

Ultrasound Guided Transversus Abdominis Plane Block versus Ilioinguinal Iliohypogastric Nerve Block for Post Operative Analgesia in Caesarean Section - A Randomised Controlled Study

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Abstract

Introduction: Effective post-operative analgesia for caesarean section has become a major medical challenge due to increasing rates of caesarean deliveries in the last two decades, and may help promote recovery, ambulation and breastfeeding. We studied the efficacy of Transverse abdominis plane block vrs Ilioinguinal-iliohypogastric nerve block for post-operative analgesia.

Material and Methods: 62 parturients posted for elective caesarean delivery under spinal anaesthesia were selected for the study. Transverse abdominis plane block [group TAP] or Ilioinguinal -iliohypogastric block [group IIH] was performed with 0.125% bupivacaine +4mg dexamethasone on each side postoperatively. Ease of performance assessed by time taken for the procedure. Assessment of pain using VAS score, time to first rescue analgesic, duration of analgesia, total analgesic consumption and patient comfort in terms of breastfeeding experiences, were assessed post-operatively for 24 hrs.

Results: The two groups were comparable with respect to the baseline characteristics [$P>0.05$]. The duration of procedure was significantly less in the IIH group compared to TAP group [$p<0.05$], the time to first rescue analgesic [12.133 ± 7.351 hrs. vrs. 17.806 ± 9.547 hrs.] and the total analgesic consumption were statistically significant [$P<0.05$] in the TAP group and IIH groups respectively. A statistically significant difference was observed in the VAS scores at all points of assessment except at 2 hrs. where it was not significant.

Conclusion: We conclude that USG guided IIH block is preferable to TAP block for postoperative analgesia for caesarean section patients, due to its ease of performance, higher success rates and good postoperative analgesia.

Keywords: Transversus Abdominis Plane block, Ilioinguinal iliohypogastric block, caesarean section, postoperative analgesia, Visual Analogue Score.

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Introduction

Evidence from many studies has demonstrated that inadequately treated pain after caesarean section is associated with an increased incidence of chronic pain[1] and post-traumatic stress syndrome[2]. Effective post-operative analgesia for caesarean section has become a major medical challenge due to increasing rates of caesarean deliveries. Also, effectual postoperative pain management hastens recovery, early ambulation and breastfeeding.

The effectiveness of Transversus abdominis plane (TAP) and Ilioinguinal-Ilio hypogastric (IIH) nerve blocks for postoperative pain after caesarean delivery with Pfannenstiel incision have been studied in the past. Ultrasound guided TAP block as well as IIH block have been described with promises of better localization and deposition of the local anaesthetic with improved accuracy. Furthermore, previously provided evidence for comparing the analgesic effects and complications between TAP and IIH blocks in caesarean section is limited. Hence, we decided to study the relative efficacy of the two blocks for post op analgesia in caesarean section patients with regards to duration of procedure, duration of analgesia, total analgesic consumption, visual analogue scores (VAS) and patient comfort and satisfaction post operatively.

Material and methods

A prospective randomised-control trial was done at our institution over a period of 6 months from December 2021 – May 2022. After approval from the institutional ethical review board and a written informed consent, 62 patients posted for elective caesarean delivery were selected for the study. Parturients with American society of anaesthesiology (ASA) physical status II aged between 20-40 years posted for elective caesarean delivery under spinal anaesthesia were included for the

study. Patients with ASA physical status III and IV, history of severe chronic pain, history of hypersensitivity or allergies to any drugs and parturients with contraindications for spinal anaesthesia were excluded from the study.

The recruited parturients were randomly assigned to one of the two groups with 31 in each group by computer generated random number table [www.randomisation.com]. The patients received either ultra-sonogram guided (USG) TAP block with 20ml of 0.125% bupivacaine +dexamethasone 4mg on each side, or USG guided IIH block with 10ml of 0.125% bupivacaine + dexamethasone 4mg on each side at the end of the surgery.

All parturients received IV ranitidine [50mg] and metoclopramide[10mg] 20-30 min before surgery. With patient in left lateral position, subarachnoid block was performed in the L3-L4 space using 26G spinal needle and 2ml of 0.5% bupivacaine heavy injected into the space after confirming free flow of cerebrospinal fluid.

