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Success rate of two different methods of ilioinguinal-iliohypogastric nerve block in children inguinal surgery

Mahin Seyedhejazi[1], Omid Ranjbar Daemi[1], Reza Taheri[2], Morteza Ghojazadeh[3]

ABSTRACT

Background: The ilioinguinal-iliohypogastric (ILIH) nerve block is a safe, effective, and easy to perform in order to provide analgesia for a variety of inguinal surgical procedures in pediatric patients. A relatively high failure rate of 10%-25% has been reported, even in experienced hands. It is assumed that this high failure rate of the ILIH nerve block in this age group could be due to lack of special knowledge of the anatomy of these nerves in infants and neonates. There are two main techniques for landmark-based ILIH nerve block with regard to determining the best insertion point. This study compared the sucess rate and outcomes of these two techniques in children undergoing surgery in inguinal region. **Patients and Methods:** In a double-blind randomized clinical trial, 120 children were candidated for surgery in inguinal region, and ILIH nerve block was recruited in Tabriz Children Teaching Hospital in a 12-month period. They were randomly clustered in two groups and underwent two different methods of ILIH nerve block. In the first group, needle was inserted in a point placed between outer 1/4 and inner 3/4 of a line connecting anterior-superior iliac spine to umbilicus ($n = 58$), and in the second group, this point was 1 cm medial and 1 cm superior to anterior-superior iliac spine. Block failure was defined as the need for analgesia during operation. **Results:** There were 50 males (86.2%) and 8 females (13.8%) with a mean age of 5.55 ± 2.32 (3-11) years in the first group and 48 males (87.3%) and 7 females (12.7%) with a mean age of 5.32 ± 2.18 (3-11) years in the second group ($P > 0.05$). The success rate of ILIH block was 94.8% in the first group and 94.5% in the second group with no significant difference between the two groups ($P = 0.64$). Changes of vital signs including heart rate, systolic blood pressure, and diastolic blood pressure, as well as the SPO2 were not significantly different between the two groups during the study period. Change of pain severity after recovery was also comparable between the two groups. Time of the first dose of postoperative analgesic was not significantly different between the two groups. **Conclusion:** Based on our findings, success rate and outcomes of the two techniques of landmark-based ILIH block are similar in children undergoing surgery in inguinal area.

Key words: Children, ilioinguinal-iliohypogastric nerve block technique, inguinal hernia

INTRODUCTION

General anesthesia is most commonly used to provide analgesia for surgical procedures in the inguinal region.[1-2] Ilioinguinal/iliohypogastric nerve block is a useful alternative, which may provide more prolonged postoperative analgesia. Ilioinguinal/iliohypogastric nerve block has been used successfully for inguinal hernia repair, orchidopexy, and varicocele surgery in children,[2-3-4] After herniotomy, pain may last up to 2 or 3 days and most of the children may need pain management after discharge.[6] Ilioinguinal-iliohypogastric (ILIH) nerve block is an appropriate technique to treat pain in children after herniotomy.[7-9] Various techniques have been recommended for needle insertion sites to approach these nerves. Two techniques frequently used needle entry points are at 1 cm above and medial to the anterior superior iliac spine (ASIS),[10] lateral 4th point of ASIS-umbilicus line.[11] However, it still remains unclear on what basis these points were selected and which needle insertion site would offer the best possible nerve block with minimal complications. The aim of this study was to evaluate the success rate and quality of block using the two different needle entry points for ILIH nerve block in children.

[1]Department of Anesthesiology, Tabriz Children's Hospital, Faculty of Medicine, Tabriz University of Medical Sciences, [2]Department of Anesthesiology, Talegani Hospital, Faculty of Medicine, Tabriz University of Medical Sciences, [3]Department of Physiology, Faculty of Medicine, Tabriz University of Medical Sciences, Tabriz, Iran

Address for correspondence:
Dr. Mahin Seyedhejazi, Tabriz Children's Hospital, Tabriz, Iran.
E-mail: seidhejazie@yahoo.com

