Original research article

Study of Effect of Caudal Clonidine on Postoperative Pain and Emergence Agitation in Pediatric Patients.

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Abstract

The aim of the present study was to study the effect of caudal Clonidine on post operative pain and emergence agitation (EA) given as a single shot caudal epidural as an adjuvant with Bupivacaine 0.25% in pediatric patients posted for infraumblical surgeries. In the present prospective study, 60 children of ASA-I aged 2-7 years with weight less than 20 kg posted for infraumbilical surgical procedures under general anesthesia received injection Bupivacaine 0.25% (0.75ml/kg) + Clonidine 1 mcg/kg caudally. Caudal block was performed after the induction of general anesthesia . Postoperatively patients were observed for analgesia, emergence delirium, need of rescue analgesic, side effects/complications for 24 hours postoperatively. Amongst the 60 patients about 38 , 18 and 4 patients required one, two and three doses of rescue analgesic respectively within 24hours of surgery. Out of all, 3 patients had emergence agitation (EA). None of patient had any side effects/ complications. Addition of Clonidine in a dose of 1mcg/kg to 0.25% Bupivacaine for caudal analgesia significantly prolongs the duration of postoperative analgesia and reduces incidence of EA, without any respiratory or hemodynamic side effects.

Keywords: Caudal epidural, clonidine, postoperative analgesia, emergence agitation. pediatric

Introduction

Incidence of postoperative pain in children is 40% with upto 13% experiencing severe pain(1). Historically they were undertreated for pain due to misconceptions like Children do not feel pain and risk of addiction to powerful opioid analgesics(2). Alleviation of pain is a “basic human right”, irrespective of age, medical condition and this undertreated pain may lead to Chronic pain conditions in future and also emergence agitation (EA) in immediate postoperative period (20-80%)(3,4), which may cause, parental apprehension and burden to caregivers and delayed recovery and discharge from the hospital. Now, postoperative pain management is becoming an integral part of anesthesia care in all major hospitals. various adjuvants such as opioids(5), midazolam(2), tramadol(6), dexmedetomidine, clonidine(5,7–9), ketamine(10) and have been used for caudal block with various results. Clonidine, an alpha-2 agonist has been studied as an adjuvant in caudal epidural block for prolonging the duration of analgesia and since pain is a risk factor for emergence agitation (EA)(7,8), caudal clonidine may reduce incidence of EA(11,12) too. Knowing the magnitude and impact of postoperative pain and emergence agitation or delirium in pediatric population, we planned to conduct prospective observational study with primary objective of studying effects of clonidine as an adjuvant to Bupivaccaine in single shot caudal epidural for prolongation of

postoperative analgesia and to study incidence of emergence agitation in pediatric population. Another primary objective was to assess the requirement of postoperative rescue analgesics. Secondary objectives to be assessed included: Intraoperative hemodynamic changes and any post operative and intraoperative adverse events.

Material and Method

After obtaining Institutional Ethical Committee approval and written informed consent from the parents, this prospective observational, single group and single centre study was conducted in 60 patients. The study included patients with American Society of Anesthesiologists (ASA) physical status I, age between 2 to 7years, weight less than 20kg who underwent infraumbilical surgeries (urethroplasty) under general anesthesia. Children with local infection of the caudal area, history of allergic reactions to local anesthetics, bleeding diathesis, preexisting neurological or spinal diseases, mental retardation, and neuromuscular disorders were excluded from the study.

After doing pre anesthetic checkup and confirming that the patient fits in decided inclusion criteria, after obtaining proper informed consent from the concerned parents and ensuring patent IV access, the patients were then shifted to the operation theater and connected to monitors; electrocardiogram, noninvasive blood pressure and pulseoxymeter and baseline values were recorded. Patients were pre-medicated with intravenous Glycopyrrolate 4mcg/kg and sedated with intravenous Midazolam 0.02mg/kg + Fentanyl 1.5mg/kg. Induction was done by intravenous Propofol 2mg/kg followed by intravenous Atracurium 0.5mg/kg. Airway was secured with proseal laryngeal mask airway of appropriate size (1.5-2) depending on the weight of the patient. Anesthesia was maintained on 50% N_2O + 50%O_2+Sevoflurane (2-3%) and 2 % Ringer lactate(80ml Ringer lactate added to 20 ml of10% dextrose) solution was administered as per the calculated fluid requirements. After induction, patients were placed in the lateral decubitus position and a single shot caudal epidural was performed under all aseptic precautions, using a 22G hypodermic needle, by an anesthesiologist who had two years of experience. Injection Bupivacaine 0.25% (0.75ml/kg) + Clonidine 1 mcg/kg was given caudally. The patients were extubated at the end of the procedure and the duration of anesthesia was noted in all the groups.