At the end of the surgery the level of block was recorded. Under aseptic precautions either USG guided TAP [posterior approach] or IIH block was performed in supine position.

For the TAP group, the patient being in supine position, area was painted and draped, aseptically prepared USG probe was placed in the mid-axillary line transverse to abdominal wall midway between iliac crest and costal margin. A Stimuplex needle [22* 80mm] was used for the procedure. The needle was advanced using the in-plane technique until the needle tip was visible in the plane between the internal oblique and the transversus abdominis muscle. Position of the needle was confirmed by hydrodissection. 20ml of Inj.bupivacaine 0.125% with inj. dexamethasone 4mg was deposited in the plane after negative

aspiration. Visualization of the hypoechoic spread of drug, with the fascial layer above and the muscle layer below, was considered a sure sign of proper deposition. The technique was repeated on the opposite side. (Figure 4)

In IIH group, patient being in supine position the probe was placed medial to the lateral one-third of the line joining the umbilicus and the anterior superior iliac spine (ASIS), with part of the probe sitting on the ASIS. The ASIS, iliocostalis lumborum, internal oblique, transverses abdominis, and the ilioinguinal and iliohypogastric nerves between them were identified. A Stimuplex needle [22* 80mm] was used. By in-plane technique the needle was advanced to the nerves, and 10 ml of 0.125% bupivacaine with 4mg dexamethasone was injected all around and the drug spread was appreciated. The same procedure was repeated on the other side. (Figure 5)

Patients were shifted to the post-anesthesia recovery room and later to the postoperative ward. Assessment for pain was started after spinal anaesthesia regressed below L2 level. Assessment of pain was done using VAS score at 2,4,8,16 and 24 hrs. post-operatively. Patients in whom the block failed were excluded from the study. One patient from the TAP group with a VAS>4 at 2 hrs. post-operatively was excluded from the study considering block failure. Patients with a VAS ≥ 4 was

administered inj. Tramadol 50mg IV as rescue analgesic and the time noted as time to first rescue analgesic (duration of analgesia). Subsequently, whenever patient complained of pain, injection tramadol 50 mg was given intravenously for the remaining 24 hrs. Any untoward events like nausea, vomiting, shivering, hypotension etc. were recorded. The comfort and satisfaction of mother was recorded in terms breast feeding experiences.

Statistical analysis

Sample size was calculated based on the study by Kiran LV *et al*[3]. Overall, 25 patients were required to study in each group. Adding 20% to compensate for loss to follow up, 32 patients in each group were studied.

Continuous data was expressed as mean \pm SD. Categorical data was expressed as number (%). Chi-square test was used to compare categorical data between the two groups. Between the group analyses was done using student T test. P < 0.05 was considered statistically significant. Collected data were analyzed with SPSS for Windows, Version 21.

Results

There was no statistically significant difference between the two groups with respect to demographic data like age, height, weight and body mass index (BMI) (Table 1).

Table 1: Demographic data

	TAP	IIH	P value
Age(years)	26.5 \pm 5.091	27.3 \pm 3.693	0.328
Weight(kgs)	69.5 \pm 5.328	67.5 \pm 5.939	0.172
Height (cms)	157.7 \pm 4.852	155.3 \pm 5.123	0.065
BMI(kg/cm ²)	27.9 \pm 1.88	27.9 \pm 1.565	1

mean \pm standard deviation (SD)

P value calculated using student T test

Table 2: Duration of procedure

	TAP	IIH	P value
mean	12.6	8.03	<0.0001
SD	2.744	1.351	

Duration in minutes

Table 3: Duration of analgesia

	Group-TAP	Group -IIH	P value
Duration(hours)	12.133±7.351	17.806±9.547	0.0059
Minimum duration (hours)	5	5	
Maximum duration (hours)	27	28	

