

Comparison of Transversus Abdominis Plane Block and Ilioinguinal-Iliohypogastric Nerve Block for Post-Operative Analgesia in Caesarean Section, a Single-Blinded Randomised Clinical Trial Study

Bimal Krushna Panda¹, Sheela Ekka², Dulal Kishun Soren³, Mahendra Ekka⁴, Kalicharan Kisku⁵, Lina Baru⁶

¹Professor, Department of Anaesthesiology, VIMSAR, Burla, Sambalpur, Odisha, India.

²Assistant Professor, Department of Anaesthesiology, VIMSAR, Burla, Sambalpur, Odisha, India.

³Professor, Department of Anaesthesiology, VIMSAR, Burla, Sambalpur, Odisha, India.

⁴Associate Professor, Department of Anaesthesiology, VIMSAR, Burla, Sambalpur, Odisha, India.

⁵Postgraduate Trainee, Department of Anaesthesiology, VIMSAR, Burla, Sambalpur, Odisha, India.

⁶Associate Professor, Department of Obstetrics & Gynaecology, VIMSAR, Burla, Sambalpur, Odisha, India.

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Corresponding author: Dr. Mahendra Ekka

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Abstract

Background: Effective and adequate post-operative analgesia for cesarean section is in demand due to increasing rates of cesarean deliveries which may promote earlier recovery, ambulation, and breast-feeding. Ultrasound-guided plane blocks. i.e., Transversus abdominis plane (TAP) block & ilioinguinal and iliohypogastric (II-IH) nerve blocks have added newer and better dimensions in providing post-CS analgesia without producing opioid-related adverse effects.

Aim: To compare the total bolus doses of rescue analgesia requirement in 24 hrs. of the postoperative period in Ultrasound-guided ilioinguinal and iliohypogastric nerve block versus transversus abdominis plane block in patients undergoing LSCS.

Methods: Single-blind Randomised clinical trial study was conducted on 70 patients undergoing LSCS under Subarachnoid block. They were non-selectively randomized into 2 groups, Group T were given a bilateral TAP block with 20ml of 0.25% ropivacaine on each side and Group-I were given a bilateral ilioinguinal-iliohypogastric nerve block with 10ml of 0.25% ropivacaine on each side after the completion of surgery. In the post-operative room\ward total dose of analgesic in 24hr post-operatively, time to first rescue analgesic, NRS score, early initiation of breast-feeding, and patient satisfaction score were recorded.

Result: Total number of bolus doses of postoperative rescue analgesic consumption in 24 hr was significantly less in Group-I (1.60±0.65) than in Group T (2.68±0.52). The time to first rescue analgesia in Group-I (11.19±0.99) hrs. was also longer than in Group T (7.31±0.63) hrs. Also, the NRS score was also comparable in the two groups. Patient satisfaction and early initiation of breastfeeding were comparable in both groups.

Conclusion: II-IH nerve block had a better analgesic effect than TAP block postoperatively in patients undergoing elective LSCS, with respect to the total dose of analgesic requirement and time to first rescue analgesia.

Keywords: Lower Segment Cesarean Section, Transversus Abdominis Plane Block, Ilioinguinal-Iliohypogastric Nerve Block.

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Introduction

Good control of pain following LSCS is essential to facilitate early mobilization and to enable adequate care of the newborn. [1] Achieving good pain relief is challenging in these cases because of the altered physiology and the possibility of transmission of drugs through breast milk. [2] Though opioids provide effective analgesia, they have side effects such as nausea, vomiting, urinary retention, pruritus and respiratory depression requiring close monitoring. [3] Various multimodal anaesthetics techniques have been tried for reducing opioid consumption in patients after cesarean section. Ultrasound-guided TAP block and II-IH nerve block are the regional anaesthetic techniques that provide satisfactory post-operative analgesia, improving the success rate of blocks, reducing the volume of local anaesthetics, and sparing the adverse effect of opioids. [4,5,6,7,8,9] Hence, our study was undertaken to compare the total dose of rescue analgesia requirement in 24 hrs of post-operative in Ultrasound-guided ilioinguinal and iliohypogastric nerve block versus ultrasound-guided transversus abdominis plane block in patients undergoing LSCS.

Methods

After obtaining approval from the institutional ethical committee (065-2022/I-S-T/39/17.05.2022), a total of 70 patients undergoing LSCS delivery under Subarachnoid block were included and single blind randomization was done by randomly allocating these patients into two groups 35 of each, Group T received TAP

block and Group I received II-IH nerve block. Written informed consent was obtained from all the participants. Patients who did not give consent, allergy to the study drug, had partial or incomplete block, block site infection were excluded from the study.

