Original Article

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

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Abstract

Background: Quality of postoperative analgesia after cesarean section makes difference to mother in child bonding, early ambulation, and discharge. Ilioinguinal iliohypogastric (ILIH) and transverse abdominis plane (TAP) block had been tried to reduce the opioid analgesics, but the relative efficacy is unknown. Hence, this study was designed to compare the efficacy of these two regional analgesic techniques in sparing postoperative rescue analgesic requirement following lower segment cesarean section (LSCS). **Methods:** Sixty patients who underwent LSCS were randomly allocated into two groups to receive either US-guided TAP block or ILIH nerve block using sealed envelope technique at the end of the surgery. In the postoperative ward, whenever patient complained of pain, pain nurse in-charge administered the rescue analgesics as per the study protocol. A blinded observer visited the patient at 0, 2, 4, 6, 8, 10, 12, and 24 h postoperative intervals and recorded the quality of pain relief and the amount of rescue analgesic consumed. **Results:** All patients in both the study groups required one dose of rescue analgesics in the form of injection diclofenac sodium 50 mg intravenously but subsequently 57% of patients did not require any further analgesics till 24 h in the TAP block group whereas in ILIH group, only 13% did not require further analgesics ($P = 0.00$), correspondingly the cumulative tramadol dose was significantly higher at all the time interval in the ILIH group when compared to the TAP group. **Conclusion:** Quality of postoperative analgesia provided by TAP block was superior to ILIH block following LSCS.

Keywords: Ilioinguinal block, lower segment cesarean section, postoperative pain, transverse abdominis plane block

Introduction

After cesarean patients, pain has to be addressed effectively with minimal interruptions and complications to ensure that they are alert and comfortable to take care of their newborn.[1-3] Conventionally, opioids are administered to provide effective pain relief in the postoperative period. However, opioids are associated with dose-dependent side effects including nausea, vomiting, pruritus, sedation and respiratory depression.[4] Various regional anesthetic techniques have been tried including transverse abdominis plane (TAP) and ilioinguinal-iliohypogastric (ILIH) nerve blocks to spare opioid analgesics and achieve the same goals but the relative efficacy is unknown. Ultrasound guidance of the simple anatomic technique (ILIH) may greatly improve the success of the inguinal nerve blocks, reduce the volume of local anesthetic, and prevent potential injury of adjacent

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structures.[5] Its feasible in a majority of operation theater setups. Ultrasound-guided transverse abdominis plane block is another effective technique with adequate safety to counter postoperative pain, especially in postcesarean section patients.[6] Hence, this study was designed to evaluate the efficacy of these two regional analgesic techniques in sparing of postoperative rescue analgesic requirement.

Methods

After obtaining Institute Research Council and Ethical Committee Approval, sixty patients belonging to the American Society of Anesthesiologists physical status 1 and 2, aged between 18 and 45 years and posted for emergency or elective lower segment cesarean section (LSCS) under spinal anesthesia were selected using a computer-generated random table. Written informed consent was obtained from all participants. Patients who were not willing to give consent, known allergy to local anesthetic or infection at the block site were excluded from the study.

All patients received standard premedication according to institute protocol with ranitidine and metoclopramide intravenously immediately before shifting the patient into the operating room for emergency LSCS or 2 h before by oral route in case of elective LSCS. Inside the operating room under all aseptic precautions, spinal anesthesia was administered using 1.8 ml of 0.5% of heavy bupivacaine without any adjuvant in L3–L4 space using Quincke's needle by the attending anesthesiologist. The case was managed by the same person without any narcotics intraoperatively. At the end of the procedure just before the skin closure, 1 g of injection paracetamol was administered intravenously over a period of 20 min as a part of multimodal analgesia.

At the end of the surgery, patients were randomized into ILIH or TAP block group by choosing a closed envelope, which contained a standard data collection sheet and an allocation card. All the blocks were performed by the principle investigator under aseptic precautions and ultrasound guidance using high frequency linear probe (HFL 38) resonating at 12 MHz in the multi-beam mode (MicroMaxx; SonoSite, Bothell, WA, USA). In TAP block group, the probe was placed perpendicular to the mid-axillary line between the iliac crest and the subcostal margin and the three abdominal muscle layers were identified, and the transverses abdominis plane was located between the internal oblique and the transverse abdominis muscle. The TAP was approached through in-plane technique using a 23-gauge Quincke spinal needle attached to a 20 ml syringe through a 100 cm pressure monitoring line, and 20 ml of 0.25% bupivacaine was injected and the drug spread in the plane was observed. The same procedure was repeated on the other side of the abdomen.

