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Caudal Clonidine in Day Care Paediatric Surgery

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Abstract

Caudal epidural is the most common regional anaesthetic technique being performed in paediatric day care procedures. Several adjuvants have been tried to prolong the duration of caudal analgesia and to increase the efficacy of analgesia. Among them Clonidine is the popular adjuvant in current paediatric practice.In this study 100 children in the age group of 1 to 10 years were selected and divided in to two groups (Group A and Group B) of 50 children each. Group A children received Bupivacaine 1 ml/kg and 1mcg/kg of Clonidine, Group B children received Bupivacaine alone at 1ml/kg in the caudal epidural route. Heart rate, respiratory rate, mean arterial pressure during intraoperative and postoperative period have been monitored. Post operative sedation was assessed by simple sedation score and the duration of analgesia by the need for first analgesic requirement. The duration of analgesia is significantly prolonged in Group A and no significant changes in the haemodynamic parameters also. So addition of 1 mcg/kg of Clonidine to Bupivacaine in the caudal route significantly prolongs the duration of analgesia without causing any major haemodynamic and respiratory effects.

Keywords: Bupivacaine; Caudal; Clonidine; Paediatric.

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Introduction

By far caudal epidural is the most preferred regional anaesthetic technique in a paediatric age group for infra umbilical surgeries because it is simple, easy to perform with low failure rates and has predictable level of blockade. The main drawback of caudal epidural is its shorter duration of action. This necessitates either insertion of catheter to prolong the duration of analgesia or the use of adjuvants to do the same. In the initial days opioids were extensively used along with local anaesthetic agents which provided significant prolongation of analgesia but it has its own side effects like nausea, vomiting, constipation, itching, respiratory depression and urinary retention.

The other adjuvants which were commonly used were Ketamine, Midazolam, Neostigmine, Tramadol and Clonidine. Among them Clonidine, an alpha 2 adrenergic agonist became more popular in prolonging the duration of post operative analgesia without any haemodynamic and respiratory effects.

The analgesic action of epidural Clonidine results from direct stimulation of pre and post synaptic alpha

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2 adrenoceptors in the dorsal horn grey matter of the spinal cord, thereby inhibiting the release of nociceptive neurotransmitters.

In this study we compared the analgesic efficacy of Clonidine as an adjunct to Bupivacaine in caudal epidural and its haemodynamic , respiratory effects in paediatric day care procedures.

Methods

A prospective, randomised, double blind, controlled study was conducted after the approval of Institutional Ethics Committee and parental informed consent, about 100 children in the age group of between 1 to 10 years, of ASA PS I, weighing between 5 to 20 kgs, scheduled to undergo infra umbilical surgeries were selected and equally divided in to two groups of 50 children each.

Group A - 1 ml/kg of 0.25% Bupivacaine with 1mcg/kg of preservative free Clonidine.

Group B - 1 ml/kg of 0.25% Bupivacaine.

Exclusion criteria were,

1. History of allergy to local anaesthetics
2. Coagulation disorders
3. Spinal cord deformity
4. Skin infection at the site of injection
5. History of any metabolic, neurologic or cardiac diseases

Premedication was purposely avoided to clearly assess the analgesic efficacy of Clonidine and its effects on haemodynamic and respiratory system because addition of opioids or anticholinergic in the premedication may affect the assessment of Clonidine. All the basic monitors were connected (SpO2, ECG, NIBP). After inhalational induction using Sevoflurane 8% with N_2O:O_2 at 66% & 33% respectively using Jackson Rees modification of Ayres T piece circuit, peripheral venous access achieved with 22G venous cannula. Once the child became sufficiently deep (2 min with Sevoflurane at 8%), a proper size proseal LMA according to the weight of the child was inserted. Anaesthesia was maintained with N_2O:O_2 at 66:33% with Sevoflurane at 2% in spontaneous ventilation with the flow rate of 2 - 3 times the minute volume for the particular child. After induction, caudal epidural was performed under strict aseptic precaution in left lateral position using 22 G hypodermic needle where Group A children received 1ml/kg of 0.25% Bupivacaine with 1mcg/kg of Clonidine and Group B children received 1ml/kg of 0.25% Bupivacaine alone. Clonidine was loaded in 1 ml syringe so as to keep volume same in both groups.Surgery commenced 15 minutes after the caudal block just to provide adequate time for the onset of block. Intraoperative monitoring of heart rate, SpO_2 were done continuously and MAP every 5 minutes after caudal block for the first 30 minutes and thereafter every 15 min till the end of the surgery and every 15 min for 2 hours then every 1 hour for about 6 to 8 hours or till discharge of the child.

Analgesic efficacy during the intraoperative period was defined by haemodynamic stability ie absence of increase in heart rate and MAP > 20% from the baseline values and if there is an increase in heart rate or MAP after 15 minutes of caudal block its considered as failure of caudal block and were treated with IV Fentanyl 1 to 2 mcg/kg as rescue analgesic and was excluded from the study.

