

Comparison of Bupivacaine Wound Infiltration with Bupivacaine Caudal Block on Postoperative Pain in Pediatric Open Inguinal Herniotomy

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ABSTRACT

Objective: To compare the effectiveness of Bupivacaine local wound infiltration with Bupivacaine caudal block on post-operative pain in children undergoing open inguinal hernia repair.

Study Design: Quasi-experimental study.

Place and Duration: Department of Paediatric Surgery, Pak Emirates Military Hospital Rawalpindi, from Jan to Sep 2019.

Methodology: 60 patients (30 each in two groups) fulfilling the inclusion criteria who underwent open inguinal herniotomy were included in this study. Patients in group-A received caudal block with 0.25% Bupivacaine 1 ml/kg body weight, while Group-B received local wound infiltration of 0.5% Bupivacaine 2 mg/kg body weight after the completion of surgery. The post-operative pain score was calculated using Hannallah's objective pain scale at 30 minutes, one, two, four, six and eight hours following the procedure. A total pain score of 3 requiring the rescue analgesia in the form of oral Paracetamol (10 mg/kg body weight) was considered the endpoint.

Results: Mean post-operative pain score was 8.20 ± 1.54 in group-A compared to 7.20 ± 1.88 in Group-B with the *p*-value of 0.02, which showed a statistically significant difference between the two groups.

Conclusion: We concluded that local infiltration with Bupivacaine after open herniotomy in children is safe, highly effective and easy to perform the procedure, which results in excellent post-operative analgesia compared to caudal Bupivacaine block.

Keywords: Bupivacaine, Caudal block, Local wound infiltration, Pain score.

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INTRODUCTION

Inguinal Herniotomy is the most commonly performed procedure by paediatric surgeons.¹ Paediatric inguinal hernia repair can be performed by open or laparoscopic method.² Pain is called a fifth vital sign, and due to advances in post-operative pain management, a number of surgeries, including paediatric inguinal herniotomy, are increasingly being performed as a day-care surgery.³ Early and effective post-operative pain control is associated with hastened mobility and rehabilitation and is also important in relieving patient and parents' anxiety associated with surgery.⁴

Acute pain in the post-operative period is one of the most feared symptoms for the surgeons having undesirable effects on the outcome of surgery if it remains untreated.⁵ Its aetiology is multifactorial, but several factors influence the severity and duration of postoperative pain, including the type of surgery, age, gender and genetics.⁶ However, specific populations, especially paediatric age groups, are more prone to pain in the post-operative period due to their inability

to apprehend and communicate effectively.⁷

Post-operative pain management in children is a highly debatable topic with several techniques available for its management, and no one found it to be a hundred percent effective. Caudal block and incision infiltration with local anaesthetic agents are the most commonly performed procedures in our hospital. Caudal block, although remaining to be the highly recommended form for provision of analgesia in children undergoing surgeries below the diaphragm, has multiple limitations as it is a sophisticated invasive procedure requiring technical expertise to administer and is associated with several complications like urinary retention, motor block, hematoma formation, block failure and a shorter duration of analgesic action.^{8,9} On the other hand, local wound infiltration is easy to administer but carries the negligible risk of complications such as wound infection, hematoma formation and systemic toxicity.

The objective of this study was to compare the effectiveness of local wound infiltration with caudal block both using the same drug in terms of mean duration of postoperative analgesia in children undergoing open inguinal herniotomy.

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METHODOLOGY

This study was conducted at Paediatric Surgery Department, Pak Emirates Military Hospital (PEMH) Rawalpindi, from January to September 2019. The sample size was calculated using the effect size technique (ES), with $ES=0.19$, $\alpha=0.05$ and 95% confidence level.¹⁰ Sixty patients were divided into two groups of 30 each using the consecutive sampling technique, with group-A receiving Bupivacaine caudal block and group B receiving Bupivacaine wound infiltration after open herniotomy.

Inclusion Criteria: Both male and female patients between 2-10 years of age who were undergoing open elective herniotomy fulfilling ASA classes I and II were included in the study.

Exclusion Criteria: Patients presenting with a recurrent, bilateral, complicated and obstructed hernia, a history of bleeding disorders, congenital anomaly of the spine, history of allergy to drug users and patients with infection at the caudal injection site were excluded from the study.