mean±SD

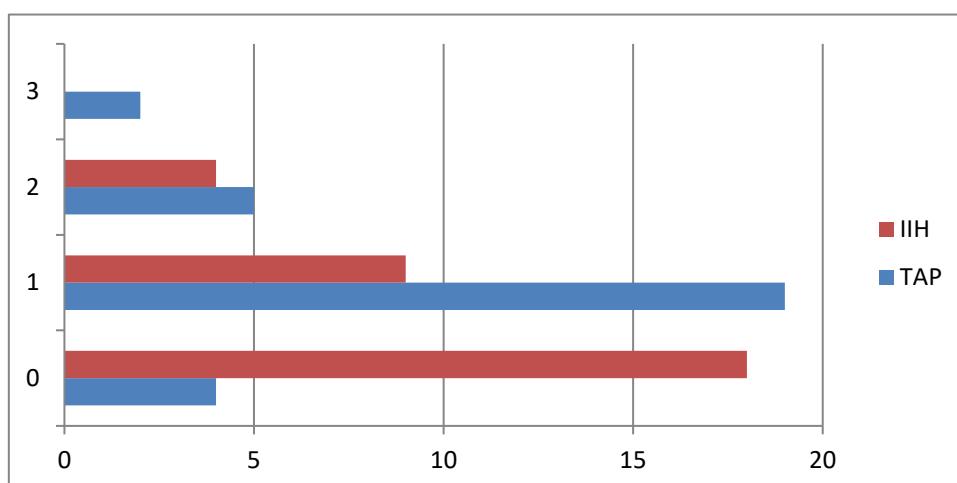
Mean rescue analgesic consumption in TAP group was 1.17 ± 0.747 times, which was higher than in group IIH - 0.55 ± 0.723 , which was statistically significant ($P=0.0008$) (table 4). 4/30 (13.3%) patients in group TAP and 18/31 (58.1%) patients in group IIH did not receive any rescue analgesia in first 24 hours (table 4)

Table 4: Total rescue analgesic consumption

Number of rescue analgesics	Group-TAP		Group-IIH		P value
	N	%	N	%	
0	4	13.3	18	58.1	0.0008
1	19	63.3	9	29	
2	5	16.7	4	12.9	
3	2	6.7	0	0	
mean±SD	1.17 ± 0.747		0.55 ± 0.723		

N- Number of patients

% -Percentage of rescue analgesic

**Figure 1: Total rescue analgesic consumption**

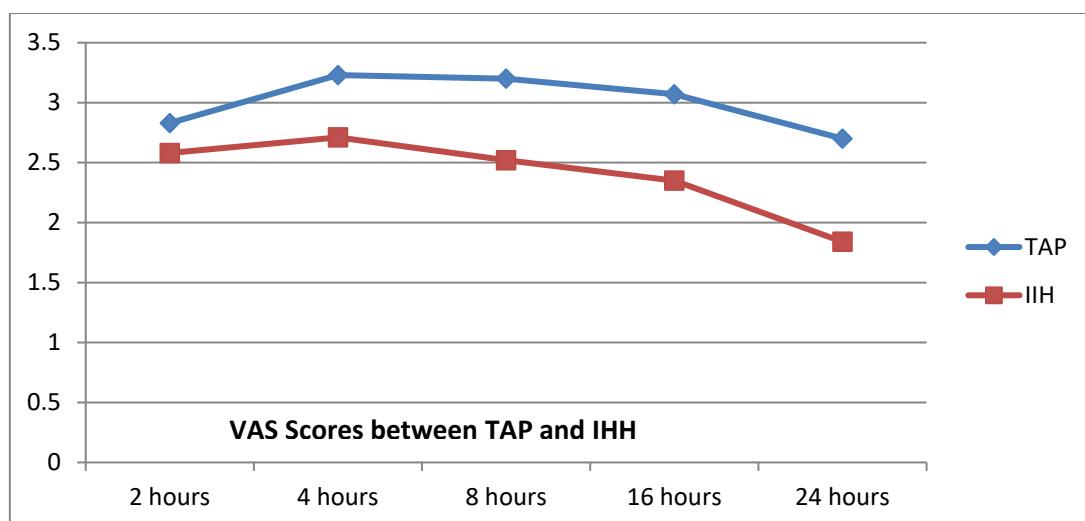
X axis- number of patients

Y axis- number of rescue analgesia given

VAS score at 2 hrs. was comparable between the two groups, whereas VAS score recorded at 4 hrs, 8 hrs, 16 hrs and 24 hrs. showed lesser VAS score in IIH group than with TAP group, which was statistically significant ($P < 0.05$) (table 5).