Hypotension and bradycardia were defined as intraoperative decrease in MAP and HR by more than 30% from the baseline after caudal block respectively and were treated by IV fluids, Ephedrine or Atropine accordingly. All the children were extubated deeply and shifted to recovery room for continuous monitoring.

Respiratory depression was defined as decrease of SpO_2 less than 95% which required supplemental oxygen via mask.

Postoperative pain was assessed 2 hours after surgery then hourly till 6 to 7 hrs based on CHEOPS scale (Table 1). Each variable (crying, facial expression, verbal response, position of torso and motor restlessness) was scored between 0-2 (0: none, 1: moderate, 2: severe), to give a cumulative score of 0-10. Children were given IV Paracetamol 15mg/kg as rescue analgesic if the pain score was high. Duration of analgesia was defined as the time from caudal injection until the pain score was 1 or until the need for parenteral analgesics.

Postoperative sedation was assessed by a simple sedation score.

1. Asleep not arousable
2. Asleep bur arousable by verbal contact
3. Drowsy

Table 1:

Score	0	1	2
Cry	No cry	Crying, Moaning	scream
Facial	Smiling	Composed	Grimaced
Verbal	Positive	None or other complaints	Pain complaint
Torso	Neutral	shifting, tense, upright	Restrained
Legs	Neutral	Kicks, squirm, drawn up	restrained

4. Alert and awake

Motor blockade was assessed by modified Bromage scale

1. Complete bock (unable to move feet or knee)
2. Almost complete block (able to move feet only)
3. Partial block (just able to move knees)
4. Detectable weakness of hip flexion while supine
5. No detectable weakness of hip flexion while supine
6. Able to perform partial knee bend

The incidence of the side effects like nausea, vomiting, urinary retention were also evaluated.

Statistical Analysis

Mean and Standard deviation were estimated from samples of each study group. Mean values were compared by students independent 't' test. Proportion of different characteristics and categorical variables were estimated from each study group which were compared by Chi-square test (M x N) , Chi-square with Yates continuity correction, Fischers exact test appropriately. In this study "P' value < 0.05 was considered as level significance.

Results

Both the groups were comparable in age, weight, duration of surgery and type of surgical procedures (Table 2).

The duration of analgesia and the time for first postoperative analgesic requirement was prolonged and showing high significance statistically (Table 3 & Fig. 3). The mean time of first analgesic requirement in Group A was 374±52.37 and Group B was 187.36± 6.68. (p value 0.000 = Highly significant).

The intraoperative and postoperative heart rate and MAP in both the groups were comparable and were showing no statistical significance (Table 3 & Fig. 1,2).

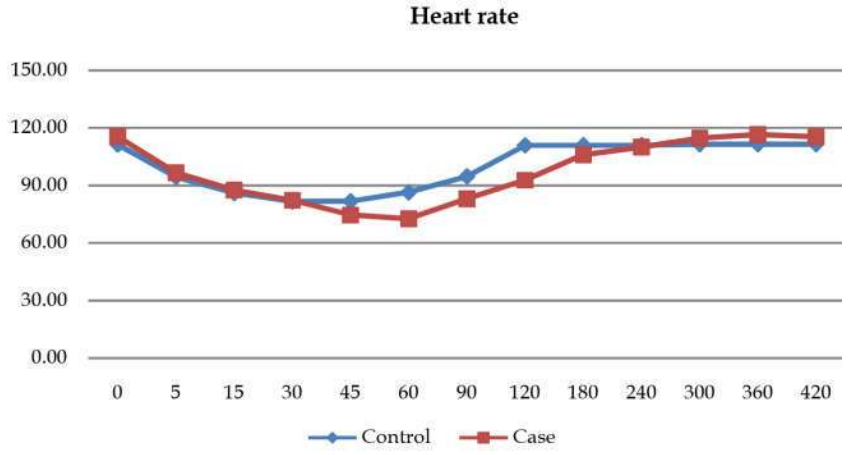
There was a decrease in the MAP from the baseline in the Clonidine group 15 minutes after the caudal block which became normal after period of 30 minutes.

Table 2: Demographic distribution

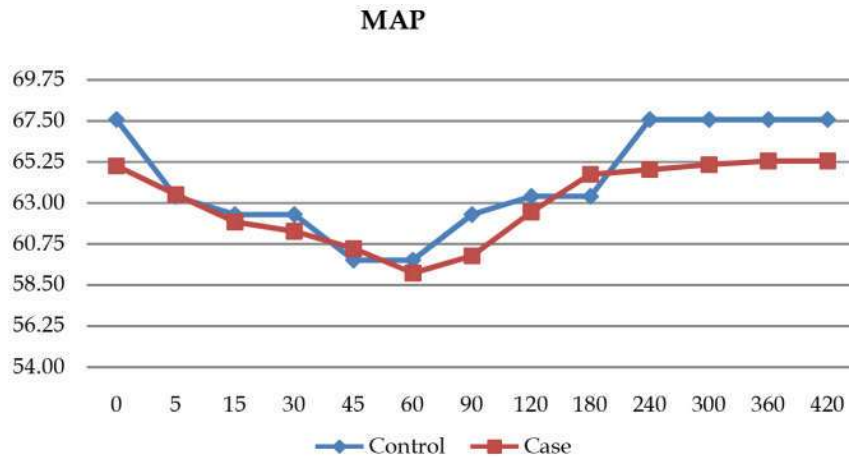
	Group A	Group B
Age (Years)	3.48 +/- 1.60	3.58 +/- 2.15
Weight (Kg)	13.65 +/- 6.04	14.58 +/- 4.40
Duration of surgery (Min)	43.50 +/- 10.15	43.75 +/- 12.20

