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Original Research Article

Evaluating Analgesic Efficacy of Ultrasound-Guided Ilioinguinal - Iliohypogastric Nerve Block in Patients Undergoing Unilateral Inguinal Hernia Repair

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Conflict of interest: Nil

Abstract

Background: Inguinal hernia repair is one of the commonest surgeries performed. Poorly controlled post-operative pain following herniorrhaphy might be a predisposing factor for the development of chronic pain. The use of ultrasound for nerve block enhances the success rate.

Aim and objective: To gauge the analgesic efficacy of ultrasound-guided ilioinguinal (IL) – iliohypogastric (IH) nerve block in patients undergoing unilateral inguinal hernia repair.

Materials and Methods: Sixty patients of the American Society of Anesthesiologists grade I–II undergoing elective unilateral inguinal hernioplasty were studied between Jan 2020 to Dec 2020. Patients were randomly divided into USG-guided II-IH blocks performed with 15 ml of normal saline (Group C; n=30) and 15 ml of 0.25% bupivacaine (Group S; n=30). A visual analogue scale (VAS) score was used for pain assessment. Patients who had VAS of 3 or more received i.v. Pentazocine. Patients were monitored for VAS scores and total analgesic consumption for 24 hours.

Results: II-IH block reduced VAS score at 2, 4, 6, 8, and 12 hours. This nerve block with 0.25% bupivacaine resulted in 7.50 hours of analgesia. Rescue analgesia was consumed less in group S. No complication was observed in this study.

Conclusion: Ultrasound-guided ilioinguinal-iliohypogastric nerve block is an effective and safe adjunct to multimodal post-operative analgesia after inguinal hernia repair surgeries. This reduces rescue analgesia consumption and provides a good VAS score. No complication was observed in any group.

Keywords: Inguinal Hernia Repair, Post-Operative Analgesia, Bupivacaine, Ilioinguinal-Iliohypogastric Block, Ultrasound.

Introduction

Inguinal hernia repair is one of the commonest surgeries performed. Incidence is reported as 11/10,000 in persons between 16 and 24 years of age and 200/10,000 in persons more than 75 years of age. Post-operative pain not only distresses the patient but prolongs the hospital stay. [1] Providing adequate post-operative analgesia facilitates early ambulation and prevents post-operative morbidity.

Chronic pain occurs 5-10% after the inguinal hernia repair, which creates a

significant problem. [2] Poorly controlled post-operative pain following herniorrhaphy might be a predisposing factor for the development of chronic pain. A considerable part of pain after hernia surgery is caused by the abdominal wall incision. [3] The somatic pain generated at the incision site is conducted by the ilioinguinal and iliohypogastric nerves (II-IH), which innervate the L1-L2 dermatome distribution. Analgesic multi-modalities were recommended to relieve post-operative pain. [4]

Generalized wound infiltration, opioids, NSAIDs, and epidural analgesia have been tried for post-operative analgesia, but these means of intervention also have limitations when used as a sole agent. Peripheral nerve blocks provide excellent analgesia over a limited field and with minimal systemic effects. [5-8] USG-guided blocks are generally easy to perform and very safe. [9] Transversus abdominis plane block and Ilioinguinal- Iliohypogastric (II-IH) nerve blocks were performed well in the past with adequate post-operative analgesia after inguinal hernia surgery without systemic side effects. Both nerve blocks were documented to reduce post-operative VAS score and opioid consumption without significant systemic side effects in hernia surgeries.

Performing these blocks under ultrasound guidance is safe and accurate. This double-prospective, double-blinded, randomized study aimed to evaluate the analgesic efficacy of ultrasound-guided ilioinguinal and iliohypogastric (II-IH) blocks in patients following unilateral inguinal hernia repair. This study analyzed the visual analog scale (VAS) pain score and total analgesic consumption following TAP block in inguinal hernia surgery.

Materials and Methods

After getting approval from Institutional Ethics Committee and written informed consent from patients, 60 patients of the American Society of Anesthesiologists grade I–II undergoing elective unilateral inguinal hernioplasty were enrolled in the study. The study was performed between Jan 2020 to Dec 2020.

