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EVALUATION OF ANALGESIC EFFICACY OF DEXAMETHASONE AS AN ADJUVANT TO CAUDAL BUPIVACAINE IN PAEDIATRIC PATIENTS UNDERGOING INFRAUMBLICAL SURGERY

Dr. Neetu Gupta*	Assistant Professor, Department of Anaesthesiology, M.G.M. Medical College and M.Y. group of Hospitals, Indore (MP), India. *Corresponding Author
Dr. Pooja Vaskale	Assistant Professor, Department of Anaesthesiology, M.G.M. Medical College and M.Y. group of Hospitals, Indore (MP), India.
Dr. Nidhi Sharma	Assistant Professor, Department of Anaesthesiology, M.G.M. Medical College and M.Y. group of Hospitals, Indore (MP), India.
Dr. . K.K. Arora	Professor and Head, Department of Anaesthesiology, M.G.M. Medical College and M.Y. group of Hospitals, Indore (MP), India.

ABSTRACT **Background:** caudal epidural block is one of the common regional techniques in paediatric anaesthesia for patients scheduled for infraumblical surgeries. Major disadvantage of this technique is its limited duration of action. Various adjuvants have been added to local anaesthetic agents for prolongation of analgesic effect of caudal block. The purpose of this study was to evaluate the analgesic efficacy of dexamethasone as an adjuvant to caudal bupivacaine in paediatric patients undergoing infraumblical surgeries.
Material and method: 100 paediatric patients aged 1 to 6 years (< 20kg weight) of ASA class 1 or 2 scheduled for infraumblical surgery were enrolled in the study and randomly allocated in to two groups. Group B (n=50) received caudal block with 1ml/kg of 0.25% bupivacaine while Group D (n=50) received caudal block with 1ml/kg of 0.25% bupivacaine with 0.1 mg/kg dexamethasome. After completion of surgery, postoperative pain was assessed with FLACC (face, legs, activity, cry, consolability) scale at hourly interval till the score >3 (duration of analgesia). Both the groups were compared for the duration of analgesia and total analgesic requirement in the first 24 hours postoperatively.
Result: Group D showed significantly longer duration of analgesia in comparison to Group B. Total analgesic requirement and mean FLACC score was also lower in Group D as compared to group B.
Conclusion: Addition of dexamethasone (0.1mg/kg) to caudal bupivacaine increases the duration of postoperative analgesia and decreases the analgesic requirement during postoperative period

KEYWORDS : caudal block, local anaesthetic, dexamethasone, analgesia, bupivacaine

INTRODUCTION:

Caudal epidural block is most commonly performed technique to manage intra-operative and postoperative pain in paediatric patients undergoing infraumblical surgery[1,2]. It can be given as single dose injection or a catheter can be inserted and continuous infusion can be given. Caudal catheter is not preferred due to high chances of fecal contamination and increased risk of infection [3]. Main disadvantage of single dose technique is its limited duration of action which may lead to inadequately managed pain during postoperative period. Inadequately managed pain in paediatric population can lead to various psychological and behavioral problems in long term [4]. Under treatment of pain is common in paediatric patients due to difficulty in pain assessment in this age group and fear of side effects of opioids also leads to inadequately managed pain in these patients[5].

To overcome this disadvantage of limited duration of analgesia various adjuvants (opioid, alpha-2 agonists, ketamine, midazolam etc.) to local anaesthetics have been studied for their analgesic efficacy and safety. Most of these agents are associated with various side effects like urinary retention, nausea, vomiting, purities and respiratory depression with opioids [6,7], bradycardia, hypotension and sedation with alpha-2 agonist[8].

Steroids when used in epidural space prolongs the duration of analgesia [9,10,11]. Epidural steroids produce analgesia due to their anti-inflammatory action [12]. Dexamethasone is a potent, long acting glucocorticoid with strong anti-inflammatory and limited mineraloc orticoid activity. Various studies have shown that addition of dexamethasone to caudal or epidural block prolongs the duration of analgesia. Inhibition of cyclooxygenase -2 syntheses in central nervous system and peripheral tissues by dexamethasone reduces the prostaglandin production which is responsible for pain and inflammation [13]. We conducted this study to evaluate the analgesic efficacy of dexamethasone as an adjuvant to caudal bupivacaine in paediatric patients undergoing infraumblical surgery.

