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COMPARISON OF ROPIVACAINE ALONE VERSUS ROPIVACAINE WITH DEXAMETHASONE IN CAUDAL BLOCK FOR PAEDIATRIC POSTOPERATIVE ANALGESIA

Anaesthesiology

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ABSTRACT

Background: Caudal block is a well-known technique for post operative analgesia for infraumbilical surgeries in paediatric patients. Ropivacaine is a long-acting local anaesthetic which is considered safe in paediatric population because of its property to produce differential neural blockade with less motor block along with reduced cardiovascular and neurological toxicity. Dexamethasone is successfully used as an adjunct in caudal blocks for children to reduce pain without inducing any significant respiratory and hemodynamic effects. This study was done to compare the analgesic efficacy of ropivacaine with ropivacaine-dexamethasone combination in caudal block in paediatric patients.
Materials And Methods: This prospective single blind randomized control study included 60 patients of ages 1 to 7 years, who were randomly allocated into two groups, Group R (n=30) who received 0.2% Ropivacaine 1ml/kg, and Group RD (n=30) who received 0.2% ropivacaine with dexamethasone 0.1mg/kg in caudal block. Patients were observed in the peri-operative period, and sedation scores, hemodynamic parameters, duration of analgesia, requirement of rescue analgesics and complications were recorded.
Results: Ropivacaine-dexamethasone group was found to have longer duration of analgesia (Group RD 720-870min ,Group R 360-480min), lesser requirement of rescue analgesic (Group RD 1.03±0.26, Group R 1.43±0.5), lesser incidence of tachycardia, and fewer complications.
Conclusion: Ropivacaine-dexamethasone combination was found to provide better post operative analgesia than ropivacaine alone in paediatric patients.

KEYWORDS

postoperative analgesia, caudal block, ropivacaine, dexamethasone

INTRODUCTION:

Pain is an unpleasant subjective sensation which can only be experienced and not expressed, especially in children.

Caudal block is a well-known technique for infraumbilical surgeries. Ropivacaine is a long-acting local anaesthetic which is considered safe in paediatric population because of its property to produce differential neural blockade with less motor block along with reduced cardiovascular and neurological toxicity. Dexamethasone is successfully used as an adjunct in caudal blocks for children to reduce pain without inducing any significant respiratory and hemodynamic effects.

This study was conducted to compare the analgesic efficacy of ropivacaine and ropivacaine with dexamethasone in caudal blocks in paediatric patients in terms of quality and duration of analgesia, as well as their complications.

MATERIALAND METHODS:

This was a prospective, single blind, randomized control study conducted after approval from the institutional ethical committee. It included 60 patients of ages 1-7 years, ASA grade I, II, III undergoing elective/emergency infraumbilical surgeries. It excluded patients of ASA grade IV,V, patients with pre-existing cardiac or neurological disease, coagulopathy, congenital spine anomalies or having local infection or inflammation.

After informed and written consent, patients were pre-medicated with intravenous glycopyrrolate 4 mcg/kg, ondansetron 150mcg/kg, fentanyl 1mcg/kg. After pre-oxygenation with 100% oxygen, patients were induced using propofol 2mg/kg, succinylcholine 1-2mg/kg intravenously, and airway was secured. Anaesthesia was maintained with sevoflurane and atracurium 0.5mg/kg intravenously.

The children were randomized into 2 groups: GROUP R (n=30): Ropivacaine (0.2 %) 1ml/kg, GROUP RD (n=30): Ropivacaine (0.2%) 1ml/kg + Dexamethasone 0.1mg/kg.

For caudal block, patient was kept in lateral position. Under all aseptic precautions, a 22-gauge short-bevelled needle was introduced into the skin at an angle of 45-50° at the sacral hiatus. Needle was advanced till a pop was felt as the sacrococcygeal ligament pierced. Position of the needle was confirmed by whoosh test and drug was administered after negative aspiration of blood or CSF. No other analgesic was given perioperatively.

At the end of the surgery, patient was reversed with glycopyrrolate 8µg/kg and neostigmine 0.05mg/kg intravenously. Patient was extubated and once vitals were stable, patient was shifted to recovery room.