In ILIH group, 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, iliacus muscle, internal oblique, transverses abdominis, and the ILIH nerves between them were identified. After appreciating the sonoanatomy, the ILIH nerve was approached with the 23-gauge Quincke spinal needle through in-plane technique and 10 ml of 0.25% bupivacaine was injected all around and the drug spread was appreciated. The same procedure was repeated on the other side, and the performer collected the procedural data, and he took no further part in the study. At the end of the procedure, patients were shifted to the postanesthesia recovery room and later to the postoperative ward after establishing the block.

The sensory assessment following the TAP and ILIH block was done after confirming the spinal regression below the level of L2 dermatome. The block was considered "Successful" when the patient was not able to perceive the cold sensation at L1 dermatome (inguinal region) on both sides. The block was considered "Partial" when patient perceives cold sensation on any one of the side. The block was considered "Failure" when the patient perceives cold sensation on both sides at L1 dermatome. Patients suffering partial and failed block were excluded form the study for further analysis but received standard postoperative analgesics as any other patients. In the postoperative ward, whenever, the patient complained of pain, nurse in-charge noted the numerical rating scale (NRS) score, and administered a single dose of injection diclofenac sodium of 50 mg as slow intravenous infusion over a period of 15 min and noted the time as time of first analgesia. Subsequently, whenever patient complained of pain, injection tramadol 50 mg was given intravenously for the remaining 24 h.

A blinded observer who was not aware of the group allocation visited the patient at 2, 4, 6, 10, 12, and 24 h postoperative intervals and analyzed the study parameters and recorded in the common standard data collection sheet. 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) during rest as well as on movement (turning lateral to any one side). Duration of analgesia was taken as time interval between the block time and the time of first analgesia. The 24 h requirement of rescue analgesics injection diclofenac sodium and injection tramadol and complications such as nausea, vomiting, transient femoral nerve palsy, any signs, and symptoms of bowel perforation were noted.

Sample size and statistical analysis

As per WHO manual for health studies to identify 30% difference in the rescue analgesic requirement between the two study groups, considering the alpha probability of 0.05 and power of 0.80, we needed a sample size of 18 patients in each group, but to give allowance for inclusion, exclusion, consent, and drop outs, we decided to recruit 30 patients in each group. The collected data were analyzed using statistical software SPSS 16 Package for Social Sciences (Version 16.0 [2007]: SPSS Inc., Chicago, IL, USA). The parametric data were analyzed by unpaired Student's *t*-test, and nonparametric data were analyzed by Chi-square test.

Results

Patient physical characteristics, type of surgery, and the procedural data of both the technique were comparable between the two study groups [Table 1]. The quality of pain relief measured on the NRS during rest [Figure 1] and movement [Figure 2] were <3 and 4, respectively, at all time intervals in both the study group and were comparable. All patients in both the study groups required one dose of rescue analgesics in the form of injection diclofenac sodium 50 mg intravenously, but subsequently, 57% of patients did not require any further analgesics till 24 h in the TAP block group, whereas in ILIH group, only 13% did not require further analgesics (P = 0.00) [Figure 3]; accordingly, the cumulative tramadol dose was significantly higher at all the time interval in the ILIH group when compared to the TAP group [Figure 4]. None of the patients had complications such as nausea, vomiting, dizziness, femoral nerve palsy, during first 24-h study period.

Discussion

Alsadek *et al*. in their study have established safety and efficacy of ultrasound-guided analgesia in children. In this study, we have demonstrated that the TAP block provides better postoperative pain relief than ILIH nerve block as a part of multimodal regimen following cesarean section.[7] The pain impulse following LSCS may arise from two components, namely, somatic and visceral.[8] Somatic pain is arising from the anterior abdominal wall due to the pfannenstiel incision. The classical pfannenstiel incision involves a 12–15 cm transverse incision made approximately 2–3 cm cranial to the symphysis pubis, and subcutaneous fat and rectus sheath are diathermally incised. If necessary, the incision is extended laterally by cutting the fibrous sheath containing the aponeuroses of the external oblique, internal oblique, and tansverse abdominis muscles. The anterior fascia and linea alba are separated from underlying rectus and pyramidalis muscles over the entire distance between symphysis and umbilicus. The rectus abdominis muscle is then separated in the midline, followed by division of the preperitoneal fat, and the peritoneum is opened.[9] The peripheral nerves that carry the pain signal from these structures are thoraco lumbar nerves ranging from T10 to LI with varying contribution from T9 and L2.[10] Hence, the regional analgesic technique that aims to provide parietal wall pain relief following LSCS should block all these nerves.

