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Effect of intravenous Dexamethasone in combination with Caudal analgesia on postoperative pain control in Paediatric Orchidopexy.

Anaesthesiology

KEYWORDS: Caudal,IV dexamethasone,Orchidopexy,analgesia.

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ABSTRACT

Many recent studies done on dexamethasone have shown its powerful analgesic action along with its anti-inflammatory action. The aim of our study was to determine the efficacy of intravenous dexamethasone as an adjuvant to caudal analgesia on postoperative pain control in paediatric patients undergoing unilateral orchidopexy.A prospective,randomized,double blind study was conducted in 80 patients aged 2-5 years, weighing 20kg or less who underwent unilateral orchidopexy. After induction of anaesthesia with propofol, children in the study group received intravenous dexamethasone 0.5mg/kg body weight (maximum 10mg) followed by the caudal block with ropivacaine 0.1%, 1.5ml/kg body weight.Children in control group received the same volume of saline intravenously as the volume of dexamethasone in the study group, followed by caudal block with ropivacaine 0.1%, 1.5ml/kg body weight. Postoperatively pain scores were assessed using CHEOPS, FLACC and VAS scales.

The pain scores CHEOPS, FLACC and VAS assessed postoperatively in the study group were less as compared to control group. The total number of patients who required rescue analgesia (oral acetaminophen) in ward was less in study group compared to control group and the difference was statistically significant .The mean time to first rescue analgesic (oral acetaminophen) in study group was 8.33±0.985 hours compared to control group where it was 6.00±1.155 hours.The difference was statistically significant. There was decreased incidence of complications like nausea and vomiting in the study group,but the inter group variation was statistically insignificant (P>0.05). The conclusion of our study was that intravenous dexamethasone in combination with a caudal block with ropivacaine increases the intensity and duration of postoperative analgesia after paediatric orchidopexy with no significant side effects.

Introduction:

Management of pain in children is often inadequate. There is no evidence to support the idea that pain is less intense in neonates and young children due to their developing nervous system[1,2]. Noxious inputs have an even more profound effect in children than in adults, but the reactions are more diffuse and the effects potentially underrated[2]. The use of regional anaesthesia in children has proved a boon for pain management in children providing a predictable and consistent level of prolonged pain relief that allows for early discharge of the child with a reduction in side effects such as nausea and vomiting, somnolence or ventilatory depression. Caudal block is the most common regional block performed in children. Caudal anaesthesia is recommended for most of the surgical procedures of the lower part of the body (mainly below the umbilicus), including inguinal hernia repair, orchidopexy, urinary and digestive tract surgery and orthopaedic procedures on the pelvic girdle and lower extremities.

Local anesthetics commonly used for regional anaesthesia are bupivacaine, levobupivacaine and ropivacaine. Several adjuvants have been used along with local anaesthetics in order to improve the duration and quality of regional blocks. More recently dexamethasone has been as an adjuvant to regional analgesia via both the routes systemic as well as regional. Many studies have proven dexamethasone to provide good and prolonged analgesia.

Method:

This study was conducted in the department of Anaesthesiology SK Institute of Medical Sciences, Srinagar over a period of 2 years. It was a prospective, randomized and double blind study. 80 patients were studied. Inclusion criteria were physical status ASA 1 unpremedicated children, aged 2-5 years,weighing 20kg or less who underwent unilateral orchidopexy. Exclusion criteria included any patient who had a contraindication to caudal block including hypersensitivity to any local anaesthetic, bleeding diathesis, infection at the puncture site, pre-existing disease or failure of caudal block. After obtaining instituitional ethical committee and review board approval and with written informed consent from the parents, the children were randomly allocated to study or control group each having 40 patients.

Children in the study group received intravenous dexamethasone 0.5mg/kg body weight (maximum 10mg) followed by the caudal block with ropivacaine 0.1%, 1.5ml/kg body weight. Children in the control group received the same volume of saline intravenously as the volume of dexamethasone in the study group, followed by caudal block with ropivacaine 0.1%, 1.5ml/kg body weight.

On the day of the pre-anesthetic visit, parents were taught how to use the visual analogue pain scores (VAS 0 = no pain and 10 = the worst imaginable pain) for assessing pain of their children postoperatively[3].

In the operating room, sterile syringes containing equal volumes of drug and normal saline were loaded by the anaesthesiologist not participating in the study. The intraoperative monitoring and postoperative observations were done by the same anaesthesiologist who administered the drug and saline, but was unaware of the content of the drug. After securing an intravenous access anaesthesia was induced with i/v propofol (1-2 mg/kg body weight) by an anaesthesiologist unaware of the group allocation. Tracheal intubation was performed after the administration of 0.5 mg/kg of

atracurium.

Children then received either dexamethasone 0.5mg/kg (maximum of 10mg) or the same volume of normal saline intravenously (n=40 in each group).

After induction of anaesthesia, caudal block was performed using 20-22G angiocath in the lateral decubitus position. After identifying the space using the loss of resistance technique with saline, children received 1.5ml/kg ropivacaine 0.1%, which was freshly prepared.

