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Effects of Caudal Epidural Analgesia for Postoperative Pain Relief in Paediatric Patients in a Tertiary Care Hospital

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Abstract **Original Research Article**

***Introduction*:** Caudal epidural anesthesia, when used as a sole method for surgical anesthesia, has favorable effects on the recovery duration and the time spent in the recovery unit. ***Aim of the Study*:** The aim of this retrospective study was to assess the efficacy of caudal epidural block for postoperative pain in children in a tertiary care hospital. ***Methods*:** The retrospective study was conducted in the Department of Paediatrics Anaesthesiology & Surgical ICU in Bangladesh Shishu Hospital & Institute; during the period of 1st January 2022 to 30th June 2022. A total 60 patients were selected as study people purposively with the permission of the Hospital Ethics Committee and the informed consent from the parents of the children. ***Result*:** A total 60 study patients were selected for this study. 30 patients had given lignocaine (Group-1) and the rest 30 patients had given bupivacaine (Group-2). According to the grading of the children who were administered in two groups good result found in group-2 and it was about 21(70.00%). Maximum fair result 11(36.67%) followed in group-1. The mean of pain duration of children who were administered lignocaine (Group I) was found 7.10±3.35 and bupivacaine (Group II) was found 14.65±2.85. Both data were statistically significant (<0.0001). ***Conclusion*:** By understanding the various surgical conditions for caudal analgesia, we conclude that caudal block is a good and safe technique for paediatric patients.

Keywords: Caudal epidural anesthesia, Lignocaine, Bupivacaine.

INTRODUCTION

The medical treatments they got specifically for postoperative pain relief was assessed to be insufficient. Inadequate methods available for of acute postoperative pain in assessment of pain in the infants and increased risks with parenteral narcotics are the two principal hindrance in proper postoperative pain management in children [1, 2]. As a positron emission tomography has already confirmed that during postoperative surveillance, higher centers for conscious perception of aims are active which confirms that infants do feel pain [3]. It is highly important to define the minimum standards of paediatric postoperative pain relief that a paediatric patient can expect after surgical procedures even in settings with limited resources. It should also be outlined that how paediatric postoperative pain relief may evolve and improve. Caudal anesthesia was described by two French physicians, Fernand Cathelin and Jean-Anthanase Sicard. By several years, the technique pre-dated the lumbar approach to epidural nerve block. However, caudal anesthesia did not gain in popularity immediately following its introduction. The major reason behind caudal anesthesia was not embraced is the wide anatomical variations of sacral bones and the consequent failure rate was caused by unsuccessful attempts to locate the sacral hiatus. The failure rate of 5% to 10% made caudal epidural anesthesia unpopular until a resurgence of interest in the 1940s, which was led by Hingson and his colleagues, who used it in obstetrical anesthesia. Caudal epidural analgesia has many applications, including surgical anesthesia in children and adults, as well as became famous for the management of acute and chronic pain conditions. According to studies, success rates of 98%–100% can be achieved in infants and young children before they

reach the age of puberty, mainly less than 12 years [4]. Regional anesthesia technique has become popular in children and infants' treatment. Recently, epidural block with a caudal approach is the most commonly used regional anesthesia technique. Today's the most popular regional anesthesia techniques, which was first described in 1933 [5, 6]. Caudal block is usually followed by general anesthesia which has the main goal to achieve efficient postoperative analgesia for paediatric patients undergoing inguinal hernia, circumcision, hypospadias, orchiopexies, lower extremity, perineal, and lower abdominal surgeries. The combination of caudal block and general anesthesia reduces intraoperative inhalational or opioid agent consumption [7, 8]. In addition to that, caudal block has the possibility to act as an alternative method in high-risk patients as well. Even if it is performed as the sole method, it can provide anesthesia with a high rate of success [9, 11]. Bupivacaine is one of the most common long-acting anesthetic agents used in maxillofacial surgery for more than past 30 years mainly to reduce the pain even after a surgical procedure is over. Lignocaine, is one of the safest short-acting local anesthetic agents being most commonly used in minor surgical procedures done in the chair side managements. Bupivacaine & Lignocaine were most commonly performed surgical procedure under local anesthesia. The aim of this study was to assess the efficacy of caudal epidural block for postoperative pain in children undergoing elective infraumbilical surgery and to compare the pain free periods after administration of lignocaine hydrochloride and bupivacaine hydrochloride.