The TAP block performed at the midaxillary line in the subcostal area provided the conduction blockade of thoraco lumbar nerves arising from T10 to L1 during 50% of the time and T11 to L1 in 100% of the time.[11] Whereas, the ILIH block at the level of the ASIS, provided conduction blockade of L1 and L2 nerves.[10] Hence, in the TAP block group, the parietal wall anesthesia was more complete as it blocked the pain impulse from both the skin subcutaneous tissue and from the rectus muscle. Whereas, in ILIH block group, we were

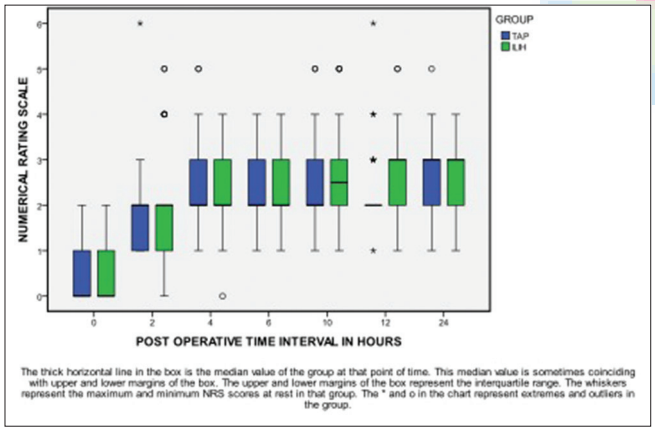

Figure 1: Median pain scores during rest at various postoperative intervals in both transverse abdominis plane and ilioinguinal iliohypogastric group.

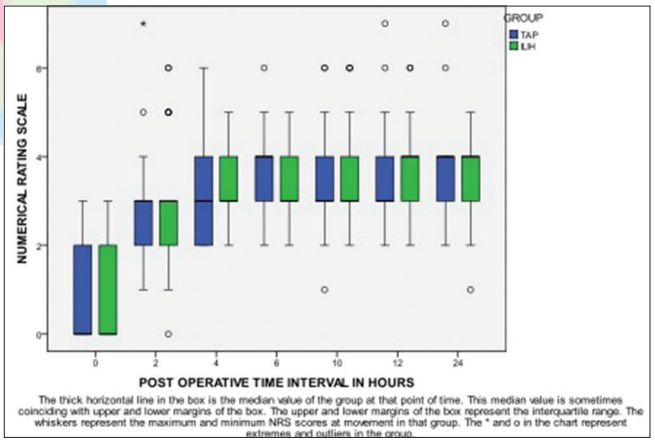

Figure 2: Median pain scores during movement at various postoperative intervals in both transverse abdominis plane and ilioinguinal iliohypogastric group.

Table 1: Patient physical characteristics and the procedural data

Parameters mean (CI)	TAP block group (n=30)	ILIH group (n=30)	P
Age	26.07 (24.57–27.56)	25.9 (24.44–27.36)	0.87
Weight	66.03 (63.03–69.03)	66.77 (63.32–70.21)	0.74
Sonography time (min)	7.73 (6.8–8.6)	7.43 (6.4–8.5)	0.66
Injection time (min)	9.93 (8.83–11.04)	8.67 (7.72–9.61)	0.80
Total procedure time (min)	17.67 (16.14–19.20)	16.10 (14.56–17.64)	0.145
Duration of block analgesia (min)	409 (332.19–485.81)	329 (258.80–400.20)	0.125

CI=Confidence interval, TAP=Transverse abdominis plane, ILIH=Ilioinguinal iliohypogastric

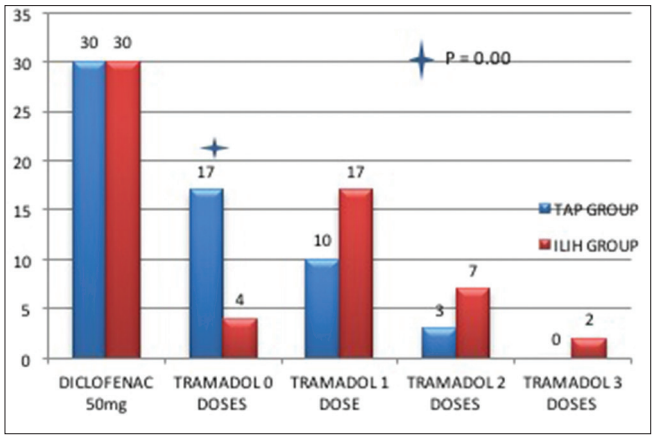

Figure 3: Rescue analgesic requirement in both transverse abdominis plane and ilioinguinal iliohypogastric group.

anesthetizing only the skin and lower one-third of the rectus muscle but leaving the upper two-third unblocked which possibly needed regular analgesic supplementation.

The visceral pain impulse from the uterus reaches the spinal cord through the sympathetic fibers through inferior hypogastric plexus which were not blocked by both the regional anesthetic technique. Hence, all the patients in both groups required at least one dose of systemic analgesics (injection diclofenac sodium) to attenuate the visceral pain.