In the OT table all the participants received standard premedication with intravenous injection of ondansetron, and pre-loading was done with RL 1000 ml 10 min before the subarachnoid block. Subarachnoid block was given with injection hyperbaric bupivacaine 2ml at L3/4 intervertebral space using 25 G Quincke spinal needle in sitting/lateral position and then supinated immediately. After the achievement of desired block height surgeon allowed for the surgical procedure. Soon after the delivery of the baby, oxytocin was administered as per the institutional protocol.

After completion of LSCS, suturing of skin incision and dressing of wound patients were administered ultrasound-guided TAP or IIN/IHN block taking aseptic precautions, according to the group to which the patient has been allocated.

In Group T, the TAP block was given with a high-frequency linear probe placed perpendicular to the mid-axillary line between the iliac crest and subcostal margin, and the three abdominal muscle layers external oblique, internal oblique, and transverses abdominis muscle were identified and transverses abdominis plane was located between internal oblique and transverses abdominis muscle. The 100 mm ultrasound needle was approached through

an in-plane technique to the Transversus abdominis plane, then 0.25% ropivacaine 20 mL was given and the same was repeated on each side.

For II-IH nerve block the transducer was placed medial to the ASIS, oriented on a line joining the ASIS with the umbilicus. The three muscle layers were identified. Moving the transducer slightly cephalad or caudad to trace the nerves, color Doppler was used in an attempt to visualize the deep circumflex iliac artery, then the needle was inserted in-plane technique in a medial to lateral orientation, through the subcutaneous tissue, external oblique, internal oblique and was advanced toward the ilioinguinal and iliohypogastric nerves. The nerve block was given with 10 mL of ropivacaine (0.25%) and visualization of the nerve. The same technique was applied on the other side.

In the postoperative room, the time of great toe movement was noted which indicated the regression of spinal anesthesia. At that point of time, the success of blocks was assessed by pinprick at the site of incision and the adequacy and presence of block was noted and confirmed. The block was considered "Successful" when the patient was not able to perceive the cold sensation at the L1 dermatome (inguinal region) on both sides. The block was considered "Partial" when the patient perceives a cold sensation on any one of the sides. The block was considered a "Failure" when the patient perceives a cold sensation on both sides at the L1 dermatome.

The quality of analgesia was assessed by NRS (unidimensional 11-point pain scale ranging from 0 to 10 with 0 no pain, 10 being severe pain, and the patients were asked to mark the pain score on the scale). If the pain score was more than 4 then a slow intravenous bolus of tramadol 50mg

was given and this is the time for the first dose of rescue analgesia. Similarly, when the patient's NRS score was ≥ 4 injection of tramadol 50 mg intravenous bolus was given. Patient satisfaction was assessed using a 2-point score, after enquiring from the patient about their willingness to have the same analgesia if ever operated again. Score-1 = (Good): 'If ever operated again in the future, I want the same analgesia' Score-2 = (Bad): 'If ever operated again in the future, I want different analgesia.'

The study parameters were recorded in a common standard data collection sheet like total duration of surgery, time of first analgesia required by the patient after TAP block / II-IH block (0hr), the quality of analgesia was assessed by NRS score at 0hr, 4hr, 8hr, 12hr, 18hr and 24hrs, total no. of bolus doses of rescue analgesia in 24hr post-operative period, time to early initiation of breastfeeding and patient satisfaction score.

Sample size and statistical analysis

As per the previous study done by "Kriti et al", considering the mean doses of rescue analgesia and taking $\alpha = 0.05$ and $\beta = 0.2$ the minimum sample size was calculated with 95% confidence interval and 80% power and was found 35 for each group.

The data were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. The studied data were analyzed by independent t-test. A probability of $P < 0.05$ was considered statistically significant.

Result

Demographic and duration of surgery

As in Table 1 there is no statistically significant difference between Group T and Group I.

