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Original Research Article **Anesthesiology**

Safety and Analgesic Efficacy of General Versus Caudal Block in Pediatric Infra Umbilical Surgery

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Abstract

Background: Caudal analgesia has become popular in the management of intraoperative and postoperative pain management, further with the use of adjuvants to prolong its duration each with varying results. Caudal block is the most preferred postoperative analgesia in pediatrics, despite its limited duration of action. Many additives are used to improve the effectiveness of caudal blocks, such as opioids or a2 agonists. Recently, the use of caudal dexamethasone as an analgesic after surgery has increased. ***Objectives:*** The aim of this study is to evaluate the safety and analgesic efficacy of general versus caudal block in pediatric infra umbilical surgery. ***Methods:*** This is an observational study. This study was carried out on 50 patients the find out about the population including children in the Department of Anaesthesia, Uttara Adhunik Medical College Hospital, Dhaka, Bangladesh. The duration of the period from January 2022 to December 2022. Statistical evaluation of the results used to be got via the use of a window-based computer software program devised with Statistical Packages for Social Sciences (SPSS-24). ***Results:*** The mean duration of postoperative analgesia was 3 times longer in Bupivacaine with preservative free Clonidine Group. Bupivacaine solution Group received significantly more doses of rescue analgesic than Bupivacaine with preservative free Clonidine Group (p-value of 0.004). There was no significant bradycardia, hypotension, sedation or urinary retention in either of the groups. There was no residual motor blockade at 6 hours. Incidence of vomiting was similar in both the groups. ***Conclusion:*** Dexamethasone in combination with bupivacaine reduces postoperative pain intensity and total analgesic consumption and prolongs analgesia.

Keywords: Caudal analgesia, Caudal blocks, Dexamethasone.

INTRODUCTION

Caudal analgesia has become the technique of choice in the treatment of pain in children both during and after surgery, for lower abdominal and lower limb surgery. Indeed, it is simple, easy to implement and the level of blocking achieved is predictable. The disadvantage of single shot caudal analgesia is the short duration of action and this requires catheterization or adjuvant use with inherent limitations. Opioids, midazolam, neostigmine, tramadol, clonidine and ketamine have been used for tail blockade with mixed results.

Clonidine, an alpha2-adrenergic agonist produces analgesia without significant respiratory depression after caudal administration in children [1-3]. The use of clonidine as an adjuvant allows us to use lower concentrations of local anesthetics to achieve similar levels of analgesia with the benefit of prolonging analgesia, reducing residual motor blockage and increased safety limit. However, clonidine can cause hypotension and bradycardia [4]. Studies have shown that clonidine at a dose of 1 µg/kg added to 0.25% Bupivacaine produces a significant prolongation of caudal block in children and is as effective as a dose of 2 µg/kg [5, 6]. Several studies have evaluated the addition of 1 µg/kg clonidine to 0.125% Bupivacaine for analgesia [7].

Good postoperative analgesia reduces the postoperative stress response, improves patient satisfaction and improves outcomes. The World Health Organization (WHO) states that 80% of people worldwide do not receive adequate treatment for pain relief. On this basis, 1 in 4 patients received adequate post operative pain (POP) [8]. Regional anesthesia in children was introduced after discovered the local anesthetic properties of cocaine in the eye by Koller in 1884. Today, the caudal block is a common regional

analgesia technique in pediatric regional anesthesia. It is effective for lower abdominal perianal, and lower extremity surgeries [9].

The caudal block (CB) has the disadvantage of a limited time. One way to increase block duration and effectiveness is to use a larger volume of concentrated local anesthetic, which can lead to undesired motor blockade; therefore, the balance between blocking efficacy and patient safety remains difficult [10]. To avoid these problems, many additives have been used to improve the quality of CB without increasing the total dose of local anesthetic (LA). However, there were large inter-individual variations in response to all additives. Currently, caudal dexamethasone is used with bupivacaine to improve blockade efficacy, but its analgesic efficacy has not been extensively studied [11]. Therefore, the aim of this study was to evaluate the postoperative analgesia of caudal dexamethasone added with bupivacaine for pediatric patients undergoing infra-umbilical surgery.