Parameters such as pulse rate, non-invasive blood pressure, electrocardiogram, respiratory rate and oxygen saturation(SpO2) were recorded and monitored every 15 minutes intraoperatively and thereafter every 30 minutes postoperatively and then 2nd hourly for next 24 hrs.

Post-operative analgesia was assessed by revised FLACC and if the score was more than 4 for 2 consecutive intervals of 10 minutes, then supplementary analgesia with syrup Paracetamol (15mg/kg) was given.

Time of rescue and the number of doses of rescue analgesic were observed.

Patients were also observed for intra-operative and postoperative adverse effects up to 24 hours.

A 4-point objective score (sedation score) based on eye opening was used, where 1 was spontaneous eye opening, 2 was responding to verbal stimulation, 3 was responding to physical stimulation, and 4 was unresponsive to stimulation.

Sample size calculation was performed by the computer software for two independent study groups. It revealed that at least 30 patients were needed in each group for the detection of at least 15% changes in the duration of analgesia assuming its incidence is 285±52.7 with a power of 0.8 and significance level at 80% power ($\alpha = 0.05$, $\beta = 0.2$).

Statistical analysis was carried out using Microsoft Excel. Quantitative variables were expressed as mean and standard deviation, while categorical variables were expressed as frequency and proportion. Unpaired student T-test was used for testing the significance of all the variables (mean and standard deviation) in both the groups. Chi square test was used to compare the non-parametric or categorical data. All the statistical results were considered significant at P value <0.05.

RESULTS:

Patient data of each study Group are shown in Table 1. No statistical differences were found in the parameters for each group.

Table - 1

PARAMETERS	GROUP A (N=30) Mean±SD	GROUP B (N=30) Mean±SD	P VALUE
Mean age (years)	5.5±1.6	4.9±2.1	0.22
Mean weight (kg)	12.0±2.7	12.4±3.2	0.6
Gender (M/F)	26/4	24/6	
Duration of surgery (minutes)	81.7±19.2	83.1±20.4	0.79

Duration of analgesia between two groups was showing mean of 410 min in Group R and 794 min in Group RD, and the difference was found to be statistically significant (P value = 0.0001). There was a statistically significant difference in FLACC score in Group R at 6,8,10,12,14 and 16 hours versus Group RD (Figure – 1).

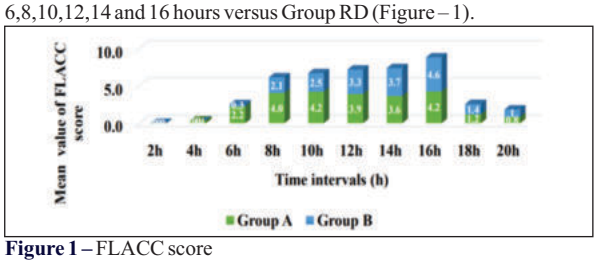

Figure 1 – FLACC score

Number of rescue analgesics required in Group R is 1.43±0.5 while it is 1.03±0.26 in Group RD. The difference is statistically significant (P value= 0.0004). There was no significant difference between the two groups in terms of sedation score.

In our study, there was a statistically significant difference between two groups of patients in terms of heart rate at 30 min, 1, 6, 8, 10 and 12 hours (Figure – 2).

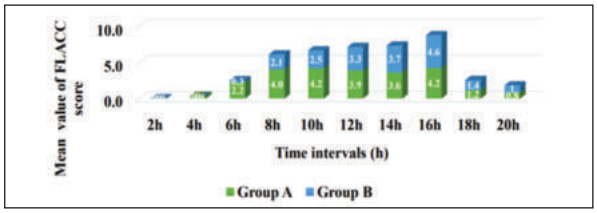

Figure 2 – Heart Rate

There was no significant difference between the two groups in terms of mean blood pressure, spO_2 andrespiratory rate.

In our study, we found that 11 (36.7%) patients in Group R and 1 (3.3%) patient in Group RD had post operative nausea and vomiting, which was a significant difference (P value =0.001).