Table 1: Demographic Profile of TAP block & II-IH Nerve Block

	GROUP T	GROUP I	P Value
Age (years)	26.24 \pm 3.4914	25.80 \pm 4.000	0.680
Weight (kg)	56.0 \pm 5.89	57.77 \pm 5.70	0.20
Duration of Surgery (min)	58.43 \pm 4.24	58.57 \pm 4.45	0.89

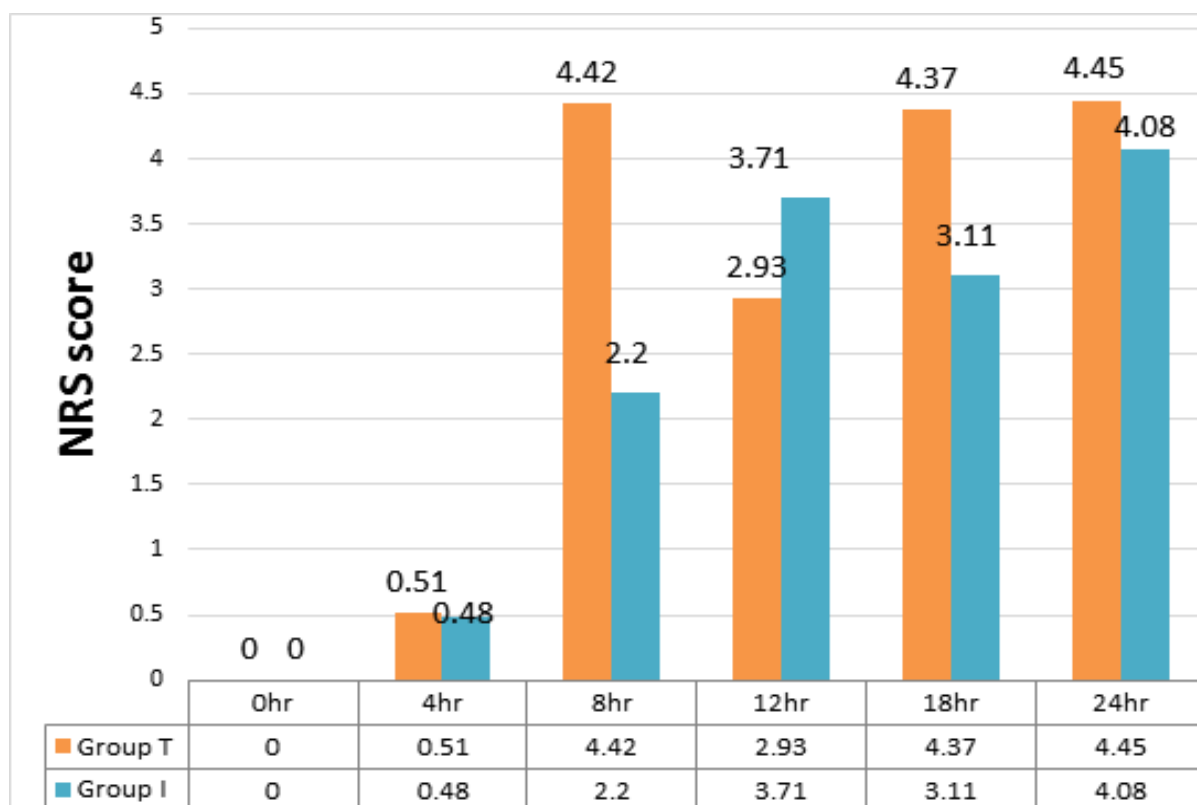
Numerical rating scale (NRS) Score

In the post-operative room NRS -scores at 0, 4, 8, 12, 18, and 24 hrs were compared using an independent t-test between Group-T and Group-I as shown in Table 2. At 8hr in Group T, the mean NRS score was ≥ 4 which required administration of rescue

analgesia, but in Group-I the mean score was 2.22. The p-value at 8hr was 0.0001 which is highly significant. At 12hr the mean NRS score was 2.93 and that of Group-I was 3.71, p-value came to be 0.001 which is statistically significant. At 18 hr. and 24hr., the NRS score was lower in group-I (Graph 1).

Table 2: NRS score at various durations

NRS score at various duration (hrs.)	Group T	Group I	p-value
0	0	0	0
4	0.514±0.50	0.486±0.50	0.81
8	4.42±0.50	2.22±0.49	0.0001
12	2.93±0.33	3.71±0.66	0.001
18	4.37±0.64	3.11±0.40	0.001
24	4.45±0.78	4.08±0.56	0.026



Graph 1: Bar graph of NRS score between two groups

Time to first rescue analgesia

As in Table 3 the time to first rescue analgesia which was early in Group T (7.31±0.63) hr. than in Group I (11.19±0.99)hr. this difference was statistically significant.