Surgery was allowed to begin 10 min after performing the block. Inhalational anaesthetic (isoflurane) was adjusted according to the clinical signs of the patient (arterial pressure or heart rate within 20% of baseline). After emergence from the anaesthesia, patients were managed by an observer blinded to group allocation in the post-anaesthetic care unit (PACU). Postoperative pain in PACU was assessed at 0, 30, 60, 120, and 180 minutes using the modified Children's Hospital of Eastern Ontario Pain Scale (modified CHEOPS, 0-10) and Faces Legs Activity Cry Consolability Tool (FLACC, 0-10).

IV fentanyl 0.5microgram/kg was given as rescue analgesia if two coupled observations separated by 5 minutes waiting period revealed both CHEOPS and FLACC of 5 or more than 5.

After assessment in the PACU for 3 hours, patients were discharged from the PACU and sent to ward if the following criteria were satisfied:

1.Clear consciousness.
2.Stability of vital signs.
3.Absence of any side effects.

In the ward postoperative pain was assessed using VAS scale and analgesia was provided with oral acetaminophen (100mg in 5ml). VAS scores were assessed after the discharge from PACU at 0hr-2hr, 2hr-4hr, 4hr-6hr, 6hr-10hr, 10hr-14hr, 14hr-18hr and 18hr-24 hours. Parents were told to use the VAS scale and note the time to first oral acetaminophen demand (first acetaminophen time). This was the time from the end of the surgery to the first registration of VAS of 5 or more. At the end of twenty four hours, reports of side-effects were gathered from the parents.

All the continuous variables of the study were shown in terms of descriptive statistics like mean and standard deviation and the categorical variables in terms of frequency and percentage. The standard statistical tests like student's independent t-test and chi-square test were used. Moreover, the repeated measurement analysis was used as multivariate analysis to analyse the data observed at different time points. Also different statistical charts were used to represent the data. All the results so obtained were discussed on 5% level of significance i.e; p value < 0.05 considered as significant. The statistical software SPSS (version 20) was used to analyse the data.

Results:
Total of 80 patients were studied. There was no failure of any caudal block. Both the groups were homogenous with reference to age, body weight, anaesthetic technique and duration of surgery.

There was no significant difference in mean heart rates (beats/min), mean oxygen saturation (SpO_2%), mean systolic and diastolic blood pressures between the two groups intraoperatively (p > 0.05). None of the patients in any group developed bradycardia (heart rate < 60/min) or hypotension.

Quality of postoperative analgesia in PACU was assessed by using CHEOPS and FLACC pain scales at 0 minutes, 30 minutes, 60 minutes, 120 minutes and 180 minutes.

A statistically significant difference (p<0.001) was observed in CHEOPS and FLACC pain scores between the two groups at 0 minutes, 30 minutes, 60 minutes, 120 minutes and 180 minutes, pain scores being less in study group compared to control group [Figure1a,1b].

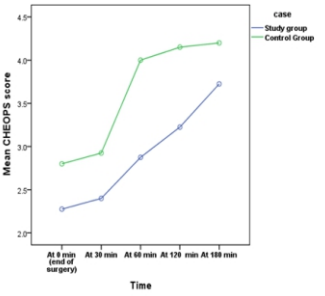

Figure 1a. Line diagram showing comparison of mean CHEOPS scores between the two groups. The difference between the two groups was statistically significant (p <0.05).

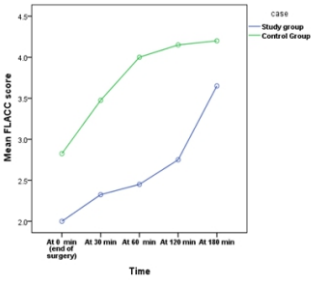

Figure 1b. Line diagram showing comparison of mean FLACCscores between the two groups. The difference between the two groups was statistically significant (p<0.05).

Quality of postoperative analgesia in ward was assessed using VAS score at different time intervals, i.e; 0hr (after the discharge from PACU)-2 hr, 2hr-4hr, 4hr-6hr, 6hr-10hr, 10hr-14hr, 14hr-18hr and 18hr-24hr. There was a statistically significant difference in overall VAS scores between the two groups, VAS scores being less in study group compared to control group (p<0.001) [Figure 2].

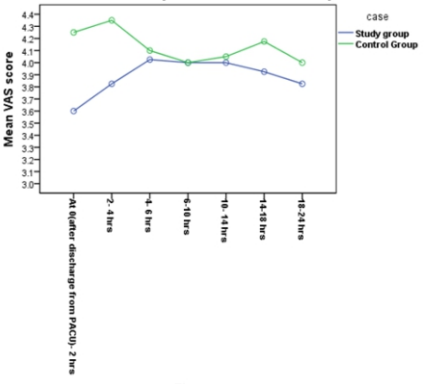

Figure 2. Line diagram showing comparison of VAS scores between the two groups. There was a statistically significant difference in overall VAS scores between the two groups (p<0.05).

