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Research Article

Analgesic Effect of Bilateral Sonography-Guided Ilioinguinal Iliohypogastric Block and Caudal Block in Children: A Randomized Trial

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ABSTRACT

Background: Herniorrhaphy is the most common inguinal surgery in children. Several methods such as caudal block, ilioinguinal iliohypogastric block, and wound infiltration have been studied for postoperative pain management in these patients. Caudal block is common in pediatrics. However, ilioinguinal iliohypogastric block is effective and less invasive. Previous studies have shown different comparative results regarding these blocks. This study compares the analgesic effect of caudal and bilateral ilioinguinal iliohypogastric block with ropivacaine in children.

Methods: This study is a randomized double-blind clinical trial. A total number of 66 patients aged between 1-7 years that volunteered for bilateral inguinal hernia repair were randomly assigned to two groups. After general anesthesia, caudal block with 1cc/kg ropivacaine 0.2% was performed for 33 patients and sonography-guided ilioinguinal iliohypogastric block with 0.1 cc/kg ropivacaine for each side was considered for another group. Hemodynamic parameters (systolic blood pressure, diastolic blood pressure, and heart rate) during anesthesia, pain score (CHEOPS), delirium score (PAED), nurses' satisfaction score (RN), need for additional narcotic, recovery time, and complications were compared in these two groups.

Results: There was no statistically significant difference between the two groups in terms of hemodynamic parameters during the anesthesia process. Furthermore, the two groups had no statistically significant difference in CHEOPS score (6.27 in ilioinguinal block and 5.70 in caudal block, P=0.061), PAED score (5.64 vs 5.30, P=0.144), and RN satisfaction score. However, the need for narcotics, mean recovery time, and block complications were comparable in two groups.

Conclusion: Caudal block and ilioinguinal block are equally effective for post herniorrhaphy pain and emergence agitation management in pediatrics. Additionally, no differences were observed in complications. It is recommended that the study be performed with a larger sample size.

The authors declare no conflicts of interest.

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Introduction

Regional anesthesia has proliferated in recent decades due to its intra and postoperative potentials for pain management in children. The acceptance rate of these techniques is increasingly growing among the parents. Herniorrhaphy is a common pediatric outpatient surgical procedure The lesser need for analgesics, especially narcotics and anesthetic drugs, is one of the main advantages of regional block in young children [1]. In outpatient setting, pain control remains suboptimal in most centers and regional anesthesia can improve it [2]. Different techniques such as intravenous analgesics, infiltration, and regional anesthesia have been considered in these patients [3-5]. Shorter recovery length and faster discharge are among the other advantages of regional block. Caudal block is a safe, simple, and an effective technique for analgesia in children. Motor block, urinary retention and systemic toxicity are the complications of caudal block [6-7]. Ilioinguinal iliohypogastric nerve block is a safe and effective method for post operative analgesia after open herniorrhaphy in children, and positive effects of sonography-guided block in improving perioperative analgesia has been highlighted in the literature [8-9]. Sonography-guided block has less complication and can be more effective with lower local anesthetic volume in comparison to anatomic landmark technique [10-11]. In contrast to caudal and ilioinguinal block techniques, previous studies have shown different results. This study compared these two techniques for bilateral herniorrhaphy pediatric patients.

Methods

This study is a randomized clinical trial study. After approval of the ethics committee (IR.TUMS.CHMC.REC.1400.018) and clincal trial registry code (IRCT 20200521047530N3), 66 patients ASA I, II aged between 1 to 7 as the candidates for bilateral inguinal hernia repair were included. Exclusion criteria were allergy to local anesthetics, coagulation disorders, lumbosacral anomaly, infection of sacral region, seizure history of chronic analgesics, or psychologic drugs consumption. Randomization was done and parent's informed consent was obtained. The patients were included in the two groups randomly: Caudal group and ilioinguinal iliohypogastric block group. Oral midazolam 0.5cc/kg was prescribed for all of the patients 15 minutes before the induction. After the inhalation induction with sevoflurane and intravenous catheter insertion, all of the patients received 1 µ/kg fentanyl. After the intubation phase, caudal block in lateral position and anatomic landmark guide, with 1cc/kg ropivacaine 0.2% was done for the caudal group. In ilioinguinal group, bilateral sonography-guided ilioinguinal iliohypogastric block was done. Each side blocked with 0.1cc/kg ropivacaine 0.2%. Caudal and ilioinguinal blocks was considered by an expert pediatric anesthesiologist. This study was double blind and the researcher who collected the data did not know the grouping of the patients. Heart rate and systolic blood pressure were measured before and after the surgery incision. Fentanyl 1µ/kg was administered if HR or SBP increased more than 20% base line during the surgery. Postoperative pain and emergence agitation were assessed by CHEOPS and PAED scores in recovery. Furthermore, recovery length, RN satisfaction factor, and complication of blocks were recorded. The data were recorded in SPSS version 23 and the categorical variables were compared using the Chi-square test or Fisher's exact test. Continuous variables were compared using independent t-test. The data are presented as mean ± standard deviation or as the number of the patients and percentages. P value of less than 0.05 was considered to be statistically significant.