METHODOLOGY

This is an observational study. This study was carried out on 50 patients the find out about the population including children in the Department of Anaesthesia, Uttara Adhunik Medical College Hospital, Dhaka, Bangladesh. The duration of the period from January 2022 to December 2022. After collection, the data were checked and cleaned, followed by editing, compiling, coding and categorizing according to the objectives and variable to detect errors and to maintain consistency, relevancy and quality control. The choice of treatment was made by the patient after a full discussion with the multidisciplinary team consisting of Transfusionists. Sample size was calculated based on a previous study [11] with a minimum requirement of 25 patients in each group and there were no drop outs. Prior to surgery, the children were kept nil per oral according to standard guidelines. They were randomly assigned to either study groups Bupivacaine solution Group or Bupivacaine with preservative free Clonidine, for caudal analgesia. Bupivacaine solution Group: 1ml/kg of 0.125% Bupivacaine solution. Bupivacaine with preservative free Clonidine Group: Mixture of 1ml/kg of 0.125% Bupivacaine with preservative free Clonidine 1µ/kg. The solution was prepared by an Anaesthesiologist who was not one of the observers for the study. All the patients were premedicated with midazolam 0.75 mg/kg orally 30 minutes prior to induction of anaesthesia. In the operation theatre, patients were connected to Datex Ohmeda A-5 multipara monitor and Heart Rate (HR), Mean Arterial Blood Pressure (MAP) and oxygen saturation (SpO2) were monitored. General anaesthesia was induced with thiopentone (1.25%) 5 mg/kg via 22-G or 24-G IV cannula and inhalation of oxygen, nitrous oxide and sevoflurane. The data for this study about had been accumulated from patients' medical information. Statistical evaluation of the results used to be got via the use of a window-based computer software program devised with Statistical Packages for Social Sciences (SPSS-24).

RESULTS

Table I: Patient characteristics and duration of surgery

Characteristic	Group	Mean ± SD	p-value
Age (Years)	Bupivacaine solution Group	4.63±1.73	0.30
	Bupivacaine with preservative free Clonidine	4.43±1.52	
Weight (kg)	Bupivacaine solution Group	12.76±3.21	0.70
	Bupivacaine with preservative free Clonidine	13.10±3.48	
Duration of Surgery (minutes)	Bupivacaine solution Group	32.1±30.61	0.89
	Bupivacaine with preservative free Clonidine	31.03±31	

Table II: Duration of absolute analgesia (hours) after caudal block

Group	Mean Duration of Absolute analgesia (hours)	SD
Bupivacaine solution Group	3.20	±0.99
Bupivacaine with preservative free Clonidine	10.60	± 1.90

Table III: No. of patients receiving postoperative rescue analgesic during the first 24 hours after surgery

Number of doses of Rescue Analgesics	Bupivacaine solution Group	Bupivacaine with preservative free Clonidine
1	0	5
2	0	23
3	17	2
4	12	0
5	1	0