Table 3: Time of 1st rescue analgesia

	Group T	Group I	P value
Time of 1 st rescue analgesia (hr.)	7.31±0.63	11.19±0.99	0.001

The number of bolus doses of analgesic 24 hr postoperatively

The number of bolus doses of analgesics in Group I was significantly lower than in Group T as shown in Table 4.

Table 4: Comparison of the mean value of the number of bolus doses of analgesic postoperatively in 24 hours

	Group T	Group I	P value
No. of bolus doses of analgesia	2.68±0.52	1.60±0.65	0.001

Early initiation of breastfeeding

There was no statistically significant between Group-T (4.48±0.50) and Group-I (4.54±0.50) with p-value >0.05.

Patients satisfaction score

Between Group-T (1.17±0.38) and Group-I (1.23±0.42) patient satisfaction score was statistically not significant (p-value -0.55).

Discussion

Childbirth is an emotional event & the mother wants to bond with her newborn as early as possible. Inadequate postoperative pain relief after CS can negatively impact ambulation, breastfeeding, and maternal bonding.

In our study, we compared two modern regional anesthesia techniques. Both these blocks have produced a significant reduction in pain and analgesic requirement. At the onset of pain, we administered an injection of tramadol 50 mg slow i.v as a bolus dose. The total number of bolus doses of tramadol required 24 hours postoperatively was significantly lower in group I than in Group T.

In the study done by Bessmertnyj AE et al where they used 20 ml 0.25% solution of bupivacaine for TAP-block, for the ilioinguinal-iliohypogastric block--10 ml 0.5% from each side. Both blocks improve postoperative analgesia after caesarean delivery. The Ilioinguinal-iliohypogastric block showed greater efficacy than the transversus abdominis plane block. [10]

Similar result was found in our study with longer duration of action in II-IH nerve block group than that of TAP block group

as depicted in the graph-1 showing NRS score of both groups at different time intervals showing statistically significant p-value at 8hrs and 12 hrs.

A similar result was found in the study done by Uma Srivastava et al, where the tramadol consumption was reduced approximately by 50% in group B (TAP block) compared to control group C in the first 48 h (127mg) vs. (253mg), respectively, $p < 0.0001$. [11]

In another study done by Seid Adem Ahmed et al, they compared the benefits of transversus abdominis plane (TAP) and ilioinguinal-ilio-hypogastric (II-IH) nerve blocks after caesarean delivery via Pfannenstiel incision. They found that the mean tramadol consumption was (55.45 mg) versus (37.27 mg) in TAP and II-IH groups, respectively (p-value 0.009). [12]

Similarly, Kirti et al in their study compared USG-guided TAP block Vs. II-IH block for post-operative analgesic efficacy in adults undergoing inguinal hernia surgery. They compared the total dose of tablet diclofenac required within 24 hr. post-operatively. They found that the average dose of tablet diclofenac was 200 mg in Group I (TAP Group) and 172.5 mg in Group II (II-IH Group) ($P = 0.004$). [13]

Moreover, in our study, we found that the need for the first dose of rescue analgesia in Group-I was longer than in Group T. In contrast to the study done by Kirti et al in which they performed block after general anaesthesia, they show time to first analgesic request was 5.30hrs in Group I and 6.80hrs in Group II ($P=0.005$). i.e. longer in the II-IH group than the TAP group. [13] In our study we got a longer

duration of action in Group-I as compared to their study and this difference may be due to the time of administration of the block. They performed the block before the start of surgery whereas we administered the block after the completion of surgery which led to a longer duration of analgesia and hence delayed request for rescue analgesia.

We also compared the Numerical Rating scale (NRS score) in our study and found that better analgesia was achieved in the II-IH nerve block group than that in the TAP block group, similar to the study done by Seid Adem Ahmed et al where they compared benefits of transversus abdominis plane (TAP) block and ilioinguinal-iliohypogastric(II-IH) nerve blocks after caesarean delivery via Pfannenstiel incision, they show that 24 hours after surgery, the II-IH nerve block reduced the NRS pain score at rest and at movement than TAP block. [12]

We also compared early initiation of breastfeeding (EBF) there was no significant difference between the two groups. Till now we could not find any study related to ours. But we found that there was early initiation of breastfeeding in patients who were given blocks. This may be attributed to the fact that since patients were pain-free post-operatively and comfortable they could initiate breastfeeding earlier. [14,15]

Patient satisfaction score was also good in both groups though not significant statistically. We did not encounter any complications related to block and this may be due to the use of USG and the use of local anaesthetics lower than their toxic dose.

