

ORIGINAL ARTICLE

A Study on Evaluation of Safety and Efficacy of Clonidine as an Adjunct to Bupivacaine in Caudal Block in Paediatric Patients

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ABSTRACT

Introduction: The use of clonidine, as additives to bupivacaine provides pain relief for longer duration than bupivacaine alone. This study was planned to evaluate the safety and efficacy of clonidine as an adjunct to bupivacaine in caudal block in paediatric patients.

Methodology: This was randomized controlled trial where study was done in three groups. In Group : A: was Inj. Bupivacaine 0.25% {0.75ml/kg}, Group : B: Inj. Bupivacaine 0.25% {0.75ml/kg}+ inj. clonidine 1µg/kg and Group : C: Inj. Bupivacaine 0.25% {0.75ml/kg}+inj. clonidine 2µg/kg was given.

Results: There was a statistically significant prolongation in the duration of analgesia in Group B ($p < 0.05$) and Group C ($p < 0.05$) when compared with Group A. None of the patients had hypotension, bradycardia, respiratory depression or urinary retention in all the three groups.

Conclusions: clonidine (1-2 µg/kg) is safe and effective adjuvant in caudal block for pediatric lower limb and lower abdominal surgery.

Key Words: Pediatric, clonidine, bupivacaine, analgesia, caudal block.

INTRODUCTION

The main difference in pain perception between children and adults is related to cognitive-evaluative component which develops throughout childhood and adolescence¹. A major difficulty is assessment and at times even the identification of pain in children, especially in infants. The younger the child, the greater the difficulty to communicate because the ability to express distress and discomfort is limited. Under treatment of post-operative pain even in the children and newborns may trigger biochemical and physiologic stress response and cause impairments in pulmonary, cardiovascular, neuro-endocrinal, gastrointestinal, immunological, and metabolic functions. An effective pain therapy to block or modify the myriad physiologic responses to stress is now an essential component of modern paediatric anaesthesia and surgical practice.

So, it is now widely accepted that children surely require postoperative analgesia. During the last decade, pediatric pain has received considerable attention, and several methods have been developed both for assessment and relief of pain in children.

Conventional post-operative analgesia techniques for paediatric surgery are administration of opioid injections, oral analgesics or popular in paediatric patients which may produce unwanted fear in children. Furthermore, administration of such injection require

nursing staff and hospitalization, which prevents early discharge to home. Regional anaesthetic techniques and pain management in children have gained established place for providing postoperative analgesia and their field of application is rapidly expanding.

Regional Anaesthesia provide complete pain relief, bring down requirement of inhalational agents drastically, faster and smoother recovery, can be extended in post-operative period.

Bupivacaine is the most commonly used local anesthetic in Caudal block. However, the duration of postoperative analgesia has been limited to 2 to 6 hours. To provide analgesia for longer periods, insertion of catheter in the caudal space is technically more difficult, time consuming, expensive and there is an added risk of infection². So various drugs have been added to local anesthesia to prolong the duration of analgesia provided by a single caudal injection. Addition of opioids and non-opioids like adrenaline, clonidine, benzodiazepines, ketamine, etc. are used along with local anesthetics³. However, opioid like morphine is associated with side effects like nausea, vomiting, pruritus, respiratory depression etc. which make their use limited for paediatric patients. The use of clonidine, as additives to bupivacaine provides pain relief for longer duration than bupivacaine alone.

Clonidine, an α -agonist when administered along neuraxis relieves pain through α -receptors located in superficial lamina of spinal cord. When given epidurally, 1-2 μ g/kg of body weight, intensifies the duration of analgesia without any fall in heart rate, mean arterial pressure, respiratory depression and oxygen saturation⁴.

This study was planned to evaluate the safety and efficacy of clonidine as an adjunct to bupivacaine in caudal block in paediatric patients.

Objectives

The study was conducted to evaluate and compare the duration of postoperative analgesia, postoperative sedation, hemodynamic effects and various side effects produced by caudal clonidine in combination with bupivacaine and bupivacaine alone.

MATERIALS AND METHODS

After approval from the Institutional ethics Committee, the present study was conducted in 60 paediatric of either sex belonging to ASA grade I to II in the age group 1 to 10 years scheduled for elective lower abdominal, orthopaedic and genitourinary surgery at Surat Municipal Institute of Medical Education and Research, Surat.

Detailed history, past history, general as well as systemic examination, preoperative assessment and routine investigations was carried out a day before operation. Patients with drug allergy, skin infections at the site of block, abnormalities of sacrum, active central nervous system diseases, history of disorders of blood clotting, and patients with cardiovascular, respiratory, hepatic and renal diseases were excluded from the study.