PATIENTS AND METHODS

A total of 120 American Society of Anesthesiologist (ASA) grades I and II children ranging in age from 3 to 11 years accepted to undergo elective unilateral repair of a hernia were included in this randomized clinical trial study. The study was approved by the institutional ethics committee. Written consent was obtained from the parents of all the children recruited for the study. The patients randomly were divided into two 60 groups using Ran List software to receive ILIH nerve block at lateral 1/4th point of ASIS-umbilicus line (group 1), 1 cm above and medial to the ASIS (group 2) 5 min before surgical incision. Children were excluded if they had hypersensitive reaction to local anesthetic and local site infection. All nerve blocks were performed under aseptic conditions using a 23-gauge short bevel needle. In the group 1, landmarks were the umbilicus, ipsilateral ASIS, and midpoint of the inguinal ligament. The ASIS-umbilicus line is divided into four equal parts; the puncture site is located at the union of the lateral fourth with the medial three fourths. In this group, the needle was inserted at that point with angle of 45-60 toward midpoint of inguinal ligament. In the supine position of the child, local anesthetic was injected after feeling loss of resistance immediately deep to the external oblique aponeurosis, where the nerves and their branches run. Then (after negative aspiration test) bupivacaine 0.25% (0.3 mL/kg) was injected. Two patients were excluded due to their parents refusal and, therefore, 58 patients were included in this study. In the second group, the needle was injected at 1 cm superomedial to the ASIS. The needle is initially directed posterolaterally to contact the inner lip of the ileum and then withdrawn while injecting local anesthetic during needle movement. In this group, finally 55 patients were included because of refusing of patient's parents. In the operating room, children were monitored for heart rate, blood pressure, and oxygen saturation (SpO2). All patients were premedicated with midazolam (0.05 mg/kg) and fentanyl (1 μg/kg). Anesthesia was induced with intravenous lidocaine (1 mg/kg) and propofol (2-3 mg/kg) and maintained with nitrous oxide (50%), oxygen (50%), and Isoflurane(1-1.5%). The airway was maintained using an appropriate size laryngeal mask airway. ILIH nerve blocks in both groups were performed by the same anesthesiologist depending upon the study group to which the patient belonged. Vital signs were monitored every 15 min by blind observer. Fentanyl (1 μg/kg) would be administered if the blood pressure and heart rate increased more than 10%. The anesthesiologist adjusted the isoflurane dose in order to maintain the depth of anesthesia needed for the surgical procedure after 20 min. After surgery, they were all continuously observed and assessed for vital signs and evidence of pain in the recovery room and then afterward were transferred to the postoperative ward, where they were meticulously monitored every 15 min for 4 h. Face Wong-Backer score was recorded for evaluation of pain. Suppository of acetaminophen (20 mg/kg) was administered for pain score >4. These observations were made in the presence of the child's parents by an experienced anesthesiologist (one of the authors) blinded to the treatment groups. An acceptable α error was 0.05, the β error for sample size calculation was 0.20 and the predicted difference between groups failure rate was 20%. According to this calculation, 57 patients were selected for each group but to increase accuracy of the study, 60 patients were assummed for each group. The data were collected and analyzed using SPSS statistical software, version 16. The data were evaluated by the methods of descriptive statistics (frequency-the percentage and mean ± standard deviation), the chi-square test or Fisher's exact test was used for comparing qualitative variables in the two groups and independent samples t-test was used for comparing quantitative variables between two groups. For evaluation of changes in vital parameters in two groups repeated measures of analysis of variance were used.

RESULTS

The groups were similar in age, weight, sex, gender distribution, vital signs, and duration of surgery. [Table 1] Heart rate, systolic, and diastolic blood pressure decreased significantly 30 min after block in each group. Changes in diastolic pressure had no significant differences in two groups [Figure 1]. There was no significant difference between two groups in intensity of pain and postoperative needing to analgesia. There was no significant difference in intensity changes of pain in group 1 ($P = 0.39$), group 2 ($P = 0.74$), and between two groups ($P = 0.53$). Analgesic requirement in group 1 was 15 cases in the first 1-2 h, 8 cases in the 3-4 h, 35 cases beyond the 4 h postoperatively and group 2 were 10, 7, 38 cases respectively that in this regard, there was no significant difference between two groups ($P = 0.57$) [Figure 2]. Acetaminophen suppository (20 mg/kg) was used as an analgesia.