Rescue analgesia in PACU in the form of fentanyl was required in 5 patients in study group while 14 patients in control group required rescue analgesia. Statistically a significant difference (p<0.05) was observed between the two groups [Figure 3].l

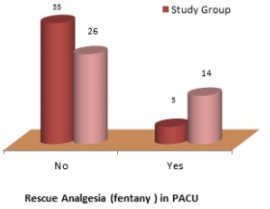

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Figure 3. Showing comparison of rescue analgesia (fentanyl) in PACU between the two groups. The difference was a statistically significant between the two groups (p<0.05).

In the ward rescue analgesia in the form of oral acetaminophen was required in 12 patients in the study group while as 28 patients in the control group required oral acetaminophen. Statistically a significant difference (p<0.001) was observed between both the groups [Figure 4].

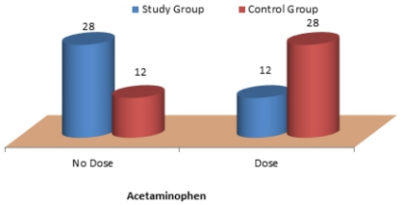

Figure 4. Showing comparison of rescue analgesia (oral acetaminophen) in ward between the two groups. The difference was statistically significant between the two groups (p<0.05).

In our study the mean time to the request for rescue analgesic (acetaminophen) was 8.33±0.985 hours in the study group while it was 6.00±1.155 hours in control group. Statistically a significant difference (p<0.001) was observed in both the groups [Figure 5].

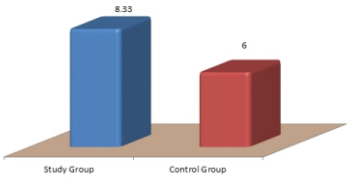

Figure5. Showing comparison of mean time to First Acetaminophen (Duration of analgesia) between the two groups. The difference was statistically significant between the two groups (p<0.05).

In our study the 2 patients in study group had nausea and 1 patient had vomiting while in control group 3 patients had nausea and 2 patients had vomiting. The total number of patients who had side effects was less in study group compared to control group but the difference was statistically insignificant (p>0.05) between the two groups [Figure 6].

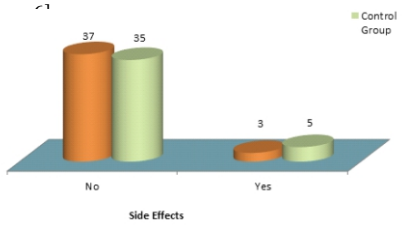

Figure6. Showing comparison of side effects between the two groups. The difference was statistically insignificant between the two groups (p>0.05).

Discussion:

Our study is one of the few studies that have demonstrated the analgesic action of intravenous dexamethasone in combination with caudal block in children. In our study, we used intravenous dexamethasone (0.5mg/kg) in combination with caudal ropivacaine (0.1%, 1.5ml/kg) which significantly prolonged the duration of analgesia as well as decreased the rescue analgesia requirement 24hours postoperatively without any significant adverse effects.

Dexamethasone is a synthetic glucocorticosteroid having minimal mineralocorticoid activity with a potent anti-inflammatory activity. Dexamethasone is utilised frequently in the perioperative setting, including prophylaxis against postoperative nausea and vomiting, reduction of airway and cerebral oedema, and in the management of acute and chronic pain[4]. It has been seen that in the perioperative setting dexamethasone decreases release of bradykinin, tumour necrosis factor, interleukin-1, interleukin-2 and interleukin-6 and decreases the production of prostaglandins also[5]. It also decreases the transmission of impulses in C fibres. Dexamethasone decreases both bradykinin receptor mRNA expression as well as the response to bradykinin binding[6]. Dexamethasone has been used as analgesic via systemic route, caudal, epidural and subarachnoid route as well. In our study we used a dose of 0.5mg/kg , as intravenous dexamethasone in a dose of 0.5mg/kg has demonstrated prolonged analgesia as an adjuvant to regional anesthesia[7]. Dexamethasone has proven beneficial in reducing pain from tonsillectomy in adults(10mg)[8], and dental surgery (4-16mg)[9]. It has proven more effective when combined with a non-steroidal anti-inflammatory, particularly for tonsillectomy [10]. Dexamethasone has been used in different doses varying from 0.1-0.5mg/kg as an analgesic via different routes.Dexamethasone has also demonstrated prolonged analgesia when used as an adjuvant in peripheral nerve blocks[11,12,13].

In our study we used a lower dose of ropivacaine 0.1% but a higher volume 1.5mg/kg based on the study of A. Camporesi et al. who showed that in children undergoing hypospadias repair, caudal block with a high volume, low concentration regimen produced prolonged analgesia and less motor block, compared to a low volume, high concentration regimen[14].

In the studies done before us different pain scores have been used for assessing the pain in children. In our study we used CHEOPS and FLACC pain scores in immediate postoperative period. In the ward pain scores were assessed by parental scoring of pain using 100mm visual analogue scale.

In our study none of the children had any complication in the 24hours postoperatively. But we could not do the long term follow up of these patients and no hormonal assay could be done in these patients because of limited resources available in our hospital.

Therefore, we concluded that using dexamethasone intravenously as an adjuvant to caudal block proved to be a good analgesic with none or minimal complications besides being reasonably economical as well.

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