OBJECTIVES

General Objectives:

1. The objective of this retrospective study was to assess the efficacy of caudal epidural block for postoperative pain in children in a tertiary care hospital.

Specific Objectives:

1. To observe the surgical conditions of the study children for which caudal analgesia was administered.
2. To compare the pain free periods after administration of lignocaine hydrochloride and bupivacaine hydrochloride.

METHODOLOGY

The retrospective study was conducted in the Department of Paediatrics Anaesthesiology & Surgical ICU in Bangladesh Shishu Hospital & Institute; during the period of 1st January 2022 to 30th June 2022. A total 60 patients were selected as study people purposively with the permission of the Hospital Ethics Committee and the informed consent from the parents of the children. We screened 60 caudal epidural analgesia out who had ASA physical status Class I for elective infraumbilical surgery. From the anesthesia charts, we recorded patient age, and weight; types of surgeries performed; and details regarding general anesthesia induction and maintenance agents, local anesthetics and adjuvant drugs, airway control routes. These study children were divided into two groups of 30 each where Group I received lignocaine 1% solution in a dose of 0.5 mLlkg body weight and Group II received bupivacaine 0.25% solution in a dose of 0.5 mLlkg body weight. Caudal epidural analgesia for patients who had bleeding-clotting disorders, local infections, sepsis, abnormal vertebral anatomy, low body weight (≥5 kg) was excluded from this study. Inside the operating room, standard monitoring was ensured for all paediatrics such as electrocardiogram, noninvasive blood pressure and peripheral oxygen saturation. The selected patients' age range was 6 months to 11 years and mean weight range was 5 kg to 25 kg. The surgeries for which this method of absence of pain was and the premedication did not include any pain medication. Before the surgery, the block was performed in the left lateral position after sedation. The posterior superior iliac spines that formed the base of an equilateral triangle and the sacrococcygeal membrane at the bicornuate spine of the fifth sacral vertebra that served as the apex were used to identify the sacrococcygeal membrane. A 23G disposable needle was used at an angle of 45 to pierce the sacrococcygeal membrane, enter the caudal epidural space before injection. During the postoperative period, all of the children were assessed for pain relief. The primary models for evaluating help with discomfort were the cry, rest, taking care of example, conduct, and utilization of supplemental absence of pain. Data was collected through physical examinations, laboratory investigations. All the data was enrolled in the data sheet for this study. Statistical analysis was carried out by using SPSS version 25.0 & MS Excel-16.

RESULT

A total 60 patients were selected for this study. 30 patients had given lignocaine (Group-1) and the rest 30 patients had given bupivacaine (Group-2). We found the mean age was 5.4±2.3 where maximum age was 11 years and minimum age was 6 months. Mean weight was found 12.7±3.21 minimum weight found 5kg. Both data were statistically significant (<0.0001) [Table-1]. In this study about maximum 51(85%) were male and the rest 9(15%) were found female. The male female ratio was found male: female 17:3 [Figure-1]. Surgical conditions of the study patients were found maximum in hypospadias correction 19(31.67%). Then 17(28.33%) was circumcision, 15(25%) was herniorrhaphy & herniotomy. After that 5(8.33%) was orchidopexy and 4(6.67%) was rectal polypectomy respectively [Table-2]. According to the grading of the children who were administered in two groups good result found in group-2 and it was about 21(70.00%).

Maximum fair result 11(36.67%) followed in group-1 [Table-3]. The mean of pain duration of children who were administered lignocaine (Group I) was found 7.10±3.35 and bupivacaine (Group II) was found 14.65±2.85. Both data were statistically significant (<0.0001) [Table-4].