Table 5: Quality of analgesia between group TAP and group IIH

	Group TAP	Group IIH	P value
VAS AT 2 Hrs	2.83±0.699	2.58±0.958	.1223
VAS AT 4 Hrs	3.23±0.824	2.71±0.961	0.0053
VAS AT 8 Hrs	3.20±0.0961	2.52±0.811	0.0019
VAS AT 16 Hrs	3.07±1.202	2.35±1.226	0.0128
VAS AT 24 Hrs	2.70±1.264	1.84±0.820	0.0012

**Figure 2: Quality of analgesia between group TAP and group IIH**

X axis – duration (hours)

Y axis- VAS score

Breast feeding experience of the mothers were better with IIH group -3.064 ± 0.249 as compared to TAP group -2.833 ± 0.698 , which was clinically significant ($P = 0.0441$).

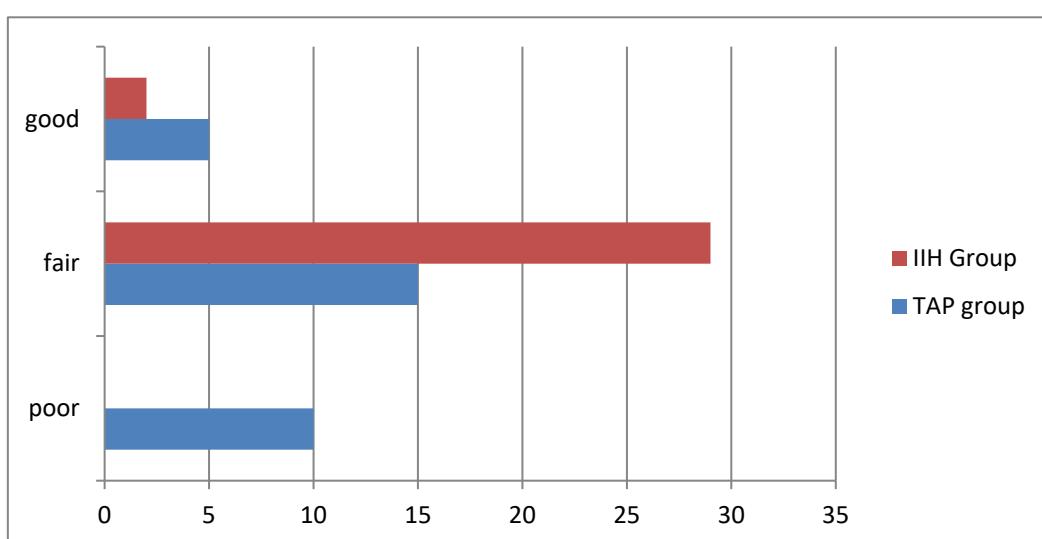
10/30 patients (33.3%) in TAP group were poorly satisfied whereas none of the patients in IIH group were poorly satisfied. And 29/31 in IIH group (93.54%) were fairly satisfied (table 6).

Table 6: Comfort and satisfaction (based on breast feeding experience of the mother)

Variables	Group TAP		Variables	Group IIH	
	N	%		N	%
Poor	10	33.30	Poor	0	0
Fair	15	50.00	Fair	29	93.54
Good	5	16.70	Good	2	6.45

5 point Likert satisfaction scale.

1=Intolerable, 2=Poor, 3= Fair, 4=Good, 5= Excellent

**Figure 3: Patient comfort and satisfaction**

x axis- number of patients

y axis- 5 point Likert satisfaction scale.



