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Postoperative Analgesic Efficacy of Ilioinguinal-Iliohypogastric Block in Inguinal Hernia Surgeries: A Prospective Randomized Single-Blind Study

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Introduction: Ilioinguinal-iliohypogastric (II/IH) nerve block is a procedure used for postoperative analgesia in lower abdominal surgeries. We aimed to compare the postoperative analgesic efficacy of ultrasound (US) guided II/IH nerve block, tramadol and paracetamol in patients scheduled for unilateral inguinal hernia surgery.

Materials and Methods: The study population consisted of the patients who underwent surgery with the diagnosis of inguinal hernia. Sixty male cases aged 18-65 years and ASA I-II were included in the study. After spinal anesthesia, those who underwent II/IH nerve block under US guidance for postoperative analgesia were classified as Group B (n=20), those who received tramadol were classified as Group T (n=20), and those who received paracetamol were classified as Group P (n=20). Demographic characteristics, hemodynamic parameters, time before postoperative first analgesic requirement, amount of analgesic used in the first 24 hours, additional analgesic requirement, Visual Analogue Scale (VAS) score, and patient satisfaction were recorded.

Results: There was no significant difference between the groups in terms of demographic data, ASA score and operation side. Up to 24 hours postoperatively, patient satisfaction in Group B was significantly higher than in the other two groups. While the time before the first analgesic requirement was 295 minutes in Group B, it was 129.5 minutes in Group T and 122 minutes in Group P (p=0.001). While the VAS scores in the first 12 hours postoperatively were lower in Group B, they were similar in all three groups after the 12th hour.

Conclusion: The study findings demonstrated II/IH nerve block reduces the need for analgesia in the first 24 hours postoperatively in inguinal hernia operations performed under spinal anesthesia. In addition, it was determined that II/IH nerve block ensures better postoperative patient satisfaction and prolongs first analgesic requirement time.

Keywords: Ilioinguinal/iliohypogastric block; inguinal hernia; unilateral spinal anesthesia; peripheral nerve block

Introduction

The relief of acute postoperative pain has recently shown rapid progress due to its positive effects on patient comfort and surgical recovery. However, there is still no standard postoperative analgesia treatment. Despite developments in the pathophysiology and

treatment of pain and new drug applications, many patients still receive inadequate treatment for their pain in the postoperative period and 30-75% of patients complain of moderate or severe pain after surgery. Regardless of the side effects and application

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method, patients want their pain to be relieved effectively in the postoperative period (1-3).

Since spinal anesthesia is a safe and practical analgesia technique for inguinal hernia surgery, it has become the preferred method (4,5). In inguinal hernia patients, different analgesia methods are used to relieve postoperative pain. The ilioinguinal-iliohypogastric (II/IH) nerve block is among methods used for postoperative analgesia together with central blocks and general anesthesia for lower abdominal surgery. The nerves that are displayed and blocked by the II/IH nerve block travel between the internal oblique and transversus abdominis muscles in the anterolateral region of the abdomen, and is preferred as an anesthesia method for small, superficial interventions on lower abdominal wall, and is preferred as postoperative analgesia for surgeries below the umbilicus (6-8). Nerves visualized and blocked in the II/IH small system show in anterolateral region of the abdomen between the internal oblique and transversus abdominis and are preferred to perform anesthesia in the lower vessel wall, superficial orientation, and postoperative analgesia in umbilicus advancement surgeries.

The purpose of our study is to compare the postoperative analgesic efficacy of ultrasound (US) guided II/IH nerve block, intravenous (IV) tramadol and paracetamol in cases scheduled for unilateral inguinal hernia surgery under elective conditions.

Materials and Methods

Ethical Statement

Prior to conducting this study, approval was obtained from the Van Yüzüncü Yıl University Faculty of Medicine Clinical Research Ethics Committee (approval number: 03/06/2016/01). The study was performed on patients who applied to the Van Yüzüncü Yıl University Faculty of Medicine General Surgery Outpatient Clinic with a diagnosis of unilateral inguinal hernia and opted for an elective surgery treatment. Before enrollment in the study, all

participants were informed in detail about the study and their written consent was obtained.

Inclusion/Exclusion criteria

Sixty male cases with informed written consent, classified in ASA I-II group, 18-65 years of age, undergoing a unilateral inguinal hernia operation, and operated on under spinal anesthesia were included in this study. Patients who did not want II/IH nerve block or spinal anesthesia, could not communicate well, had a BMI>30, were allergic to the drugs used in the study, or were contraindicated for regional anesthesia (sepsis, local infection, coagulopathy, heart disease, hypovolemia) were excluded from the study.