We compared two modern regional anesthesia techniques, namely, TAP block and ILIH nerve block. Both these blocks have produced a significant reduction in pain and analgesic requirements in the previous studies reducing the amount of systemic analgesic requirement. In a study conducted by Oriola *et al*.[12] reported a 51% decrease in morphine consumption following ILIH block given for patients who underwent nonlaparoscopic gynecological technique. The amount of morphine consumption was 21 ± 9 mg in ILIH block group while it was 41 ± 24 mg in patients who did not receive block for first 48 h postoperatively, but there was no reduction in opioid-related side effects. In another study done by Belavy *et al*.,[13] the 24 h median morphine consumption following ultrasound-guided TAP block with 0.5% ropivacaine postcesarean found to be 18 mg which was significantly less when compared to patients who received saline for TAP block which was 31.5 mg.

In our study, there was no difficulty in performing either block. The average time to perform ILIH block was 16 ± 4 min, and the average time for TAP block was 18 ± 4 min. In both the block groups, the pain scores recorded at regular time intervals were insignificant both at rest and movement. The duration of analgesia in ILIH block in our study was 330 ± 189 min. This was in contrast to a study done by Lalchandani *et al*.,[14] who showed the duration of analgesia following ILIH block in postcesarean patients to be 15.25 ± 2.77 h (915 ± 166.2 min) while it was 7.4 ± 0.56 h (444 ± 33.6 min) in patients who received injection diclofenac 1.5 mg/kg intramuscularly. The technique of ILIH block was different from our study. They

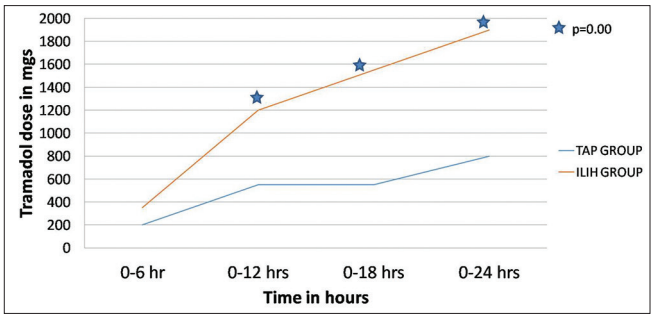

Figure 4: Cumulative rescue analgesic requirement in both transverse abdominis plane and ilioinguinal iliohypogastric group for 24 h.

performed ILIH block by blind technique and 5 ml of 0.25% bupivacaine was injected feeling for the loss of resistance after passing through external oblique muscle. Moreover, another 5 ml was giving while coming out. The duration of analgesia in our study was 409 ± 206 min in TAP block group. This was in contrast to a study conducted by Kanazi *et al*.[15] The median time for first analgesic request following TAP block with 20 ml of 0.375% bupivacaine and 5 μg/ml epinephrine on each side was 4 h (0.5–29), which was less when compared to patients who received 0.2 mg morphine in spinal anesthesia.

The primary outcome measure in our study was postoperative analgesic sparring by either block. In our study, the maximum tramadol consumption in TAP group was 100 mg over a 24 h period. In a study conducted by Eslamian *et al*.,[16] for postoperative analgesia in LSCS patients, the maximum tramadol consumption was 150 mg in TAP block group and 400 mg in no block group. The mean tramadol consumption in a 24-h period was only 75 mg in TAP block group while it was 250 mg in patients who did not receive tramadol. This differed from our study as the patients underwent LSCS under general anesthesia and at the end of surgery, all patients received morphine 0.1 mg/kg intravenously. In our study, the highest Tramadol requirements in a patient were only 150 mg in ILIH group. This was very less when compared to study conducted by Sakalli *et al*.,[10] who showed the average tramadol consumption over 24 h period in patients who received ILIH block was 331 ± 82 mg while it was 622 ± 107 mg in patients who did not receive the block. In our study, we compared TAP and ILIH blocks for amount of analgesic consumption for 24 h. All the patients in both the groups required diclofenac. The amount of Tramadol required was more in ILIH group when compared to TAP block group. Although the amount of tramadol required in ILIH group was high, it was less when compared to previous studies.

The NRS score was comparable at all the time intervals in both groups indicating the effectiveness of regional techniques in relieving pain during rest as well as movement.[10,16,17] The procedure-related complication such as hematoma, liver trauma, bowel puncture, and transient femoral nerve palsy were nil in our study, which indicates the improved safety during ultrasound guidance in these techniques.[18,19] There are more recent options such as patient-controlled epidural with

an elastomeric pump, wound infiltrations with catheter, and bilateral quadrates lumborum blocks with proven success. Still, we resorted to these two techniques to compare each other as they have established efficacy with proven safety.[20,21]

Conclusion

Ultrasound- guided TAP block is more effective than ILIH block for postoperative pain relief as part of multimodal pain management following LSCS.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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