MATERIALAND METHOD:

After approval from institutional ethics committee and parental consent this prospective randomized double blind study was conducted in the department of anaesthesiology, M.G.M. Medical College and M.Y. Hospital, Indore. 100 patients in the age group 1 to 6 years (< 20 kg weight) of either sex in ASA class 1 or 2 scheduled for infraumblical surgery were included in the study after written informed consent from parents. Patients having contraindication for caudal block like infection at the site, sacrococcygeal abnormalities, allergy to the drugs, bleeding disorders were excluded from the study.

Pre-anaesthetic checkup was done one day prior to the study. Patients were randomly allocated into two groups, Group B (n=50) and Group D (n=50) with sealed envelope technique. In Group B patients received 1ml/kg of 0.25% bupivacine and in Group D patients received 1ml/kg of 0.25% bupivacaine with 0.1mg/kg dexamethasone in caudal block.

On arrival to operation theater patient's baseline vital parameters SpO2, heart rate, respiratory rate, noninvasive blood pressure were noted down. Patients were premeditated with injection glycopyrolate 0.008 mg/kg and injection midazolam 0.05mg/kg intravenously through already secured IV line and IV fluid started. Anaesthesia was induced with injection ketamine 2mg/kg and maintained with O2:N2O mixture (40:60) and sevoflurane 0.8 -1% with facemask till the end of surgery. Under all aseptic precaution Caudal epidural block was given in lateral position by the anaesthesiologist who was blinded to the drug and patient's assigned group. Drug for caudal block was prepared by the anaesthesiologist who was not involved in the study. Surgery was allowed to start after ten minutes of caudal block. If the patient showed lower limb movement, increase in heart rate >15% from baseline the block was considered as failed block and patient was excluded from the study.

Vital parameters SpO2, heart rate noninvasive blood pressure, respiratory rate were monitored throughout the surgery. At the end of surgery all anaesthetic agents were discontinued and duration of surgery was noted down and patients were shifted to post-anaesthesia care unit for further observation.

Postoperative pain was assessed with FLACC scale (face, legs, activity, cry, consolability) at hourly interval till score was > 3. At this time rescue analgesia was given with injection paracetamol 15mg/kg and duration of analgesia was noted down (time interval between administrations of caudal block to first rescue analgesia). Total analgesic consumption during first 24 hours was also noted down.

he FLACC scale or Face, Legs, Activity, Cry, Consolability scale is a

measurement used to assess pain for children between the ages of 2 months and 7 years. The scale is scored in a range of 0–10 with 0 representing no pain.

Criteria[1]	Score 0	Score 1	Score 2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, uninterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking, or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting, back and forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers; occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort

During intra-operative and postoperative period Patients were also observed for any side effect like bradycardia, hypotension, nausea, vomiting, respiratory depression, sedation etc and treated accordingly.

STATISTICALANALYSIS:

All the data were entered in Microsoft excel sheet and SPSS software was used for data analysis. Numerical data were expressed as mean ± SD. Comparison between two groups was done with unpaired t test. Categorical data were expressed as percentage and numbers. Comparison between groups was done with chi squared test. A P value of < 0.05 was considered as statically significant.

OBSERVATION AND RESULTS:

Table 1 shows the demographic data. There was no statically significant difference between both the groups in terms of age, gender, weight, ASA class and duration of surgery (p>0.05)

Table 1: Demographic data

	Group B (n=50)	Group D (n=50)
Age (years)	2.82 ± 1.782	2.72 ± 1.642
Sex (male/female)	48/2	46/4
Weight (kg)	14.26 ± 4.606	14.52 ± 4.101
Duration of surgery (minutes)	36.6 ± 7.85	38.6 ± 12.61
ASA (1/2)	42/8	40/10

Table 2 shows the distribution of type of surgery in both the groups. There is no significant difference among both the groups in terms of type of surgery. There was no significant difference was observed in vital parameters during intra-operative and postoperative period in both the groups. There was no significant side effect noted in both the groups.

Table 2: type of surgery

Type of surgery	Group B (n=50)	Group D (n=50)
Circumcision	12 (24%)	13 (26%)
Herniotomy	30 (60%)	26 (52%)
Orchiopexy	4 (8%)	6 (12%)
urethroplasty	4 (8%)	5 (10%)

The mean FLACC score was comparable between both the groups during first 4 hours, all the patients of both the groups had adequate analgesia (FLACC<3) for initial 4 hours. Duration of analgesia (time interval between administration of caudal block to first rescue analgesia) was significantly prolonged in Group D as compared to Group B (p<0.05). In Group B duration of analgesia was 5.08 ± 1.010 hr while in group D it was 10.80 ± 0.755hr (fig. 1).