Table 1: Demographic Characteristics of the study patients (N=60)

Characteristics	Mean±SD	Range	P Value
Age	5.4±2.3	0-11 (yrs.)	< 0.0001
Weight	12.7±3.21	5-25(kg)	< 0.0001

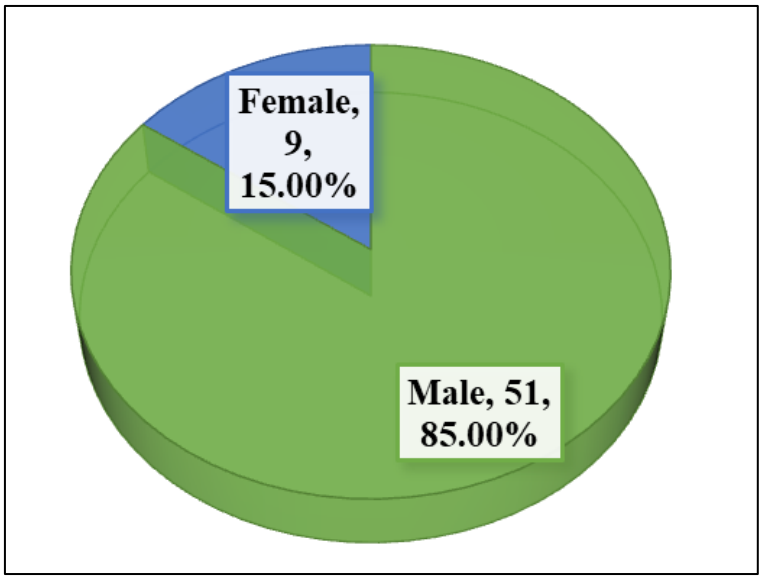

Figure 1: Gender distribution of the study patients (N=60)

Table 2: Surgical conditions for caudal analgesia of the study children (N=60)

Operation Type	n	%
Circumcision	17	28.33
Herniorrhaphy & Herniotomy	15	25.00
Hypospadias correction	19	31.67
Orchidopexy	5	8.33
Rectal Polypectomy	4	6.67

Table 3: Grading of children who were administered lignocaine (Group I) and bupivacaine (Group II)

Grade	Group-1 (n=30)	Group-2 (n=30)	Total (N=60)
	n(%)	n(%)	n(%)
Poor	2(6.67%)	2(6.67%)	4(6.67%)
Fair	11(36.67%)	7(23.33%)	18(30.00%)
Good	17(56.67%)	21(70.00%)	38(63.33%)

Table 4: Pain duration of children who were administered lignocaine (Group I) and bupivacaine (Group II)

Pain Duration	Mean±SD	P Value
Group-1	7.10±3.35	<0.0001
Group-2	14.65±2.85	<0.0001

DISCUSSION

Caudal block is our most performed regional anesthetic technique. Caudal epidural anesthesia is a simple and safe method for sub-umbilical surgeries shorter than 90 minutes in children [12]. In this study we are going to apply this anaesthesia in infraumbilical surgery of children. It is a relatively easy and safe technique. The rate of serious complications was reported as 1/40 000 and the total complication rate was 1.5/1000.6 during caudal block, the most frequent complications (due to the technique) encountered were vessel perforation (1.6%-10.6%) and subcutaneous infiltration (5%-19%) [13-15]. Caudal block is known for more than 80 years, and complications are also well recognized, including dural puncture, intravascular injection, rectal penetration, drug overdose. Several techniques have been considered in detecting proper

placement of caudal needle in the epidural space, including nerve stimulation, ultrasound imaging, whoosh test, and modified swoosh test [16-18]. A total 60 patients were selected for this study. We found the mean age was 5.4±2.3 where maximum age was 11 years and minimum age was 6 months. Mean weight was found 12.7±3.21 minimum weight found 5kg. Both data were statistically significant (<0.0001). In this study about maximum 51(85%) were male and the rest 9(15%) were found female. The male female ratio was found male: female 17:3. A study by Lt Col Kr Slyashankar and Brig Sk Dass of same objective, they found the mean age was 5.5±2.5 years, mean weight was 13.5 ± 4.7 kg and the male female ratio was 4:1 [19]. Another study by Serbülent Gökhan Beyaz found the mean age was 5.6±2.8 years. Female was (13.7%) and the rest (86.3%) were males. Mean body weights were 16.1±6.7kg which is higher than my study [20].

