range], 2 [2–3] vs TFPB group, 2 [0–2], $p = 0.046$; dynamic NRS, anterior QLB group, median [interquartile range], 3 [2–4] vs TFPB group 2 [0–3], $p = 0.001$).

○ In our study there was no statistically significant difference in VAS scores except for VAS at 24 hrs. VAS at 24hrs in QL Block group Q (3.20 ±0.81) and in TFPB group T (3.60 ± 0.76) showed statistically significant difference. The DVAS scores of QL block (**2.17±0.70)** and TFPB Block **(**3.00±0.68)at 12hrs postoperatively showed statistically significant difference, indicating the better quality of analgesia of QL Block.

○ The total number of analgesic doses in 24 hrs was less in group Q (0.70± 0.24) compared to group T (1.10± 0.5) but is not statistically significant.

● **Fouad AZ et al[8]** conducted Ultrasound-guided transversalis fascia plane block versus transmuscular quadratus lumborum block for post-operative analgesia in inguinal hernia repair and concluded that TFP block is equally effective as the QL block in controlling postoperative pain in inguinal hernia repair. Both groups showed no statistically significant differences in NRS scores either at rest or with leg movement over the first 24 hours postoperatively.Most patients in both groups received two doses of rescue analgesia (*i.e.*, 10 mg of IV nalbuphine) during the first 24 hours, postoperatively. However, these results were comparable between both groups, with no statistically significant difference.

○ Similarly In our study there was no statistically significant difference in VAS and DVAS scores except for VAS at 24 hrs,DVAS at 12hrs. VAS at 24hrs in QL Block group Q (3.20 ±0.81) and in TFPB group T (3.60 ± 0.76) showed statistically significant difference. The DVAS scores of QL block (2.17±0.70) and TFPB Block **(**3.00±0.68) at 12hrs postoperatively showed statistically significant difference, indicating the better quality of analgesia of QL Block.

○ The total number of analgesic doses in 24 hrs was less in group Q (0.70± 0.24) compared to group T (1.10± 0.5) but is not statistically significant.

In our study all the three blocks - Transversalis fascia plane block,Ilioinguinal iliohypogastric and Quadratus lumborum block were given with 30 ML of levobupivacaine and 8 mg dexamethasone on each side. Since the volume and the concentration of the drug given are higher compared to the other studies, all the three blocks resulted in lower VAS,DVAS scores,prolonged duration of analgesia, and lesser number of analgesic doses in the first 24 hrs compared to the other studies eliminating the need for Nsaids,opioids and their side effects.All the three blocks addressed somatic pain, but the visceral pain was reduced by Quadratus lumborum block and Transversalis fascia plane Block as evident by lower VAS scores,longer duration of analgesia, and lesser number of analgesic doses compared to the ILIH block.

CONCLUSION:

● We conclude that the three blocks - Transversalis fascia plane block,Ilioinguinal iliohypogastric and Quadratus lumborum block provide reliable postoperative analgesia after caesarean section,but the QL block provides prolonged and profound analgesia compared to other two blocks.

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