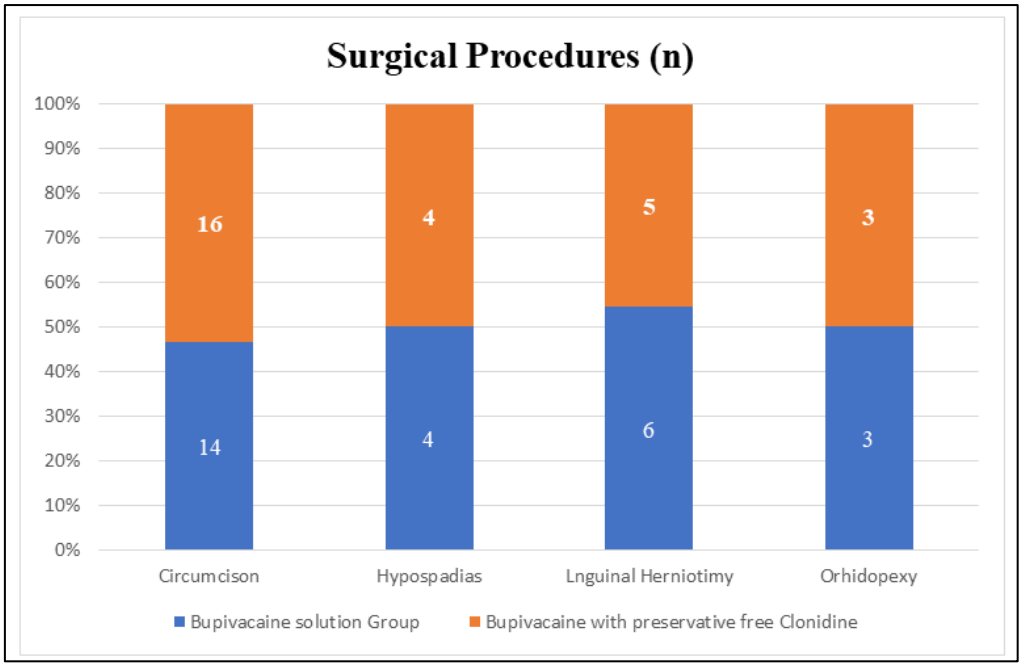

Figure I: Comparison of different surgical procedures in the two groups

Table IV: Mean and Std. Deviation (SD) of Intraoperative and post-operative HR and MAP in the two groups

Variable	Bupivacaine solution Group Mean±(SD)	Bupivacaine with preservative free Clonidine Mean±(SD)	p-value
Intra-operative HR (beats/min)	114.75 ± (8.30)	114.75 ± (8.30)	0.17
Postoperative HR (beats/min)	114.75 ± (8.30)	114.75 ± (8.30)	0.38
Intra-operative MAP (mm of Hg)	114.75 ± (8.30)	114.75 ± (8.30)	0.61
Postoperative MAP (mm of Hg)	114.75 ± (8.30)	114.75 ± (8.30)	0.8

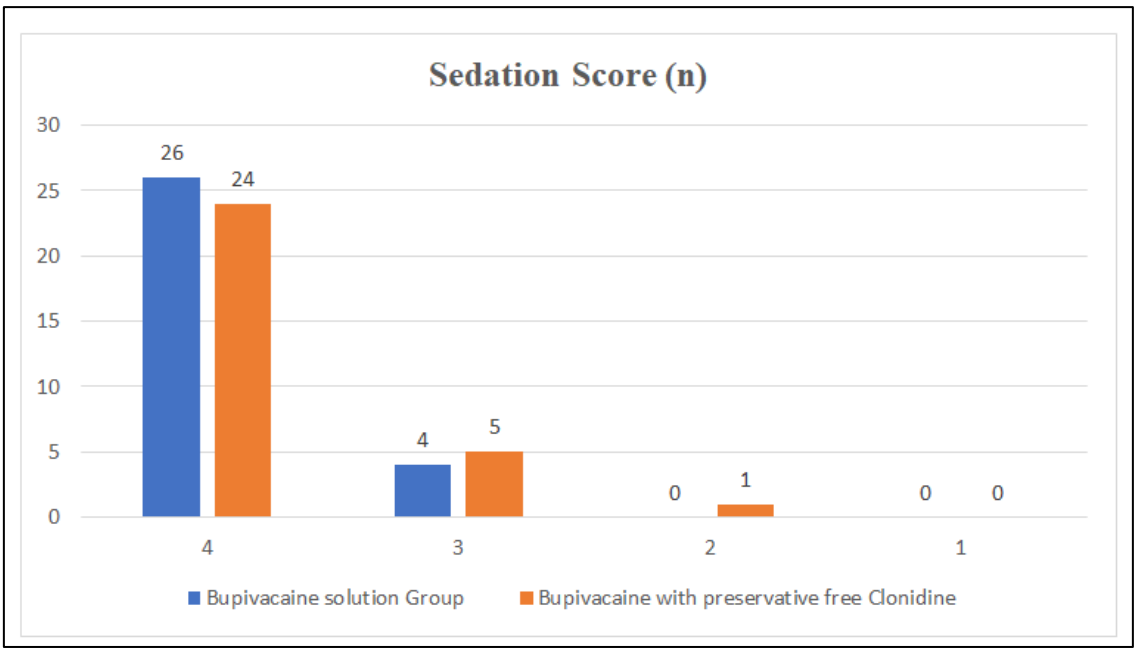

Figure II: Comparison of postoperative sedation scores at 2 hours.