Data collection tools

CHEOPS (Children's Hospital of Eastern Ontario Pain Scale): A behavioral scale for evaluating postoperative pain in young children. The scoring is between 4-13 and score>10 is considered as severe pain [12].

PAED score was used for the evaluation of pediatric emergence agitation. Minimum score is 0 and maximum is 20. Sensitivity and specificity are 100% and 94.5% for emergence delirium [13].

RN satisfaction score: Recovery nursers' satisfaction from 1 (unsatisfied) to 5 (completely satisfied).

Results

There was no statistically significant difference in gender, mean age, and weight between the two groups. The mean age in caudal group was 54.06± 15.40 and in ilioinguinal block was 51.12±16.06 months. The mean weight in caudal group was 15.15 kg and in ilioinguinal block, it was 14.7 kg. There were no differences between the two groups in terms of heart rate and systolic blood pressure changes after the anesthesia induction and after the surgical incision (Table1). CHEOPS score had no statistically significant difference between the two groups. In the caudal group, the mean CHEOPS score was 5.70 and in the ilioinguinal block, it was 6.27 (P value=0.061). Additionally, PAED score had no statistically significant difference between the two groups. Mean PAED score for the caudal block was 5.30 and for the ilioinguinal block, it was 5.64. P value=0.144 (Table 2). In the ilioinguinal block, 2 patients and in the caudal group, 1 patient required an additional dose of fentanyl. No block-related complications were observed. Mean recovery time was 10.15 minutes in the caudal group and 9.39 minutes in the ilioinguinal block with no significant difference (P value= 0.526).

Table 1- Mean HR and BP in two groups

time / group	After induction Mean±SD	After surgical incision Mean±SD	Δ in two times Mean±SD
HR in ilioinguinal block	119.79±14.68	119.70±18.19	8.52±7.86
HR in caudal group	124.24±12.48	127.00±10.13	7.36±5.51
P value			P=0.493
SBP in ilioinguinal block	93.82±8.71	95.15±8.78	4.42±2.81
SBP in caudal	93.33±9.90	94.12±10.85	4.12±2.70
P value			P=0.741

Table 2- CHEOPS, PAED and RN satisfaction score in two groups

group	CHEOPS (mean±SD)	PAED (mean±SD)	RN satisfaction (mean±SD)
Ilioinguinal	6.27±1.28	5.64±2.41	3.45±1.80
caudal	5.70±0.77	5.30±3.54	3.94±1.43
P value	0.061	0.144	0.469

Discussion

Caudal block and ilioinguinal block were both safe and effective for inguinal surgeries in children. Previous studies have shown different results for the efficacy of these methods [14]. In some studies, more efficacy, longer duration, lesser dose of local anesthetics. and lesser need to rescue analgesics have been shown for the ilioinguinal iliohypogastric block [15-18]. However, in other studies, the efficacy and complication of these techniques were Identical [19-20]. Most of the previous studies addressed unilateral inguinal surgeries [21]. Various local anesthetics and additives have been used. In this study, we employed ropivacaine in bilateral herniorrhaphy due to its safety in comparison to bupivacaine. Changes in hemodynamic, heart rate, and systolic blood pressure were comparable in the two groups before and after the surgical incision. It seems that both caudal and ilioinguinal blocks can control stress responses effectively. CHEOPS scale in recovery was low in both group and these two techniques were successful in postoperative pain control. None of the patients required additive narcotic in recovery and all of the patient had CHEOPS score less than 8. CHEOPS score did not have statistical difference in the two groups. Furthermore, PAED score was low in the two groups and emergence agitation score did not have any statistical difference. Both caudal block and ilioinguinal block reduced postoperative agitation. None of the patients needed intravenous midazolam in recovery. RN satisfaction factor in each group was relatively high and recovery length was similar in both groups. In our study, caudal block and bilateral sonography-guided ilioinguinal iliohypogastric block had similar analgesic effects on postoperative analgesia in children. Each center can use any of these methods based on its facilities and anesthesiologist experience. These blocks can reduce anesthetic drug dose which is considerable due to the neurotoxic effects of general anesthesia in young children. The limitations of our study include the absence of onset comparison and duration of analgesia. Future studies comparing analgesics consumption and lower dose of local anesthetics in ilioinguinal and caudal block are recommended.

Conclusion

Sonography-guided ilioinguinal iliohypogastric block has similar analgesic effect on caudal block in bilateral inguinal pediatric surgery. Both of them can be used in each center specially in outpatient surgeries. Ilioinguinal iliohypogastric block due to lesser local anesthetics dose and higher margin of safety is recommended.

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