All the patients were evaluated by detailed history obtained from the parents and general physical examination confirming the diagnosis of inguinal hernia. Ultrasound of the inguinoscrotal region was done to confirm the diagnosis in cases where history was doubtful. A complete blood picture and hepatitis serology were done on all the patients for pre-anaesthesia evaluation. Patients were kept nil per mouth for four to six hours prior to operation. Parents were counselled about surgery, and informed consent was obtained. Prophylactic antibiotic in the form of single-dose third-generation Cephalosporin (30 ml/kg body weight) and Nalbuphine 0.1 mg/kg body weight was given before induction of anaesthesia. All the patients underwent open herniotomy under general anaesthesia through groin skin crease incision. After the surgery, patients in group-A received caudal block using the land-mark technique with 0.25% Bupivacaine at 1 ml/kg body weight, while Group-B patients received local wound infiltration using 0.5% Bupivacaine at 2 mg/kg body weight. On recovery from anaesthesia, patients demonstrated full awakening and hemodynamic stability. Post-operative pain was evaluated at 30 minutes, one, two, four, six and eight hours by using Hannallah modified objective pain scale.¹¹ It consists of three parameters with a score range of zero to nine. Parameters were crying (no cry=0 score, crying but responds=1 score, crying with no response=2 score), movement (none=0 score, restless=1 score,

thrashing = 2 score) and agitation (calm/ comfortable = 0 score, mild agitation = 1 score, hysterical = 2 score).¹² At any stage, a pain score of 3 or more is considered severe pain and rescue analgesia in the form of oral Acetaminophen suspension @ 10 ml/ kg body weight was given.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Mean and standard deviation were calculated for quantitative variables like age and pain score. For qualitative variables like gender in both groups, the frequency and percentages were computed. An independent sample t-test was used for the comparison of post-operative pain scores. The p -value of <0.05 was considered significant.

RESULTS

A total of 60 patients were included in the study. Out of the total 60 patients, 24(80%) in group-A and 26 (86.7%) in group-B were male, while 6 (20%) in group-A and 4 (13.3%) in group-B were female. Age distribution of the patients showed that 19 (63.3%) in group-A and 16 (53.3%) patients in Group-B were between 2-6 years of age, whereas 11 (36.4%) in group-A and 14 (46.7%) in group-B were between 6-10 years of age.

Statistical analysis revealed that the mean post operative pain score was 8.20 ± 1.54 in group-A and 7.20 ± 1.88 in group-B. Independent samples t-test was applied, and the calculated p -value of 0.02 showed statistically significant difference between the two groups (Table-I).

Table-I: Comparison of post-operative pain score.

Pain Score	Group-A (n=30)	Group-B (n=30)	p -value
	8.20 ± 1.54	7.20 ± 1.88	0.02

Table-II: Pain score with regard to age of the patients.

Pain Score	Group-A (n=30)	Group-B (n=30)	p -value
Age: 2-6 years	8.21 ± 1.84	6.87 ± 1.85	0.04
Age: 6-10 years	8.18 ± 0.87	7.57 ± 1.91	0.34

For patients below 6 years of age, pain score was 8.21 ± 1.84 in group-A and 6.87 ± 1.85 in group-B (p -value = 0.04). Pain score was 8.18 ± 0.87 in group-A and 7.57 ± 1.91 in group-B for patients above 06 years of age (p -value =0.34) (Table-II). Similarly, for male patients, pain score was 8.04 ± 1.57 in group-A and 7.26 ± 1.73 days in group-B (p -value = 0.10). On the other hand, for female patients, pain score was 8.83 ± 1.33 in group-A and 6.75 ± 2.98 in group-B (p -value = 0.17) as shown in the Table-III.

Table-III: Pain score with regard to gender of the patients.