During intra-operative period, adequacy of analgesia was gauged by hemodynamic stability. Absence of rise of heart rate (HR) or mean arterial pressure (MAP) of more than 15% compared with baseline values recorded just before surgical incision was considered as adequate analgesia. An increase in HR or MAP (>15%), 15 min after administration of caudal anesthesia was defined as failure of analgesia. If HR, MAP increased 45 min after surgical incision it was considered as inadequate analgesia. Patients with failure of caudal analgesia or inadequate analgesia were given further fentanyl 1-2 μg/kg intravenously. Patients, in whom caudal anesthesia failed or inadequate analgesia was present, were excluded from study. The patients were continuously observed for 24 h postoperatively.

Postoperative assessment was done by another anesthesiologist in the post-anesthesia care unit (PACU) who was not aware of the drug administered and by a nurse in the ward. Pain score was assessed using the FLACC pain scale (F — face, L — leg, A — activity, C — cry, C — consolability) scale [Table 1]. Assessment of pain by FLACC scale was done at 0, 1, 2, 3, 4, 8, 12 and 24 h postoperatively. The time from caudal placement of drug to the first recording of a FLACC score ≥4 was taken as the duration of analgesia.

In the PACU, the necessity for rescue analgesic was decided by the pain score using FLACC pain scale. Rescue analgesic was administered when patients had score of ≥4 on at least 2 occasions or showed obvious signs of pain. Per rectal Paracetamol suppository was used as rescue analgesic with 20 mg/kg. The number of doses of rescue analgesic required and the time to first administration of rescue analgesic also noted. The HR and MAP were measured intra-operatively and immediate postoperatively. Sedation scores were recorded at 0, 1,2, 4, 8, and 12 hours after surgery using a 4 point sedation score [Table 2]. Children were also observed for occurrence of emergence delirium with Watcha's score after 1st postoperative hour [Table 3]. In the postoperative period, patients were also monitored for adverse effects, including shivering, respiratory depression, vomiting ,urinary retention, hypotension and bradycardia. Respiratory depression was defined as a decrease in oxygen saturation requiring oxygen by face mask. Hypotension was defined as systolic blood pressure (SBP) <70 mm Hg and bradycardia was defined as a HR <80 beats/min.

Table 1: FLACC pain scale

Parameter	0	1	2
Face	No expression	Occasional grimace	Frequent to constant quivering chin
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quiet	Squirming, shifting back and forth, tense	Arched, rigid or jerking
Cry	No cry	Moans or whimpers	Crying steadily
Consolability	Content, relaxed	Reassurance, hugging	Difficult to console

Table 2: Four (4) point sedation score

Sedation score	
Asleep, not arousable by verbal contact	1
Asleep, arousable by verbal contact	2
Drowsy not sleeping	3
Alert / Awake	4

Table 3: Watcha's Score

Behavior	Score
Asleep	0
Calm	1
Crying but can be consoled	2
Crying but cannot be consoled	3

Results

In our study we observed 60 patients, undergoing infraumbilical surgeries (urethroplasty, herniotomy).Mean age of patients was 4.45yrs, mean weight being 14.19 and mean duration of surgery being 69 min. There was no significant change in HR during intraoperative and postoperative period, as observed by mean sytolic blood pressure baseline was 90.56, intraoperative was 90.33 and postoperative was also 90.48 and change in systolic blood pressure baseline, intraoperatively and postoperatively was acceptable.

Surgical analgesia in all patients was found to be adequate, as indicated by absence of an increase in MAP or HR of >10% Of baseline .

Table 4: Demographic and clinical data

Parameters	Mean
Age (years)	4.45(±0.9)
Weight (kg)	14.19(±1.67)
Duration of Surgery (min)	69.16
Duration of analgesia (hrs)	12.08(±0.95)
Baseline: HR (beats/min)	98
Baseline: SBP (mmHg)	90

Data shown as mean ± SD. SD = Standard deviation, HR = Heart rate, SBP = Systolic blood pressure

The pain score was assessed using the FLACC pain scale .The FLACC pain score never reached ≥4 during the first3 h in any of the patients. Mean duration of postoperative analgesia (FLACC score <4) 12.08±0.95 hours with 95% confidence interval.