Determination of study groups

The study was planned as prospective, randomized and single-blind. The cases were randomized according to the closed envelope method and divided into three groups of 20 each. After spinal anesthesia, an II/IH nerve block was performed under US guidance for postoperative analgesia in Group B (n=20), a Tramadol IV administered to group T (n=20), and paracetamol IV administered to group P (n=20) (Table 1).

Procedures performed

The cases scheduled for surgery were taken to the preoperative evaluation room before the operation. The procedures to be done were explained again. All patients were monitored with a standard electrocardiogram (ECG), peripheral oxygen saturation (SpO₂), heart rate (HR) and noninvasive blood pressure. Two vascular accesses were opened with a 20G cannula in the antecubital region and hydration was provided with 10-15 mL/kg saline. The first measured values were recorded as pre-block values. Then, a spinal block was applied to patients in all three groups in the lateral decubitus position, with the operation site down. Following spinal anesthesia, Group B (n:20) was administered 10 mL of 0.5% bupivacaine around the II/IH nerve under US guidance. Group T (n: 20) was administered 1

mg/kg tramadol, whenever $VAS \geq 5$, in the first 24 hour after the surgery. Group P (n:20) was administered three doses of 15 mg/kg paracetamol during the first 24 hours after surgery. In addition, tramadol 1 mg/kg was administered as a rescue analgesic whenever $VAS \geq 5$ for all groups (Table 1). All blocks and observational data were collected by two experienced clinicians. All blocks were performed by the same anesthesiologist, and the statistical data collection of the patients in the intraoperative and postoperative period was performed by the observational physician.

Visual Analogue Scale (VAS) was used for pain scale in patients. The VAS scores were accepted as 0-2: no pain, 3-4: mild pain, 5-6: moderate pain, 7-8: severe pain, 9-10: excruciating pain. The patient satisfaction scale was stated verbally with numbers between 1-4 and a questionnaire was filled out for satisfaction. On the satisfaction scale; 1: not at all satisfied, 2: somewhat satisfied, 3: moderately satisfied, 4: very satisfied. All of the patients' demographic data, time to first analgesic requirement and the amount of analgesic used within 24 hours, VAS values, patient satisfaction scale were recorded.

Statistical Analysis

Postoperative analgesic efficacy of ilioinguinal-iliohypogastric nerve block was considered as primarily outcome variable. According to the results of previous study (9), standard deviation (SD) ranged from 9 to 27 minutes. Thus, we considered as 18. In this prospective cross-sectional study, sample size was computed by considering %80 power ($\alpha = 0.05$ and $\beta = 0.20$) value, 8 effect size (d), and 1.96 Z value for the 0.05 type-I error. Thus, the minimum sample size was found 19.5 by using the equation for sample size calculation ($n = Z^2 \times \sigma^2 / d^2$). Thus 20 patients in each group were included by using the probability sampling method. Descriptive statistics for continuous variables was expressed as Median, Mean, Standard

Deviation, Minimum and Maximum values, while Categorical variables were expressed as Number and Percentage. Normality assumption of the continuous variables was tested with Kolmogorov-Smirnov test. After normality test, One-way ANOVA and Two-way ANOVA (Two Factor Repeated Measures Analysis of Variance) were performed to compare continuous variables in terms of groups and time periods. Duncan's Multiple Range test (DMRT) was used to identify different groups following analysis of variance. Pearson's Chi-square test was used to determine the relationship between groups and categorical variables. In addition, two proportion Z test was calculated. The statistical significance level was taken as 5% in calculations and SPSS software for Windows (version 21.0; IBM, Armonk, NY, USA), statistical package program was used for the calculations.

Results

Sixty male cases were included in our study. There were no patients excluded from the study during the study. There was no significant difference between the groups in terms of age, BMI (Body mass index), ASA score, duration of surgery and operation side (Table 2).

No significant difference was found between the groups when the patient satisfaction was compared at the postoperative 0th minute. However, when the patient satisfaction level is compared up to 24 hours postoperatively, satisfaction scores were found to be significantly higher in Group B than in Group T ($p=0.046$) and Group P ($p=0.022$) (Table 3).

When the groups were evaluated in terms of time of first requirement of analgesic; While the time for the first analgesic requirement was 295 minutes in Group B, it was 129.5 minutes in Group T and 122 minutes in Group P. The time taken for the first analgesic requirement in Group B was statistically significantly longer than the other two groups. ($p=0.001$) (Table 4).

When the groups in the study were evaluated in terms of VAS score, the VAS scores of Group B were found to be significantly lower during the first 12 hours after the operation. However, there was no significant difference between the groups in terms of VAS scores at the 18th and 24th hours after the operation (Figure 1).