Gender	Group-A (n=30)	Group-B (n=30)	p-value
Male	8.04 ± 1.57	7.26 ± 1.73	0.10
Female	8.83 ± 1.33	6.75 ± 2.98	0.17

DISCUSSION

Around twenty percent of children can develop chronic pain if their acute postoperative pain is not addressed adequately.¹¹ Good post-operative pain management is associated with enhanced mobility, early start of oral feeding, quick recovery and early discharge from the hospital. Previously it was thought that pain severity after paediatric herniotomy is related to the length of the incision. However, a study comparing the severity of post-operative pain after open and laparoscopic inguinal hernia repair in children failed to demonstrate any statistically significant difference between the two groups showing that pain severity is not related to the length of incision in such cases.¹²

Pain is considered to be multifactorial in aetiology. Several methods have evolved to overcome it promptly, especially in children, as it is the most annoying complaint in children in the post-operative period.¹³ Such strategies start from the operation room to control or decrease the pain incidence and severity. The use of non-steroidal anti-inflammatory drugs in children is associated with several side effects such as bleeding and renal and gastrointestinal toxicity.¹⁴ Similarly, opioids usage in children is associated with increased post-operative nausea and vomiting and a dreadful risk of respiratory depression.¹⁵

Single-shot caudal block, which once used to be very popular, is now losing its popularity in clinical practice due to its relative shorter duration of action, for which several additive drugs are now being used to enhance the Bupivacaine caudal block analgesia duration.¹⁶ Caudal block is also associated with local and systemic side effects, including ascending meningitis, arrhythmias, hypotension, seizures, puncture site infection, osteomyelitis of sacral bone, block failure, and local nerve root injury.¹⁷ Splinter *et al*, performed a study to compare the effect of local anaesthesia with caudal anaesthesia on post-operative care of children undergoing inguinal hernia repair. It was a randomized, single-blind investigation of 202 children aged 1–13 year. They found that postoperative pain scores, opioid usage, vomiting incidence, and time to the first ambulation were comparable in both groups. However, patients with local wound infiltration had a shorter recovery room stay than those who received caudal anaesthesia.¹⁸ Fell *et al*, also compared caudal

block and wound infiltration in the paediatric population for post-operative pain. They found that local anaesthetic infiltration offers a safe and straight forward alternative to caudal block for post-operative analgesia.¹⁹ In a study conducted by Hosseini *et al*, post-operative efficacy of Acetaminophen suppository, Bupivacaine wound infiltration and caudal block with Bupivacaine was compared on postoperative pain in children undergoing inguinal herniotomy. They found that patients in the bupivacaine infiltration and caudal block groups had less postoperative pain than those in the acetaminophen group.

They found that bupivacaine wound infiltration and caudal block had better analgesic effects than acetaminophen suppository. Additionally, they concluded that bupivacaine infiltration is better than caudal block because of its simplicity, lower incidence of complications and failure rate.²⁰ Kutty *et al*, compared the analgesic effects of caudal epidural using 1 ml/kg body weight of 0.25% Bupivacaine against a combination of local infiltration of 0.25% bupivacaine 0.5 ml/kg body weight with Diclofenac suppository 2 mg/kg body weight in the management of post-operative pain following paediatric inguinal herniotomy. They concluded that Diclofenac suppository, when used with local infiltration, is a less invasive and effective alternative to caudal Bupivacaine for analgesia in paediatric herniotomy.⁹

Another study compared Levobupivacaine local wound infiltration (group A) with Paracetamol suppository (group B) following inguinal hernia repair in children revealed that analgesia duration was 8.30 hours in group A as compared to 6.50 hours in group B (*p*-value <0.01) showing that local anaesthetic wound infiltration is a superior form of analgesia in children.²¹

Regarding the safety profile of both techniques in our study, in group-A, three patients had twice pricking for caudal, and two patients developed urinary retention, which was relieved by the Crede manoeuvre. At the same time, no complication was observed in group-B.

LIMITATIONS OF STUDY

Blind application of caudal block without using ultrasound guidance could have improved the safety profile of this technique.

CONCLUSION

We concluded that local infiltration with Bupivacaine after open herniotomy in children is safe, highly effective and easy to perform the procedure, which results in excellent

post-operative analgesia compared to caudal Bupivacaine block.

Conflict of Interest: None.

Author's Contribution

MMS: Study design/conduction, AR: Study design/data collection, JUR: Study conduction, NA: Data analysis, SR: Statistics, ZA:, TA: Proof Reading.

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