Figure 4: Transversus abdominis plane block

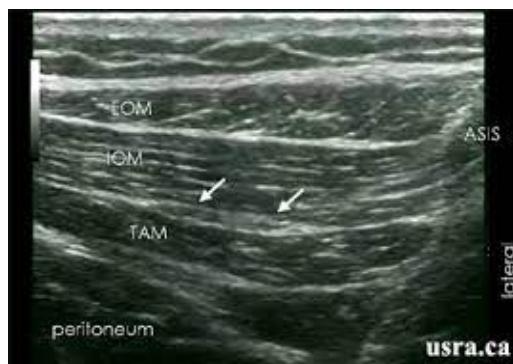


Figure 5: Ilioinguinal iliohypogastric block

Discussion

Effective post-operative analgesia for caesarean section has become a major medical challenge due to increasing rates of caesarean deliveries in the last two decades. The development of chronic pain, prolonged hospitalization, and compromised breastfeeding were among the consequence of untreated acute post-operative pain[4,5]. Other than patient preferences, factors like, hospital resources, trained nursing staff and inter-individual variations in pain threshold effect choices of analgesia.

Abdominal field blocks are among the alternative techniques for postoperative pain management after the caesarean section with promising results on efficacy, as they reduce the need of supplemental analgesia[6] thereby lowering the incidence of drug-related side effects[7]. Ultrasound-guided transverses abdominis plane block (TAP) and Ilioinguinal-iliohypogastric nerve block (IIH) have

proved to be effective alternatives to placebo[8-11]. The choice between IIH block and TAP block is merely based on practitioners' preference implying limited literature comparing the two.

We decided to study the relative efficacy of the two blocks with regards to duration of analgesia, time to first rescue analgesia, number of rescue analgesics, VAS score and patient comfort and satisfaction.

TAP block is a relatively new abdominal field block that has proven to provide excellent post operative analgesia following caesarean section[12-14]. The ultrasonographic anatomy to perform the block is identifiable, even after caesarean delivery. The major disadvantage of TAP is that it does not cover visceral analgesia. This lacuna likely explains why multiple studies have failed to show superiority of TAP compared with standard multimodal analgesia with intrathecal morphine. Studies on post caesarean TAP in the

absence of intrathecal morphine show benefit compared with placebo or no intervention.

The ilioinguinal-iliohypogastric nerve block covers the L1 dermatome and has been studied as a target for analgesia after caesarean deliveries. Bunting published one of the first studies in 1988 describing bilateral IIH nerve block in 26 patients who had general anaesthesia for caesarean deliveries[15]. The study showed that pain scores were lower through the first 24 hours in the patients who received IIH nerve block.

In our study, block performance time in minutes (from probe placement to the needle withdrawal) was significantly longer in the TAP group. The average time to perform IIH block was 8 ± 1.3 minutes as against 12.6 ± 2.7 minutes for the TAP block. This was statistically very significant (Table 2). Kiran et.al. in their study documented a block performance time for IIH as 16 ± 4 min. and 18 ± 4 min. for TAP block[3]. The finding was not statistically significant. Both increase in BMI and abdominal girth during pregnancy can be attributed to the difficulty in locating the transversus plane and effective drug deposition in TAP block. The use of the anterior superior iliac spine (bony landmark) and the umbilicus as a guide simplifies the accurate placement of the ultrasound transducer while US-guided IIH block is performed. The ease of identification of the actual ilioinguinal and iliohypogastric nerves under USG guidance adds further accuracy to needle placement.

We used 20ml and 10ml of local anaesthetic on each side in TAP block and IIH block respectively. Hadzic A and Tran TM in their study described that in both the blocks local anesthetic should be injected into the fascial plane between the internal oblique and transversus abdominis muscles with only a difference in the volume and anatomical point of injection[16-19]. The recommended

volume of injected local anaesthetic for TAP is 20–30 ml, as compared with 10 ml for IIH. US-guided nerve blocks include depositing local anaesthetic in close proximity to the nerve in IIH block, increasing block success rate using a lower volume of the local anaesthetic.

The duration of analgesia (time to first rescue analgesic) achieved in the IIH group was 17.806 ± 9.547 hours and was significantly longer than that achieved in the TAP group 12.133 ± 7.351 hours (Table 3). A study done by Sied Adem Ahemed et.al showed findings similar to our study with duration of analgesia in IIH group being 14.09 ± 8 hrs. and 10.71 ± 7.76 hrs. in the TAP group[20]. In another study done by S. Abiy et.al also the IIH group patients had a longer median analgesic request time as compared to the TAP group though not statistically significant[21]. A systematic review and meta-analysis of 5 studies done by Tikuneh yetneberk et.al found that there was no statistically significant difference in the two blocks in terms of duration of analgesia, which was not consistent with our study finding[22].