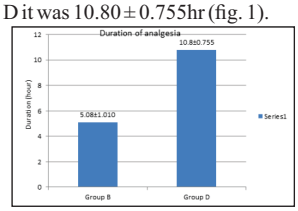

Fig.1: Duration of analgesia

Analgesic requirement during first 24 hours was significantly high in Group B as compared to Group D (p<0.05). In gGoup B analgesic required in first 24 hours was 4.8 ± 0.756 while in group D it was 1.80 ± 0.404 (fig 2).

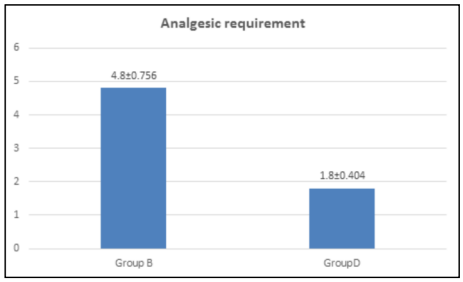

Fig. 2 : Analgesic requirement

DISCUSSION:

Caudal epidural block is one of the commonly performed techniques in paediatric patients scheduled for infraumblical surgery. It provides effective intra-operative analgesia which reduces the anaesthetic requirement intra-operatively. It also provides postoperative analgesia. The duration of postoperative analgesia can be increased by adding various adjuvants with local anaesthetics.

This study was performed to evaluate analgesic efficacy of dexamethasone as an adjuvant to bupivacaine in caudal block. Various studies have shown the analgesic effect of epidural steroids. Various mechanisms have been suggested for the analgesic effect of caudal dexamethasone. Administration of steroids suppresses bradykinin synthesis [14] and neuropeptide release from the nerve endings [15]. It inhibits the synthesis of cyclooxygenase -2 in central nervous system and peripheral tissues which leads to decreased production of prostaglandin leading to analgesia [16]. Johansson et al have suggested that by direct membrane action corticosteroids may have a local anaesthetic effect on nerves [17]. Hong et al have reported that analgesic effect of intravenously administered dexamethasone was seen with much higher dose (0.5mg/kg)[13].

Hefni et al have studied the analgesic effects of different doses of epidural dexamethasone (4,6,8 mg) added to 0.25% bupivacaine in women scheduled for abdominal hysterectomy under general anaesthesia. They found that analgesic effect of dexamethasone increases with increasing dose of dexamethasone to 8mg, without increase in blood sugar[18]. In our study addition of dexamethasone 0.1mg/kg to caudal bupivacaine 0.25% increased the duration of analgesia significantly. This finding is supported by studies done by Kim et al[19]. Girgis[20] used a dose of 0.2mg/kg with 0.25% bupivacaine, finding of their study was also consistent with our study, time to first rescue analgesia was 11.2 hrs.

El-feky et al[21] compared fentanyl, dexmedetomidine and dexamethasone as additive to caudal local anesthetic, they found dexmedetomidine and dexamethasone effective in prolonging analgesia with less side effects as compared to fentanyl. Systematic effects of dexamethasone like hyperglycemia and adrenal suppression are least likely to be there with dose of 0.1mg/kg caudally [18]. So we did not monitor the blood sugar of the patients during our study.

There are some limitations with our study. This study included paediatric patients of 1- 6 years scheduled for various infraumblical surgeries. Varying degree of tissue handling and invasiveness of different surgical procedures could have produced different intensity of pain. Varying threshold and ability to communicate pain among different age group may have influenced the observed pain score. However different type of surgeries and age wise distribution of patients was comparable in both the groups.

Another limitation of the study is that we cannot be sure that analgesic effect of dexamethasone is not due to its systematic effect. Although many studies have suggested that for analgesic effect with intravenous dexamethasone much higher dose is required[13,22].

CONCLUSION:

Addition of dexamethasone 0.1mg/kg to caudal bupivacaine (0.25% of 1ml/kg) significantly increases the duration of postoperative analgesia without any significant side effect and haemodynamic variability.

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