Patients aged 20– 60 years and weighing between 50 and 80 kg were selected for the study. Patients with psychological disorders, significant liver and renal disease, bilateral inguinal hernia, scrotal hernia, recurrent inguinal hernia, obstructed inguinal hernia, and known allergy or contraindication to study drugs were omitted from the study.

The sample size was calculated based on the 24-hour pentazocine consumption in patients undergoing inguinal hernia repair. For sample size calculation, we found that there would be a 25% reduction of the dose of pentazocine least. This was based on our pilot data. We calculated 25 patients would be required per group using an α=0.05 and β=0.2. To minimize any effect of data loss, we recruited 30 patients per group into the study.

A detailed history of all selected patients was taken. A thorough pre-anesthetic evaluation, including the airway assessment, was performed. They were also educated about the VAS score. Monitors were attached, and baseline parameters, viz. heart rate, systolic and diastolic blood pressure, mean arterial pressure, SpO2, and ECG tracings, were continuously monitored during surgery and the post-operative period. The intravenous line was secured. All patients were given Subarachnoid Block with Bupivacaine (0.5%) heavy (bupivacaine hydrochloride in dextrose injection USP) 3ml injection into the subarachnoid space at L3-L4 spinal level via 25 gauge Quincke's spinal needle. Lichtenstein tension-free meshplasty was performed after checking the desired level of anaesthesia achieved. The drug for nerve block was prepared by some colleagues, either 15 ml of normal saline or 15 ml of 0.25% Bupivacine, and the colleague who prepared the drug did not participate further

in the study. At the end of the surgery, an ultrasound-guided nerve block was performed, who was blinded to the medication given. The patients were randomized using a computer-based randomization software, "Random Allocation Software 1.0" [Copyright @ Informer Technologies, INC], in two groups of 30 patients each, depending on the drug given for the IH/II nerve block.

Group C (n=30) was the control group and received 15 ml of normal saline. Group S (n=30) was the study group and received 15 ml of 0.25% bupivacaine. After the surgical wound was closed, patients underwent II-IH nerve block. The lower abdomen, the iliac crest, and the groin area were exposed, and the anterior superior iliac spine (ASIS) was marked. After skin and transducer preparation, a linear transducer (7.5 Hz) of MINDRAY DC 30 SERIES was placed obliquely along a line joining the anterior superior iliac spine (ASIS) and the umbilicus immediately 2 cm superior and 2 cm medial to the ASIS. The three muscular layers of the abdominal wall: the external oblique (most external), the internal oblique, and the transverse abdominis muscles, were identified.

The II and IH nerves, which were hypoechoic in appearance, are identified within the fascial plane between the transverse abdominis and internal oblique muscles above the ASIS. A 5-8 cm 22 G needle was inserted parallel to and in line with the transducer and the ultrasound beam and was accurately placed in the fascial plane between the internal oblique and transverse abdominis muscle layers.

After negative aspiration for blood, 15 ml of 0.25% bupivacaine was injected. After completion of the block, patients were transferred to the post anaesthesia care unit (PACU). At the PACU, pain and its intensity were assessed by an anaesthesiologist unaware of the group assignment. All patients received IV Paracetamol 1gm 8 hourly, with the first dose given at the end of surgery. The pain was assessed at rest using a visual analogue scale (VAS) ranging from 0 to 10 at PACU at 0,2,4,6,8,10,12 and 24 hours. Patients who had VAS of 3 or more received i/v Pentazocine 0.3 mg/kg as the first dose and i/v Pentazocine 0.1mg/kg as a subsequent dose if needed. Total analgesic consumption in the 24-hour post-operative period was recorded. Any complications related to interventions were also noted.