In the first 24 hours after the surgery, 3 (15%) of the patients in Group B did not need tramadol at all, while 10 cases (50%) needed tramadol administered once, 5 (25%) cases needed tramadol administered twice, and 2 (10%) cases needed tramadol administered 3 times. In the Group T, additional tramadol was administered twice in 7 (35%) cases, 3 times in

10 (50%) cases, and 4 times in 3 (15%) cases in the first 24 hours after surgery. In the Group P, in addition to paracetamol, additional tramadol was administered once in 8 (40%) cases in the first 24 hours. In the remaining 12 (60%), 3 doses of 15 mg/kg paracetamol in 24 hours provided sufficient analgesia and no additional tramadol was administered.

Discussion

In the present study, postoperative analgesic efficacy of the II/IH block in inguinal hernia surgeries performed under unilateral spinal anesthesia was evaluated; we found that II/IH nerve block provides better patient satisfaction than using paracetamol and tramadol, the time

Table 1. Types of anesthesia and analgesia given to each study group

Variables	Group B (n:20)	Group T (n:20)	Group P (n:20)
Anesthesia Method	Unilateral spinal anesthesia	Unilateral spinal anesthesia	Unilateral spinal anesthesia
Analgesia Method	II/IH nerve block	Tramadol	Paracetamol
Rescue Analgesic	Tramadol	Tramadol	Tramadol

** Group B: Group that was administered II/IH nerve block, Group T: Group that was administered Tramadol, Group P: Group that was administered paracetamol, II/IH: Ilioinguinal-Iliohipogastric

Table 2. Demographic characteristics of the patients in each group

Variables	Group B (n:20)	Group T (n:20)	Group P (n:20)	p value
Age (years)	40.7±13.98	44.5±13.91	51.05±13.67	0.066
BMI (kg/m ²)	25.021±2.41	24.33±3.14	24.96±2.53	0.675
ASA score (I/II- n)	4/16	8/12	4/16	0.256
Duration of Surgery (min)	53.8±11.66	48.7±9.65	49.75±11.48	0.307
Surgery side (right/left- n)	10/10	12/8	14/6	0.435

** One - Way ANOVA, BMI: Body mass index ASA: American Society of Anesthesiologists

Table 3. Patient satisfaction scale data postoperative up to 24 hours

Patient Satisfaction	Group B (n: 20)	Group T (n: 20)	Group P (n: 20)	p value (Group B-T)	p value (Group B-P)	p value (Group T-P)
Not at all satisfied	0	0	1 (%5)	0.999	0.999	0.999
Somewhat satisfied	2 (%10)	7 (%35)	7 (%35)	0.047	0.047	0.999
Moderately satisfied	6 (%30)	7 (%35)	8 (%40)	0.735	0.505	0.744
Very Satisfied	12 (%60)	6 (%30)	4 (%20)	0.046	0.022	0.716

** Two Proportions Z test

Table 4. Time to first analgesic requirement analgesia

Variables	Group B (n:20)	Group T (n:20)	Group P (n:20)	p value
Time to First Analgesic Requirement (Mean±SD/min-max)	295±58.17 (190-390)	129±10.5 (110-150)	127±15.17 (100-145)	0.001

** One - Way ANOVA

taken for the first analgesic requirement is longer, therefore the need for additional tramadol for postoperative pain is reduced. While need was less for additional analgesics in the postoperative pain control, paracetamol provided less patient satisfaction. Additionally, the tramadol group's requirement for analgesic was found to be higher than in the other groups. Peripheral blocks performed under ultrasound guidance have now become a regular part of anesthesia practice. It has an important place in postoperative pain control with lower local anesthetic doses and a high block success rate (10-13). In our study, we compared the efficacy of the II/IH nerve block, tramadol IV and paracetamol IV in treatment of post-operative pain in the inguinal hernia cases, which is characterized by moderate to severe pain.

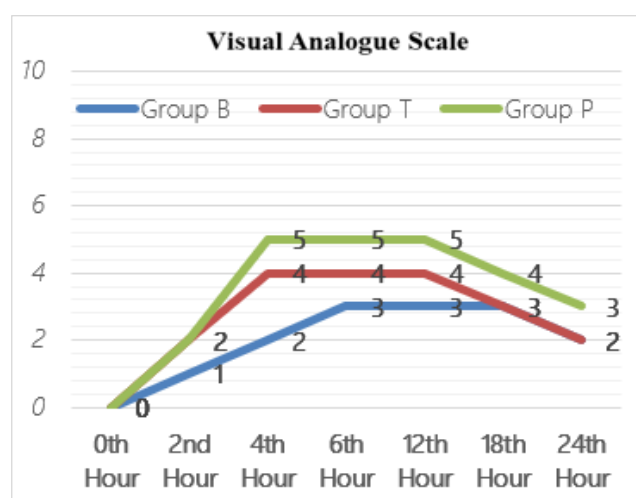


Figure 1. Median VAS scores of each group over 24-hour period (The Mean VAS score of all three groups were 0 (zero) since the patients did not experience any pain at the 0th hour postoperatively)