There were a few limitations in our study. First of all, the sample size is small. Another is the use of neuraxial blockade to perform LSCS which otherwise provides considerable residual analgesia with a difficulty in assessing a successful nerve block thereby adding considerably to existing confounding factors. Another

limitation is that postoperative pain involves both somatic and visceral components. But we treat only somatic pain at the incision site whereas the visceral component of pain remains exists.

Conclusion

II-IH nerve block had a better analgesic effect than TAP block postoperatively in patients undergoing elective LSCS, with respect to a total dose of analgesic requirement and time to first rescue analgesia. The use of ultrasound highly improves the success of blocks and minimizes the risk of complications due to landmark technique, also minimizes the total volume of local anaesthetics used for block thus reducing the incidence of local anaesthesia toxicity. Both TAP block and II-IH blocks provide good patient satisfaction and help in the early initiation of breastfeeding post-operatively.

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Reference

1. Borges NC. Originales Postoperative pain in women undergoing caesarean section. Federal University of Goias. Brazil.6/11/2016
2. Elsous A, Health Policy Post-Operative Pain after Caesarean Delivery: Initial Assessment for Quality Improvement. International Journal of Caring Sciences 2018;11(1) :136.
3. Hudcova J, McNicol E, Quah C, Lau J, Carr DB. Patient controlled opioid analgesia versus conventional opioid analgesia for postoperative pain. Cochrane Database Syst Rev 2006; CD 003348
4. Yulu JIN et al, "Comparison of ultrasound-guided iliohypogastric ilioinguinal nerve block and transversus abdominis plane block for analgesia after cesarean section: A retrospective propensity match study" Department of Anesthesiology, Yueqing Third

- People's Hospital, Yueqing, Zhejiang 325604.
5. NYSORA (NYSORA, Inc; The New York School of Regional Anesthesia).
 6. U Eichenberger et al "Ultrasound-guided blocks of the ilioinguinal and iliohypogastric nerve: accuracy of a selective new technique confirmed by anatomical dissection 2006; 97 (2): 23843.
 7. McDonnell J, O'Donnell B, Curley G, Hefferman A, Power C, Laffey JG (2007) The analgesic efficacy of transversus abdominis plane block after abdominal surgery: a prospective randomized controlled trial. *Anesth Analg* 104:193–197
 8. Carney J, McDonnell J, Ochana A, Bhinder R, Laffey J (2008) The transversus abdominis plane block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. *Anesth Analg* 107:2056–2060
 9. L Vamsee Kiran et al Relative Efficacy of Ultrasound-guided Ilioinguinal-iliohypogastric Nerve Block versus Transverse Abdominis Plane Block for Postoperative Analgesia following Lower Segment Cesarean Section: A Prospective, Randomized Observer-blinded Trial; *Anesth Essays Res*; 2017 Jul-Sep; 11(3): 713-717.
 10. Bessmertnyj AE et al Comparison of the effectiveness of ilioinguinal-iliohypogastric blockade and transversus abdominis plane block for analgesia after cesarean section. *European PMC; Anesteziologičeski Reanimatologičeski Vestnik*, 01 Mar 2015, 60(2): 51-54 Language: rus.
 11. Uma Srivastava et al, 2015 "Efficacy of trans abdominis plane block for post cesarean delivery analgesia: A double-blind, randomized trial" *Saudi J Anaesth*. 2015 Jul-Sep; 9(3):298-302.
 12. Seid Adem Ahemed et al, Efficacy of Bilateral Transversus Abdominis Plane and Ilioinguinal-Ilioypogastric Nerve Blocks for Postcaesarean Delivery Pain Relief under Spinal Anesthesia"; *Anesthesiol Res Pract* 2018 Jan 21; 2018: 1948261.
 13. Kirti Kamal "A comparative study to evaluate ultrasound-guided transversus abdominis plane block versus ilioinguinal iliohypogastric nerve block for postoperative analgesia in adult patients undergoing inguinal hernia repair". *Indian J Anaesth*. 2018 Apr; 62(4):292-297.
 14. Heather J. Rowe-Murray et al "Operative intervention in delivery is associated with compromised early mother-infant interaction" *BJOG*/ October 2001; 108(10) 1068-1075
 15. Vincenzo Zanardo MD Elective Cesarean Delivery: Does It Have a Negative Effect on Breastfeeding? December 2010; 37(4): 275-279.