Statistical Analysis

Statistical analysis was performed using a standard statistical program, the statistical package for Social Sciences version 20.0 software. (IBM Corporation, Armonk, NY, USA SPSS VERSION 20). Demographic data were analyzed using Student's t-test. Pain scores were analyzed using the unpaired t-test. Baseline variables and pain scores were expressed as mean ± standard deviation, while categorical data were presented as raw data and frequencies. All analyses' levels were set at P=0.05, and a P-value less than 0.05 were considered statistically significant.

Results

Sixty patients were included in the study and were randomly allocated into two groups. In group C, patients were undergone spinal anesthesia with 0.5% Bupivacaine (heavy) plus ilioinguinal/ iliohypogastric nerve block with normal saline. In Group S, they were to undergo spinal anesthesia with 0.5% Bupivacaine (heavy) plus ilioinguinal/iliohypogastric nerve block with 0.25% bupivacaine for post-operative analgesia. The two groups were comparable in demographic profile (age, height, weight) shown in Table 1.

There was no statistical difference in the duration of surgery in the groups given in Table 2. There was no statically significant difference in VAS score at 0 and 24 hr. The significant p-value in VAS score is observed at 2,4,6,8,12 hrs and shown in Table 3. The time the first dose of pentazocine was demanded was relatively

longer in the study group (7.50 hours) than in the control group (4.30 hours). The total pentazocine requirement in the 24-hour study was significantly less in group S (21.20 mg) than in group C (36.60 mg). Nausea and vomiting were observed in the control group but were clinically insignificant.

Table 1: Demographic profile in two groups

Group	Age in yrs (Mean ± SD.)	Weight in kg (Mean ± SD.)	Height in cm (Mean ± SD.)
Group C	37.57 ± 12.71	59.80 ± 6.96	158.33 ± 5.05
Group S	40.23 ± 12.29	60.87 ± 4.67	156.60 ± 5.506
P value	0.412*	0.842*	0.591*

Table 2: Duration of surgery in two groups

Outcome	Group s	Group c	P value
Duration of surgery in minutes	57±4.69	59±5.04	0.19*

Values are in mean±SD, *p-value non-significant

Table 3: VAS scores in both groups at different time interval

(Mean ± SD.)	immediate after surgery	2 hrs	4 hrs	6 hrs	8 hrs	12 hrs	24 hrs
Group C	0.0±0.0	0.97±0.81	2.53±1.17	2.83±1.09	3.20±1.45	2.90±1.09	2.43±0.77
Group S	0.0±0.0	0.10±0.31	0.60±0.97	1.37±1.13	1.57±0.94	1.37±1.13	2.30±0.90
P value		<0.0001#	<0.0001#	<0.0001#	<0.0001#	<0.0001#	0.550*

Values are in mean±SD, *p-value non-significant, # p-value significant SD, Standard deviation

Table 4: Requirement of rescue analgesic in both groups

Outcome	Group C	Group S	P- value
Time of the first request for rescue analgesia (Pentazocine)	4.30±0.95	7.50±1.11	<0.0001#
The total requirement of opioid analgesic	36.60±15.41	21.20±5.40	<0.0001#

Values are in mean±SD, # p-value significant (using T-test)

Discussion

The importance of post-operative analgesia is well known, i.e., early ambulation, early discharge, and patient comfort is a significant benefit. Ilioinguinal and Iliohypogastric nerves (II-IH) block have produced excellent post-operative pain control in adults and children following hernia repair and groin surgery. After a review of previous studies, we used bupivacaine as our local anesthetic due to its long-acting effects. This study evaluated the benefits of USG-guided Ilioinguinal and Iliohypogastric nerve block for the post-operative analgesic outcome of inguinal hernia repair surgery. The primary end-point was the first-time request for intravenous pentazocine injection (rescue analgesic); other objectives were the estimation of total opioid consumption and assessment of VAS score.

Previously the II-IH nerve block was performed by anatomical landmark technique. To reduce the failure rates with the blind approach, II-IH nerve blocks were performed with PNS guidance. But both methods carry the risk of intra-peritoneal injection, bowel injury, hematoma formation, and transient femoral nerve palsy. USG-guided nerve blocks are very safe to reduce those complications and increase success rates by accurate needle positioning. [10] They also reduce the local anesthetic requirement for producing nerve

blocks as the drug is delivered very close to the nerve. In our study, we used 15 ml of 0.25% bupivacaine for the II-IH nerve block after the closure of the surgical wound.