Informed written consent was taken from parents. We conducted a prospective, randomized controlled study. The patients were randomly allocated in three groups of twenty patients each. In Group : A: was Inj. Bupivacaine 0.25% {0.75ml/kg}, Group : B: Inj. Bupivacaine 0.25% {0.75ml/kg}+ inj. clonidine 1 μ g/kg and Group : C: Inj. Bupivacaine 0.25% {0.75ml/kg}+inj. clonidine 2 μ g/kg was given. The children belonging to each group received the following drugs.

Clonidine used in our study was a preservative free preparation available in 150 μ g/ ml ampoules. All preoperative, intraoperative and postoperative procedures performed as per standard protocol.

The **duration of caudal analgesia** was defined from the time of caudal injection to the time of the first analgesic supplementation, **Respiratory depression** was defined as a oxygen saturation <93 %

Patients were assessed for pain with **Observational pain score** and sedation assessed with Four Point sedation score.

These scores were assessed at 0.5, 1, 2, 4, 6, 8, 12, hours postoperatively.

1. Observational Pain Score (OPS)

Behavioral Objectives	None	Moderate	Severe
Crying	1	2	3
Facial expressions	1	2	3
Position of legs	1	2	3
Position of torso	1	2	3
Restlessness	1	2	3

A OPS score of 5 signified excellent analgesia and a score of OPS score 15 signified that the analgesia was ineffective Patients were administered rescue analgesia, syrup paracetamol 10 mg/g when the OPS was more than 12.

Four Point Sedation Score

A Four Point Sedation Score was assigned as follows:

- 1= Asleep, not arousable by verbal command
- 2=Asleep, arousable by verbal command, nausea vomiting
- 3= Drowsy/ not sleeping
- 4= Alert/ aware

Side effects like nausea, vomiting, bradycardia, hypotension, urinary retention and respiratory depression were noted.

Statistical Analysis: All data are presented as mean (SD) except where specified. Data were analysed using ANOVA for repeat measurements. Continuous variables were analysed using student's t-test. The paired t-test was used for comparisons within the groups and the unpaired t-test for intergroup comparisons. Probability values <0.05 were considered significant.

RESULTS

The prospective, randomized study was carried out on 60 paediatric patients of either sex between ages of 1 and 10 years, belonging to ASA Grade I and II scheduled for lower abdominal and lower limb surgery at Surat Municipal Institute of Medical Education and Research, Surat.

In the study patients were randomly selected from the routine list and they were divided into three groups of 20 patients each and received the following drugs in the caudal block.

In the study, Intraoperative monitoring was done and postoperatively patients were observed at different intervals for 12 hours. During the study following observations were noted.

Table 1: Age Distribution of Patients.

Age (Yrs)	Group A (n=20)	Group B (n=20)	Group C (n=20)	P Value
Age (mean SD)	4.75±1.96	4.72±1.58	4.85±1.86	0.972
Sex (Percentage)				
Male	18 (90)	15 (75)	19 (95)	0.153
Female	2 (10)	5 (25)	1 (5)	
Weight (kg) (mean SD)	13.6±3.20	13.55±3.06	13.05±3.23	0.831
Duration of surgery(Min) (mean SD)	60.75±11.15	64.5±14.03	62±11.28	0.616
duration of analgesia (hrs) (mean SD)	5.29±0.83	11.82±1.01	11.45±0.93	<0.001
Side Effects (%)				
Nausea	2(10)	2(10)	2(10)	-
Vomiting	2(10)	1(5)	2(10)	-

Table 2: Four Point Sedation Score postoperatively at different time intervals in all the three groups.

	Group A Number of patients				Group B Number of patients				Group C Number of patients				p Value
	1	2	3	4	1	2	3	4	1	2	3	4	
0.5 hr	0	8	12	0	0	13	7	0	0	16	4	0	< 0.05
1hrs	0	1	19	0	0	7	13	0	0	5	15	0	< 0.05
2 hrs	0	0	7	13	0	4	16	0	0	5	15	0	< 0.05
4 hrs	0	0	0	20	0	1	19	0	0	1	19	0	< 0.05
6 hrs	0	0	0	20	0	0	0	20	0	0	18	2	< 0.05
8 hrs	0	0	0	20	0	0	0	20	0	0	0	20	< 0.05
12 hrs	0	0	0	20	0	0	0	20	0	0	0	20	< 0.05

There is no difference in age of the patient in all these groups. The Patients in all the three groups weighed between 5 and 20kg. The difference in weight distribution among the groups was not statistically significant. The mean duration of surgery there was no statistically significant difference in the duration of surgery, among the three groups on intergroup comparison (>0.05)

There was no statistically significant difference in mean heart rate (intraoperatively & postoperatively), mean arterial blood pressure (intraoperatively & postoperatively), mean oxygen saturation (intraoperatively & postoperatively), mean respiratory rate postoperatively among the three groups on intergroup comparison at different time intervals. There was a statistically significant prolongation in the duration of analgesia in Group B ($p < 0.05$) and Group C ($p < 0.05$) when compared with Group A. None of the patients had hypotension, bradycardia, respiratory depression or urinary retention in all the three groups.