In the study conducted by Toivonen et al. comparing patients who underwent inguinal hernia surgery and were administered II/IH nerve block in addition to spinal anesthesia versus those who weren't administered the II/IH nerve block, the postoperative 2nd, 3rd and 4th hours' VAS scores and additional analgesic requirement during the first 6 postoperative

hours were found to be lower (14). Similarly, Bugedo et al. found that postoperative pain values at the 3rd, 6th, 24th and 48th hours and additional analgesic requirements in the first 24 hours were lower (15). In their conclusions, the authors stated that the application of the II/IH nerve block is technically basic, is a reliable postoperative analgesia, and is long-lasting. In our study, we found that the group that was administered the II/IH nerve block, had a reduced need for postoperative analgesics, especially in the first 12 hours, and the need for additional analgesics in the first 24 hours was less, when compared to the tramadol and the paracetamol groups. In this respect, our findings are consistent with previous studies.

In another study that compared the effects of the II/IH nerve block, added to general anesthesia or spinal anesthesia, on post-operative pain scores, the VAS scores of the spinal anesthesia with II/IH nerve block group at the postoperative 30th, 60th and 120th minutes and the amount of analgesic required in the first 24 hours were found to be lower. Therefore, they stated that an II/IH nerve block provides better analgesia during the early postoperative period (16). In our study, we found lower VAS scores, longer times before the first analgesic and lower total analgesic requirement in the first 24-hour postoperative period in patients who were administered the II/IH nerve block. Our results are compatible with the literature.

Interestingly, Yilmazlar et al. administered the II/IH block both as a method of intraoperative anesthesia and postoperative analgesia (17). They compared spinal anesthesia with the II/IH nerve block in terms of intraoperative and postoperative parameters, early discharge and early oral intake. The researchers found that the II/IH block had an earlier discharge, earlier oral intake, and a longer time before first analgesic requirement than the spinal anesthesia group. The study states that the block can also be used as a method of anesthesia.

In cesarean section patients that are administered a bilateral II/IH nerve block, lower pain scores, less need for additional analgesics in the first 24 hours, and a longer time to first opioid use were reported (18). In a similar study, transverse abdominis plane (TAP) block and II/IH nerve block were compared in patients with cesarean section, and they stated that II/IH nerve block significantly reduced the postoperative analgesic requirement and VAS scores compared to the TAP block (19).

Another parameter that shows the success of anesthesia in the postoperative period and whether the procedure is the right choice is patient satisfaction. Yücel et al. reported that patient satisfaction was higher in patients who underwent the II/IH nerve block procedure compared to control groups. In our study, patient satisfaction was found to be higher in the II/IH nerve block group than in the tramadol and paracetamol groups (20). In addition, it was observed that patient satisfaction was higher and VAS scores were lower in the tramadol group compared to paracetamol I.

In a study, Aghamir et al. compared tramadol to paracetamol to determine which would prevent postoperative pain (21). In this study, they argued paracetamol is a safe alternative for postoperative pain control, but that it is insufficient than tramadol for controlling severe pain. Although opioids are the preferred analgesics for moderate and severe pain, this group of drugs, in a dose-dependent manner, can cause various undesirable side effects and adverse post-operative results. Opioid-like drugs, such as tramadol, are one of common causes of postoperative nausea and vomiting (22). In our study; we found that the II/IH block is a better alternative to opioids in preventing postoperative pain due to its positive effects on both patient satisfaction and VAS scores.

Our study is one of the rare studies in which the II/IH nerve block was applied in addition to unilateral spinal anesthesia. We could not find

any other study planned this way in the literature. One of the limitations was that the groups were not compared in terms of the duration of the II/IH nerve block procedures and related postoperative complications. In addition, postoperative long-term follow-ups of the patients was not performed, and the differences between the groups in terms of the incidence and severity of postoperative chronic pain could not be compared. These may be the subject of other studies.

Conclusion

The study findings demonstrated that II/IH nerve block reduces the need for analgesia in the first 24 hours postoperatively in inguinal hernia operations performed under spinal anesthesia. In addition, it was determined that II/IH nerve block ensures better postoperative patient satisfaction and prolongs first analgesic requirement time.

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Author Contributions

Conception or design of the work: NK, NY, CS, MK; Data collection: NK, NY, MK; Data analysis and interpretation: NK, NY, CS, MK; Drafting the article: NK, NY, CS; Critical revision of the article: NK, NY, CS, MK; All authors approved the final version of the manuscript to be published.

Conflict of Interest

The authors declare no conflict of interest.

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