Surgical conditions of the study patients were found maximum in hypospadias correction 19(31.67%). Then 17(28.33%) was circumcision, 15(25%) was herniorrhaphy & herniotomy. After that 5(8.33%) was orchidopexy and 4(6.67%) was rectal polypectomy respectively. A similar study was found that the maximum patients' operations were found in circumcision, herniorrhaphy, appendectomy, hypospadias correction, orchidopexy, biopsy respectively [19, 20].

In caudal block, the most used local anesthetic agent is bupivacaine, because it is readily available, has a long duration of action and its side effects are very well known [21, 22]. Regional anesthesia has been shown to provide a wide spectrum of benefits such as early recovery, improved functional status, decreased postoperative nausea and vomiting, and decreased length of hospital stay [23, 24]. The local anesthetic of choice in caudal block was lignocaine in 30 patients (Group-1), and bupivacaine in 30 patients (Group-2) in group distribution. This number differs from the study of Serbülent Gökhan Beyaz [20] they applied levobupivacaine in 79.9% patients, and bupivacaine in 20.9% patients. The mean of pain duration of children who were administered lignocaine (Group I) was found 7.10±3.35 and bupivacaine (Group II) was found 14.65±2.85. Lignocaine took less time than bupivacaine in this study. Both data were statistically significant (<0.0001). This may prove that a single-shot caudal injection of lignocaine and bupivacaine as sole local anesthetic provides effective postoperative analgesia. For inguinal region surgeries, 2-2.5 mg/kg bupivacaine is given caudally, and this provides effective postoperative analgesia for 2 to 4 hours without any additional analgesics [25]. Similarly, a study compared in another anaesthesia with bupivacaine about 20.1% of patients received bupivacaine for caudal block, and mean postoperative analgesia duration was 314±39 minutes, & levobupivacaine group had a postoperative analgesia duration of 359±25 minutes. Levobupivacaine is an isomer of bupivacaine and has some advantages and side effects. It leads to less motor blockage and longer sensorial blockage. Also, it is less toxic to the central nervous and cardiovascular systems [21, 25]. Luckily in our study no side effects had been followed.

According to the behavioral scale (Poor, Fair, Good) grading of the children who were administered in two groups good result found in group-2 and it was about 44(73.33%). Maximum fair result 24(40.00%) followed in group-1. Similar results followed in the study of Lt Col Kr Slyashankar and Brig Sk Dass, they said that the quality of analgesia obtained was analyzed in both the groups and there was not much of a difference in the 'fair' and 'good' grading[19]. Various methods have been employed for assessing the intensity of postoperative pain in children [26, 27]. We had to progress our own behavioural scale for grading of pain relief. The quality of caudal analgesia was very good in both the groups. The condition of the children in the evening after surgery was satisfying for the parents, the nursing staff and the treating doctors.

Limitations of the Study

This retrospective study carried out with a small sample size as well as in a short period. For being a study in a single community with comparatively small number of sample size, the study result may not reflect the exact scenarios of the mass people.

CONCLUSION & RECOMMENDATION

By understanding the various surgical conditions for caudal analgesia, we conclude that caudal block is a good and safe technique for paediatric patients. It performed in infraumbilical surgeries in children & infants, with a high success rate & a low incidence of complications or side effects in this study. However, single-shot caudal block with lignocaine or bupivacaine showed an appropriate and effective method. As well as caudal block with bupivacaine found a step better result than the observation of lignocaine in pain relief in infraumbilical surgery of children in this retrospective study. Future studies with longer duration of the intervention and bigger sample size are needed to confirm the validity of our findings. Multiple centers can be included to support current conclusions. Comparison of different pain relief drugs can be a better choice for further studies.

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