Table 3:

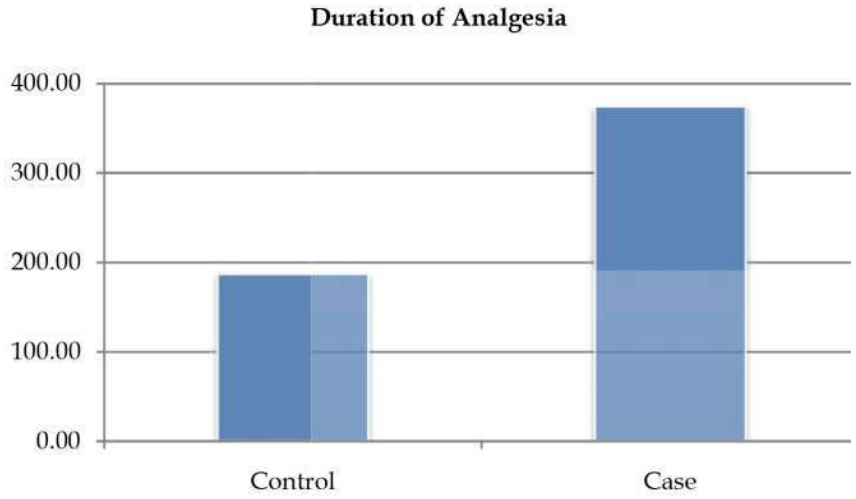
	Group A	Group B	p - Value
Intra op HR (BPM)	82.2 +/-3.06	81.48+/-1.54	0.140
Post op HR (BPM)	109.92+/- 4.46	111 +/-4.14	0.212
Intra op MAP (mmHg)	63.46+/-0.84	63.36+/-1.10	0.611
Post op MAP (mmHg)	65.6+/-9.37	70.15+/-10.09	0.15
Duration of analgesia	374.86+/- 52.37	187.36 +/- 6.68	0.000
Mean sedation score	2.8+/-0.45	2.83+/-0.47	0.84
Mean CHEOPS score	4.65+/-0.25	4.55+/-0.25	0.62



Graph 1:



Graph 2:



Graph 3:

There was no significant difference in either group in the mean postoperative sedation score and CHEOPS score (Table 3).

None of the children had SpO_2 values less than 98% and none of the children had bradycardia.

The incidence of vomiting was comparable between the groups and no children had urinary retention. On awakening no motor blockade was observed in any case in either group.

Discussion

Pain in children if left untreated can result in morbidity and mortality and there are several research activities going on in managing postoperative pain in children. The analgesic effects of Clonidine have been demonstrated in several studies when administered via epidural route , later it was used in paediatric neuraxial blocks which was found to prolong the duration of analgesia in children.Several studies were using different doses of Clonidine along with Bupivacaine and it was found that increasing the doses of Clonidine did not enhance its efficacy rather it increases the incidence of side effects like bradycardia and hypotension in a dose dependent manner, the incidence being less with the dose of 1 mcg/kg.Thats why we chose Clonidine 1 mcg/kg along with Bupivacaine 0.25% in this study group.

Our study indicates, for caudal block addition of Clonidine 1mcg/kg to Bupivacaine 0.25% significantly prolongs the duration of analgesia (Mean 374±52.37 min) than Bupivacaine 0.25% alone (Mean 187.36±6.68)

Clonidine produces dose dependent sedation but in our study the degree of sedation in the first two

hours following caudal block was similar in both the groups.

Clonidine when administered via epidural route produces hypotension due to inhibition of preganglionic sympathetic fibres and bradycardia due to parasympathetic dominance. In our study there was no statistically significant differences with respect to heart rate and MAP both during intraoperative and postoperative period.

There was no respiratory depression in either of the groups. All children could move their legs at the end of 6 hour period and there was no case of retention of urine.

There was no case of postoperative vomiting and therefore discharge of no child was delayed.

The purpose of this study was to assess the suitability of low dose Clonidine and Bupivacaine in daycare patients who are to go home on the same day. Absence of any side effects like sedation, bradycardia, vomiting and respiratory depression with significant prolongation in duration of analgesia and reduction in the need of rescue analgesic suggests that Clonidine in low doses as an adjuvant with local anaesthetic in paediatric day care procedures.

Conclusion

Caudal Clonidine in the dose of 1mcg/kg on paediatric age group is a satisfactory and efficacious adjuvant to caudal Bupivacaine for producing prolonged postoperative analgesia with minimal side effects.

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