Table 1: Demographic data of the patients

	Group 1	Group 2	*P* value
Age	5.55±2.32 (3-11)	5.32±2.18 (3-11)±	*P*=0.58
Gender	50/8 (m/f)	48/7	*P*=0.87
weight	19.56±7.17	17.80±5.25	*P*=0.16
LMA size	2.17±0.32	2.16±0.32	*P*=0.88
Surgery (time)	22.48±5.51	22.80±7.10	*P*=0.79

LMA: Laryngeal mask airway

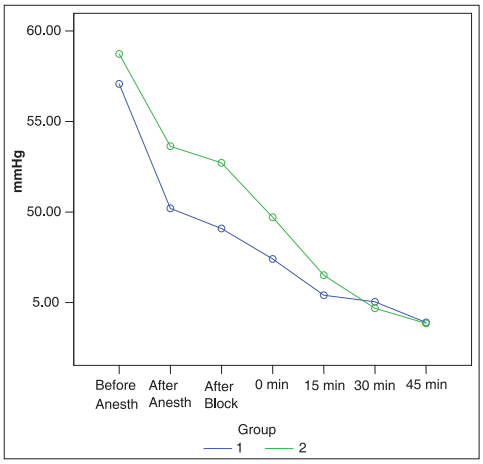


Figure 1: Changes of diastolic pressure during study in both groups

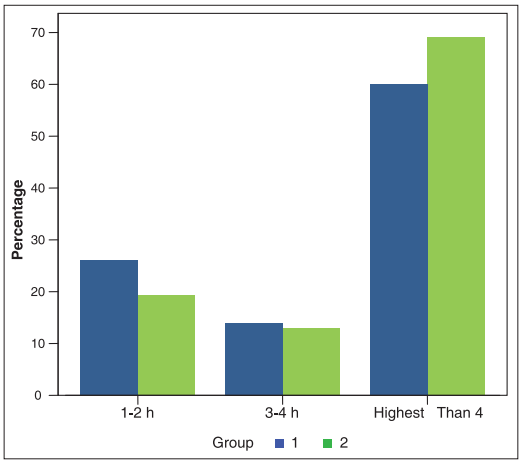


Figure 2: Onset time of required analgesia

DISCUSSION

In this study, we compared success rate of two techniques of ILIH block. According to this study, success rate of ILIH at the union of the lateral fourth with the medial three fourths was 94.8% and in 1 cm medial, 1 cm above to the ASIS it was 94.5%, so there are not significant difference between two groups. Although inguinal hernia is the most important surgery in children, determinig the exact location of ILIH has not been done yet. Meanwhile, understanding the precise anatomy of nerves in the area and correct injection of local anesthetic can increase the success rate of the block significantly.[1,12] Kokki *et al.*,[6] demonstrated that children undergoing inguinal hernia without ILIH block, they suffered from variable degree of pain in the area.Van schoor *et al.*,[5] in the study of 25 infant's cadaver evaluated location of ilioinguinal and iliohypogastric nerves in regard to common used landmarkers. In this study, the point of 2.5 cm medial to the ASIS on the line between umbilicus and ASIS was selected as the best point for performing block. In the study of Lim *et al.*,[13] 45 children undergoing inguinal hernia surgery were evaluated. ILIH block was done at 1 cm above and 1 cm medial to ASIS by adminstration of bupivacaine 0.25% (0.25 mL/kg). The success rate of this technique was 72%. Meanwhile, in the study of Willschke *et al.*,[14] success rate of ILIH block at the union of the lateral fourth with the medial three fourths was 74%. On the contrary, in the study of Kundra *et al.*,[15] on the 132 children there was not significant difference between groups with regard to location of block at 1 cm superomedial to ASIS, at 1-2 cm medial to ASIS, 1 cm inferomedial to ASIS and group with no nerve block. Similarly, in our study like the previous studies, we found that there was no significant difference in analgesic effect with regard to the location of ilioinguinal block. What makes our study outstanding is that there is no other study comparing these two techniqus. On the contrary, the success rate of ilioinguinal block has been reported in a considerably variable range (55-94%). There are some reasons concerning this event as follows: Difference in sample size could increase power of the study and is very helpful in achieving the accurate results. In our study, the sample size was enough according to statistical analysis. Using the special technique might have an effect on the quality of analgesia. Although we did not found significant difference between two techniques, the other studies recommended using sonography for ilioinguinal nerve block.[16,17] Papadopoulos *et al.*,[18] demonstrated that the outcome of ilioinguinal block was distinctive in different ages, but in our study two groups were matched in the view point of age. In the previous studies, it has been shown that the side of the surgery might have effect on quality of block but there are controversy in this issue. The experience of anesthesiologist is one of the important factors in the success rate of ilioinguinal block.[5] In our study, the success rate of ilioinguinal block were similar and high at two techniques that could be due to experience of anesthesiologist. In conclution, there was no significant difference at success rate of ilioinguinal block between two techniques and selection of one of these techniques depend on the experience of anesthesiologist but accuracy of block will be better by using sonography.

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