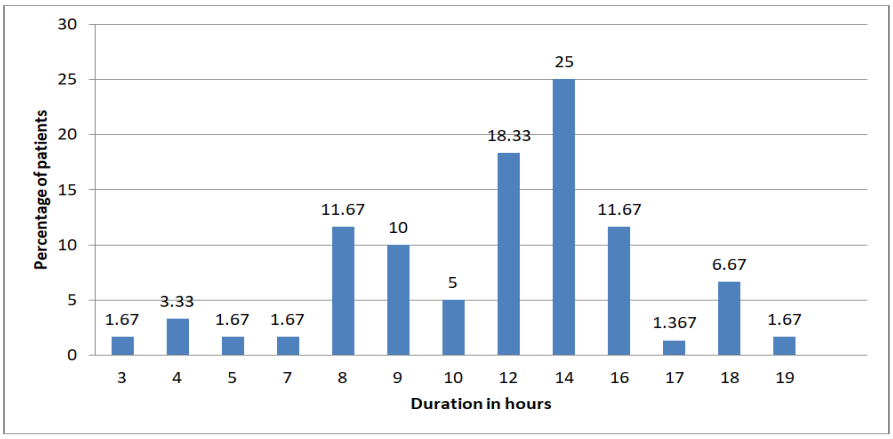

Figure 1: Duration of Analgesia (n=60).

Amongst the 60 patients observed about 63.33% required single dose of rescue analgesic,30% required two doses of rescue analgesic and about 6.66% required three doses of rescue analgesic.

1 dose of rescue analgesic – 38 pts, (63.33%)
2 doses of rescue analgesic - 18 pts (30%)
3 doses of rescue analgesic - 4 pts. (6.66%)

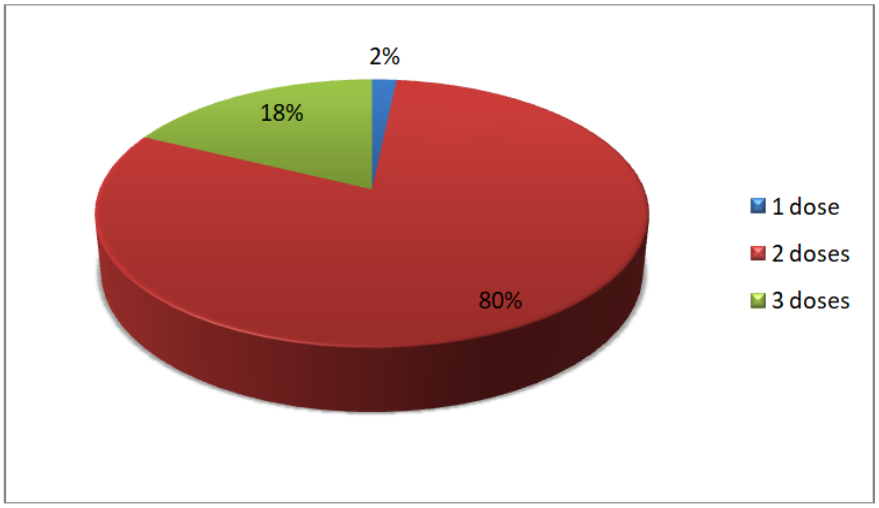

Figure 2: Number of doses of rescue analgesic (n=60)

None of patients had score >=4 during first 3 hours and 66% patients <4 in first 12 hours.

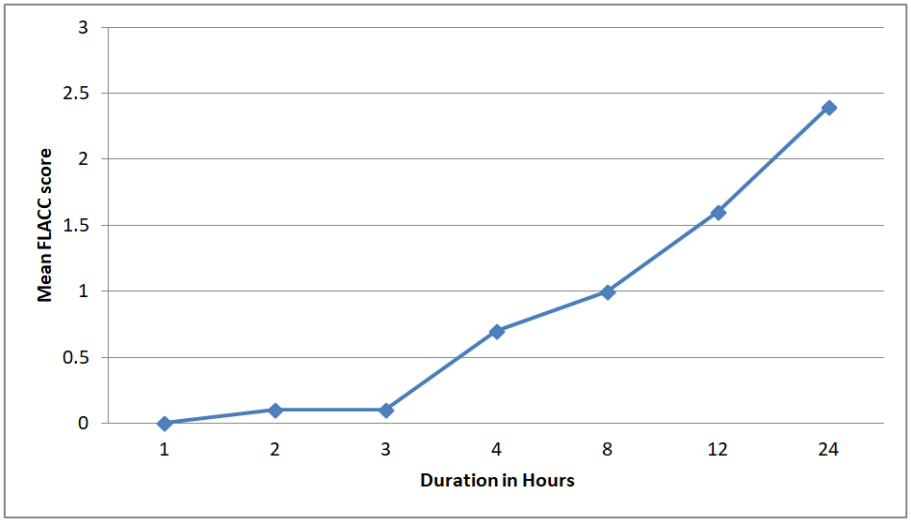

Figure 3: Mean FLACC score by duration (n=60)

Mean FLACC score at the end of 24 hrs was 2.4 [figure 3].
Four point sedation score of the patients, Mean sedation score in immediate postoperative period was 1.5 (+- 0.5) at 30 min. Thereafter there was gradual rise in mean sedation score in all the patients (figure 4).