DISCUSSION

Our study showed that the first analgesia request time significantly differed between the bupivacaine dexamethasone group (BD) with median of 915 (649.75–1,440) min compared with bupivacaine-alone group (B) with median of 432.5 (327.5–555) min ($p < 0005$). The result was consistent with a study done by Solanki Nilesh M *et al*., the mean duration of analgesia in the bupivacaine group was 435.85 (±144.72) min, while in the dexamethasone, it was 1,044.92

(±392.29) min [12]. Further, our study is in line with a study done by Karim Girgis *et al*., Murni Sari Ahmad Arbi, Mohamed in 2016 and Dhanashree H. which also found that the time to first analgesic requirement was higher in the bupivacaine dexamethasone group compared with the bupivacaine-alone group [13].

Contrary to the findings of our study, J.-Y. Hong found that the time to first acetaminophen request was 646 vs 430 min in a dexamethasone group and control group, respectively and Almajali Z *et al*., also found that the mean pain-free period in their dexamethasone-group was 272 min while in the bupivacaine-alone group was 186 min. [14] Two possible explanations for the lower time to first analgesic request might be difference in pain perception assessment and treatment among the nurses and pain tolerance level differences between societies. This might also be due to the fact that the experience (perception) of pain is affected by genetics and cultural and social factors differ across the world.

Our study showed that the median total analgesic consumption was 55 (0–250) in the bupivacaine dexamethasone group and 402 (95–812.5) mg in the bupivacaine-alone group with a statistically significant difference within 24 h ($p < 0.001$) (Table IV). Our study is not in line with the study done in Egypt by Mohamed M. Abu *et al*., [19] Analgesia consumption (mg/kg) was 29.14 ± 8.09, 22.29 ± 7.61; this is due to this study compared the mean dose of analgesic consumption in (mg/kg) but our study compared the total dose used in 24 h (Table IV).

The study done by Mohamed et al. shows that a number of patients received rescue doses of paracetamol (57.14%, 94.28%) in the bupivacaine dexamethasone group and the bupivacaine alone group respectively [13]. Similarly, Bhimired dy Venkata Reddy *et al*., [15], K *et al*., [16], and J. Y. Hong [4] revealed that a number of patients need less analgesics in the dexamethasone groups compared to the non-dexamethasone groups. Likewise, our study showed that the number of patients that received paracetamol postoperatively in the bupivacaine dexamethasone group and the bupivacaine alone group was (43.3%, 66.7%), respectively. However, none of the children in both groups required analgesia in the PACU and up to 2 h postoperatively.

In our study, there is no significant difference in total postoperative tramadol consumption even though there is less tramadol consumption in the bupivacaine dexamethasone group. In contrast, postoperative diclofenac consumption is higher in the bupivacaine dexamethasone group compared to the bupivacaine-alone group; the likely explanation for this contradictory result might be due to variability in pain-management practice and lack of standard postoperative pain-management protocol in the study setup.

According to this study, overall incidence of nausea and vomiting was 6.7% in the bupivacaine dexamethasone group and 40% in the bupivacaine-alone group, with statistical differences between the two groups. In line with our study, Karim Girgis *et al*., and K *et al*., show less proportion of dexamethasone-added group developing nausea and vomiting [16]. This difference can be attributed primarily to the effects of dexamethasone on relieving nausea and vomiting. Dexamethasone exerts an antiemetic action via prostaglandin antagonism, serotonin inhibition in the gut, and release of endorphin.

CONCLUSION

The caudal anesthesia performed after anesthesia for infra-umbilical surgery with dexamethasone in addition to bupivacaine had significant postoperative analgesia without significant side effects compared with caudal bupivacaine alone. We also recommend a low-dose randomized controlled study.

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