The duration of analgesia in our study group Group S (7.50±1.11 hours), was longer compared to Group C (4.30±0.95 hours). The first request for rescue analgesia was considered as the duration of analgesia. The reason for the prolonged analgesic effect following a single shot II/IH nerve block is not entirely apparent. This may be explained by the fact that these nerves are relatively poorly vascularized, so that drug clearance may be slowed.

VAS score in Group S was consistently lower in the study group till 12 hr later. The 24hr VAS score was very close to Group C because the block effect has worn off. Total opioid consumption in Group S (21.20±4.49 mg) was less as compared to Group C (34.60±15.41mg). duration of analgesia and reduction of opioid consumption is remarkable, which makes the II-IH block superior for post-operative analgesia. Similarly, Krishnegowde et al. [5] used bilateral II-IH nerve block to manage post-operative pain in a patient undergoing elective cesarean section. She found longer analgesia duration (515.64 ± 82.87 min), lower VAS scores (1.72 ± 0.68), and lower analgesic consumption. Khedkar et al. [6] compared rescue analgesia dose requirement and time to its first demand between USG and conventional technique of II-IH nerve block using 15 ml of 0.75% ropivacaine. They concluded that ultrasound-guided hernia block thus has the advantage of early onset, less dose requirement, and increased time to rescue analgesia. Demirci et al. [7] compared the efficiency of ilioinguinal-iliohypogastric nerve blocks with ultrasound-guided and anatomical landmark techniques in cases of inguinal herniorrhaphy in adults. They found that USG-guided II/IH block provides more effective analgesia and higher analgesia satisfaction than iliohypogastric/ilioinguinal nerve block with the anatomical landmark technique. Both studies [6] and [7] have shown that USG guided approach is better than any other approach. Since we have not compared conventional and USG-guided approaches for a block but based on these studies, we performed USG-guided block for both groups. Bhatia et al. 2019 [8], concluded that medial transverse abdominis plane block is a novel, simple, and easily performed procedure that can serve as a useful alternative to ilioinguinal-iliohypogastric nerve block for providing post-operative pain relief in inguinal hernia repair patients.

Our study found that the USG-guided II-IH block is easy, but sometimes air between the muscle creates problems in visualization as air is a bad acoustic window, but this was not significant. Seyedhejazi et al. [9], found caudal epidural block and ilioinguinal- iliohypogastric nerve block using bupivacaine-clonidine have comparable effects on analgesia in children after surgery on the inguinal region.

Our study showed no complications in the 60 patients who received ilioinguinal and iliohypogastric nerve block. Although case reports of Udo et al. [10], Ghani et al. [11], and Tsai et al. [12] found weakness in the lower limb following this nerve block. Since nerve blocks are ultrasound-guided, no procedure related complications were recorded in our study; none of the 60 patients who received the II-IH nerve block with bupivacaine had the above-mentioned complications.

Our study of II-IH nerve block under USG guidance facilitated real-time US image accuracy of ilioinguinal and iliohypogastric nerve block. The limitations of this study are many; the first is post-operative pain, which is a subjective experience and can be difficult to quantify objectively and compare. The second study was conducted

in a single center; a multicentre, more extensive study may be more informative. Third is that patient-controlled analgesia would have been better for better results, but our Institute doesn't have this facility. Forth by putting the catheter, analgesia with block could have been increased.

Conclusion

Our study concluded that the analgesic efficacy of ultrasound-guided ilioinguinal-iliohypogastric(IIIH) nerve block is an effective and safe adjunct to multimodal post-operative analgesia in patients undergoing unilateral open inguinal hernia repair surgeries. Consumption of intravenous opioids has been reduced with this block, resulting in fewer opioid-mediated side effects.

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