The table 2 shows sedation score of all the patients at different time intervals.

We observed a statistically significant difference in the sedation scores of Group C on intergroup comparison with Groups A and Group B from the first hour up to 6 hours postoperatively (p value < 0.05). After 8 hours postoperatively, the mean sedation scores were '4' in all the three groups in the study (p

value >0.05) There was no significant difference in the duration of motor block among the four groups.

DISCUSSION

Caudal analgesia provides an excellent means of pain relief to children in the postoperative period. This study was planned to evaluate the safety and efficacy of clonidine as an additive to bupivacaine in caudal block in paediatric patients.

In our study, there were no significant differences in heart rate and mean arterial pressure among the three groups on intergroup comparison at various intervals for the first 12 hours postoperatively ($p > 0.05$). Similar results were observed by samir jamali and colleagues (1993)⁵, Lee jj et al (1993)⁶, Klimscha et al (1997)⁷ studied, Dr. Lt.Col. Upadhyay et al (2004)⁴, Hennawy and colleagues (2009)⁸ and Jayshreesood et al (2008)⁹

However, Seyedhejazi M et al (2007)¹⁰ found significant differences between two groups in the mean of systolic blood pressure, diastolic blood pressure and heart rate. No such side effects were observed in any of our patients, who all had comparable respiratory frequencies and SpO₂ value above 93% breathing room air, possibly because 1µg/kg and 2 µg/kg clonidine are well below the dose used in the above-mentioned study.

In our study, there was no significant difference in the mean respiratory rate and mean oxygen satura-

tion among the three groups on intergroup comparison measured at different time intervals for the first 12 hours postoperatively ($p > 0.05$). Similar findings were observed in study conducted by Samirjamali et al (1993)⁵, Klimscha W, et al (1997)⁷, Dr. Lt. Col. Upadhyay et al (2004)⁴, TS Yildiz et al (2005)¹¹, Maria de Lourdes et al (2007)¹, Jayshreesood et al (2008)⁹ and Hennawy and colleagues (2009)⁸

The mean duration of postoperative analgesia was 5.95 hrs. in Group A (Bupivacaine alone), 11.82 hrs. in Group B (Bupivacaine clonidine 1 µg/kg), 11.45 hrs. in Group C (Bupivacaine clonidine 2 µg/kg). So the mean duration of postoperative analgesia was statistically highly significant in Group B and Group C, as compared to Group A ($p < 0.05$). Similar findings were observed in study conducted by Samir jamaliet al (1993)¹⁸ Lee jj et al (1993)²³, Constant I et al (1997)¹¹, Kimscha, et al (1997)⁷ Dr. Lt. Col. Upadhyah et al (2004)⁴ Maria de Lourdes et al (2007)¹ Jayshree Sood et al (2008)⁹ evaluated, T.S. Yildiz et al (2005)¹¹ studied, Hennawy and colleagues (2009)⁸ compared,

In our study, the assessment of sedation was done using four point sedation score. No significant differences were found among the four groups for the pain scores. Similar results were found in studies J.C. De Mey et al (1999)¹² evaluated and Wanda Joshi DO et al (2003)¹³ Performed

In our study the Sedation scores were higher in bupivacaine- clonidine (2µg/kg) (group C) up to 6 hours (drowsy but not sleeping, asleep) postoperatively as compared to other groups. In Group C duration of sedation was significantly longer statistically as compared to other groups ($p < 0.05$). Similar results were obtained in studies by Lee JJ et al (1993)⁶ They, Klimscha et al (1997)⁷, Dr. Lt. Col. Upadhyay et al (2004)⁴ and Maria de Lourdes et al (2007)¹.

In our study, nausea occurred in 10 % of patients in Groups A, Group B and Group C. Vomiting occurred in 10 % of patient's In Group A and Group C and 5% of patients in Group B. None of the patients had hypotension, bradycardia, respiratory depression or urinary retention in all the three groups. There is no difference in rate of side effect among three groups. The similar results were also observed by Lee jj et al (1993)⁶, Jayshree sood et al (2008)⁹ and Hennawy and colleagues (2009)⁸. However, Maria de Lourdes et al (2007)¹ observed higher rate of side effects, vomiting in 17.3% in bupivacain group and 8.7% in clonidine group.

CONCLUSION

From the above study we conclude that the addition of clonidine (1-2µg/kg) to single shot caudal bupiva-

caine (0.25%) prolongs the duration of postoperative analgesia (11.5 hours) while maintaining hemodynamic stability, respiratory stability, producing minimal side effects, leaving the child calm, quiet comfortable, minimally sedated and easily arousable in the immediate postoperative period. Thus clonidine (1-2 µg/kg) is safe and effective adjuvant in caudal block for pediatric lower limb and lower abdominal surgery.

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