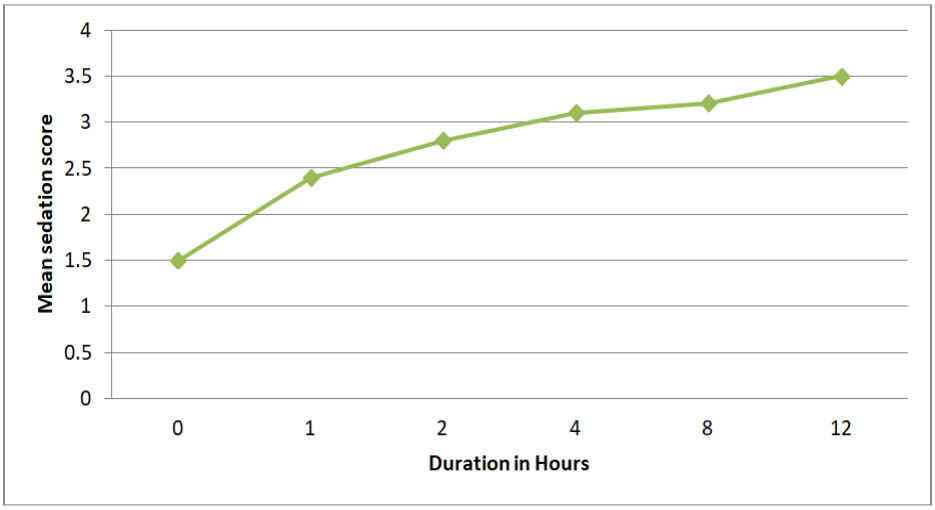

Figure 4: Four point sedation score by duration (n=60)

Out of the 60 patients observed 3 patients had emergence agitation, i.e. Emergence agitation as observed by Watch's scale, overall incidence was 5%.
None of patient had any episode of shivering, respiratory depression, Postoperative nausea and vomitting, hypotension, bradycardia or urinary retention.

Discussion

Caudal epidural anesthesia is a relatively simple, frequently used technique, caudal clonidine when used epidurally provides very effective analgesia intra and postoperatively in pediatric patients undergoing infra-umbilical surgeries(13–16). Clonidine was demonstrated to have an analgesic action when administered via epidural route(17). Caudal clonidine, combined with bupivacaine has been used in varying doses and it was found that increasing the dose of clonidine from 1 µg/kg to 2 µg/kg did not enhance its efficacy(15,18,19), and when 1µg/kg

clonidine was used as an adjuvant for epidural caudal block lesser incidence of hypotension, bradycardia(20) and respiratory depression (21). Clonidine 1µg /kg provided increased duration and better quality of pain relief with no motor blockade and sedation when added to 0.1% ropivacaine compared to plain 0.1% ropivacaine and 0.2% ropivacaine as demonstrated by Dr. Manickam et al(22). Thus, we used 1 µg/kg clonidine as an adjuvant to 0.25% bupivacaine.

Our study indicates that addition of clonidine to bupivacaine for epidural caudal block as an adjuvant is safe and efficacious in prolonging the duration of postoperative analgesia in children undergoing lower abdominal surgeries comparable to other studies. Furthermore, postoperative rescue analgesic requirements decreased with the use of clonidine with no side-effects(23,24). In terms of mean duration of analgesia (12.21 hour) and doses of rescue analgesics in first 24 hours(6% -3doses, 32% -2 doses, and 62%-1 dose) our finding s were comparable to those observed by Sanwatsarkar et al(6). Although authors have studied various doses (1-3mcg/kg) , in our study dose of 1mcg/kg provided longer duration of analgesia as only 3 patients required 3 doses of rescue analgesics. Antinociceptive action is due to the direct suppression of spinal cord nociceptive neurons by epidural clonidine.
In this study we found that addition of Clonidine not only prolongs duration of analgesia and but also reduces EA as reported by Saxena A, Sethi A et al(8,25). We used Watcha's scale to quantify severity of EA. Delayed onset of analgesia has association with EA. Alpha 2 agonist by reducing secretion of noradrenalin from the locus cerulus, facilitate release of inhibitory neurons, such as those of gamma-aminobutyric acid system, thereby may be reducing incidence of EA(26).

Conclusion

Clonidine in a dose of 1mcg/kg added to 0.25% Bupivacaine for caudal analgesia and administered as a 0.75ml/kg in children for infraumbilical surgery, significantly prolongs the duration of postoperative analgesia and reduce incidence of EA, without any respiratory or hemodynamic side effects.

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