DISCUSSION:

Regional anaesthetic techniques have gained considerable popularity for use in paediatric patients. The primary advantage of regional supplementation is lowering the anaesthetic requirement along with good post-operative analgesia. Relieving the patient of pain will also lead to early ambulation which helps in decreasing the morbidity and improving the outcome after surgery. Ropivacaine in comparison to bupivacaine, has a wider margin of safety, less motor blockade, less cardiovascular /neurological toxicity and similar duration of analgesia. It can be safely used for regional anaesthesia and analgesia in the ambulatory setting in paediatrics. Addition of steroid to local anaesthetics effectively and significantly prolongs the duration of analgesia as well as producing earlier onset of action. Dexamethasone, a 9 - alpha derivative synthetic glucocorticoid is a highly potent anti-inflammatory property (25-30 times as potent as hydrocortisone) and has absent mineralocorticoid activity. Thus it was found to be safe and devoid of potential side effects. Dexamethasone is also known to reduce post-operative nausea and vomiting. This study was aimed at evaluating the efficacy of dexamethasone in prolonging the analgesic duration when given along with ropivacaine in caudal blocks for paediatric postoperative analgesia.

The duration of analgesia range in Group R was 360-480 min with a mean 410.0±44.8 min while in Group RD it was 720-870 min with a mean 794.0±41.5 min. Other studies found the analgesia duration to be 250-330min for ropivacaine, and 450-1200 min for ropivacaine-dexamethasone combination.

Effective analgesia was recorded using FLACC score, and was found to be <4 up to 12th hour in ropivacaine-dexamethasone group, and up to 6th hour in ropivacaine group, hence showing that ropivacaine-dexamethasone group had a longer duration of effective analgesia. Chatrath et al found that FLACC pain score reached 4 at 6th hour in most of the patients with mean analgesic duration of 324 ± 55.6 min in ropivacaine group while FLACC score reached 4 at 24th hour in most of the patients with mean analgesic duration of 1278 ± 304.4 min in ropivacaine-dexamethasone group. Yousef et al observed FLACC score of 4 at 8th hour in ropivacaine-magnesium group, whereas FLACC scores of 4 at 12th hour was observed in ropivacaine-dexamethasone group. Sree et al found that FLACC scores were comparable between the groups whereas CHEOPS scores at 1, 2 and 3 h after surgery were higher in ropivacaine group than ropivacaine-dexamethasone group, with statistical significance. These study findings are in agreement with the findings of our study.

Similar to other studies, our study also did not find any significant difference in the sedation scores of the two groups.

Rescue analgesic requirement was found to be lesser in ropivacaine-dexamethasone group than the ropivacaine group. Similarly, Sree et al, in their study, found that the patients who received ropivacaine-dexamethsone combination had significantly lesser requirement of rescue analgesics. Chatrath et al found that the patients who needed 2nd dose of rescue analgesia were more in Group R (ropivacaine) as compared to Group RD (ropivacaine plus dexamethasone) where no patients needed 2nd dose of rescue analgesia. The mean number of rescue analgesics needed in Group R was 1.58 ± 0.501and in Group RD was 1.00 ± 0.000.

Our study showed a significant difference in the heart rate between the two groups, which was in contrast to the previous studies like those conducted by Chatrath et al and Srinivasan et al, who found no significant difference between the two groups.

Our study found a significantly higher incidence of nausea and vomiting in the ropivacaine group compared to the ropivacaine-dexamethasone group. Our finding is comparable to the study done by Kim et al. In contrast, Hong et al found that there is no significant difference in incidence of adverse effects like vomiting (7.7% vs 10.5%), sedation (25.6% vs 31.6%), and shivering (2.6% vs 0%).

CONCLUSION:

From our study, we conclude the addition of dexamethasone to ropivacaine in caudal analgesia in paediatric patients who are undergoing infraumbilical surgeries can prolong the duration of analgesia, decrease the need for rescue analgesics in first 24 hours, without significant changes in hemodynamic parameters and without significant sedation and postoperative complications. Finally, we conclude dexamethasone can be used as safe and effective adjuvant in caudal blocks for paediatric postoperative analgesia.

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