Tramadol in the dose of 50mg IV was administered in our patients when the VAS score was 4 and more than 4. Mean rescue analgesic consumption in TAP group was 1.17 ± 0.747 [58.5 ± 35 mg] whereas in the IIH group it was 0.55 ± 0.723 [27.5 ± 35 mg] over 24 hrs. study period. This was statistically significant. None of the patients in the IIH group required 3 rescue analgesics, as against 2 patients in the TAP group. 18/31 patients (58.1%) in the IIH group and 4/30 patients (13.3%) in the TAP group did not receive any rescue analgesics over 24 hrs. (figure 1). A finding consistent with our study was demonstrated by Syed Adem ahmed et.al with total tramadol requirement of 52.45 ± 30.5 mg in TAP group against 37.25 ± 27.09 mg in the IIH group[20]. In contrast to our study S. Abiy et al found that overall median tramadol consumption was 100mg in TAP group but 150mg in

IIH group.[21] The discrepancy in this study could be because their study period was 48hrs as against 24 hrs. in our study and they performed the blocks by landmark technique while we did it under ultrasound guidance. In a systematic review and meta-analysis of randomized controlled trials conducted by Youfa Zhou, *et al* there was no significant difference in tramadol consumption between the study groups.[23] One other meta-analysis by Yatneberk *et al* was not consistent with our study, the mean difference of total analgesic consumption at different cut-off points within 24 hrs. were not statistically significant between the TAP and IIH groups[22].

We demonstrated a statistically significant difference in the two groups with regards to duration of analgesia and total analgesic consumption with IIH group faring better than TAP block (Table 4). Both increase in BMI and abdominal girth during pregnancy can be attributed to the difficulty in locating the transverses plane and effective drug deposition while performing TAP block. Also, in ultrasound guided IIH block the drug is deposited closest to the nerves hence L1 sparing is negligible as compared to TAP block which is a compartment block.

We studied the post-operative pain scores using the Visual Analogue Scale at 2, 4, 8, 16 and 24 hrs. The VAS scores were comparable in both groups at 2 hrs. But from 2 hrs. through 24 hrs. the VAS scores were lower in the IIH group with statistical significance in comparison to the TAP group (Table 5) (Figure 2). The meta-analysis by Zhou *et al.* showed that no significant difference was found in the VAS scores at 1 and 2 hrs., consistent with our findings[23]. But the overall finding in this meta-analysis by Zhou *et.al.* showed no significant difference in post-operative pain scores at rest between TAP and IIH group which contradicted our findings[23]. Seid Adem Ahmed *et al.* in their study found no difference between the two

groups with regards to post-operative pain scores[20]. In another study by Kiran *et al.* the NRS score was comparable at all time intervals in both the groups[15]. S Abiy *et.al.* in their study found that the pain scores in both groups were comparable and not statistically significant at 4,8,12, and 24 hrs.[21]. The findings in all the three studies were contradicting to our findings.

We assessed the comfort and satisfaction level of mother post-operatively, with regards to their breast-feeding experience. This was done using the 5-point Likert satisfaction scale. 93.5% of patients in the IIH group graded themselves as "Fair" [grade-3] whereas only 50% patients in the TAP group graded themselves as "Fair" [grade 3]. 33% patients in the TAP group graded themselves as "Poor" [grade-2], while 0% in the IIH group graded themselves as "Poor" [grade 2].(Table 6) (Figure 3).

Untoward events like nausea, vomiting, pruritis or sedation though negligible were comparable in the two groups.

Conclusion

In this study we found a statistically significant difference between the two groups with respect to ease of performance of block, duration of analgesia and total analgesic consumption. Accordingly we would like to conclude that ilioinguinal iliohypogastric nerve block is preferable to transversus abdominis plain block for post-operative analgesia in caesarean section.

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