

# Observational Study to Compare Dexmedetomidine and Dexamethasone as an Adjuvant to Ropivacaine 0.2% in Potentiation of Post Operative Analgesia in Caudal Block

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## Abstract

**Introduction:** Caudal block is commonly performed in paediatric anaesthesia for post-operative analgesia using various adjuvants.

**Aim of Study:** To compare efficacy and safety of dexmedetomidine and dexamethasone in view of post-operative analgesia along with haemodynamic stability when used as adjuvant to local anaesthetic.

**Material and Method:** After the approval of ethical committee, an observational study of 60 pediatric patients calculated using website <http://openepi.com> (2-6 years old) of either gender and ASA I and II scheduled for infra-umbilical surgeries under general anesthesia allocated to 2 groups of which Group A received inj dexmedetomidine and group B received inj dexamethasone as an adjuvant to inj ropivacaine 0.2% (1 ml/kg) caudally after completion of surgery. Haemodynamic parameters and pain score (FLACC) were recorded every 2 hourly upto 8 hours in post operative period. Rescue analgesia was given when score was  $\geq 4$ . Total duration of analgesia was recorded.

**Statistical Analysis:** Numerical variables were presented as mean and standard deviation while categorical variables were presented as frequency and percent. For analysis, unpaired student - t test and chi - square test were used.

**Results:** The groups were comparable in demographics and haemodynamics. The mean duration of analgesia was similar in both the groups. The pain score in the two groups were comparable.

**Conclusion:** Both dexamethasone and dexmedetomidine prolonged the duration of analgesia with no significant difference between them. Dexamethasone can be used as an alternative to dexmedetomidine as an adjuvant in caudal block in paediatric patients.

**Keywords:** Dexmedetomidine; Dexamethasone; Ropivacaine; FLACC Score; Caudal Block.

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## Introduction

Paediatric patients react to pain with tachycardia, hypertension and intracranial pressure [17]. Caudal epidural block is reliable, popular and relatively safe for post operative analgesia.

Caudal epidural block is popular and commonly performed but has shorter duration of action when only local anaesthetics are used.

Dexmedetomidine, a stereoisomer of medetomidine, is a highly selective  $\alpha_2$ -adrenergic receptor agonist [8]. Dexamethasone added to local anaesthetics was found to prolong the duration of the epidural block [18,12].

This study was undertaken to evaluate the efficacy of dexmedetomidine and dexamethasone as an adjuvant to ropivacaine in prolonging analgesia when used in paediatric patients undergoing infra-umbilical surgeries.

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## Method

Sample size is calculated using website <http://openepi.com> results from openepi version 3, open source calculator-ssmean. For better validation of results the sample size is taken 30 in each group.

SSmean is taken from reference - Hossam A, El Shamaa , Mohamed Ibrahim A comparative study of the effect of caudal dexmedetomidine versus morphine added to bupivacaine in paediatric infra umbilical surgeries. Saudi J Anesth 2014; 8:155-60.

*Setting:* Dhiraj general hospital, Piparia.

Patients with ASA grade I and II of age between 2 and 6 years of either gender posted for infraumbilical surgeries were included in study. Whereas patients not giving consent for procedure, patients on adrenoceptor agonist and antagonist therapy, known hypersensitivity to local anesthetics, infection at the site of block, patients with systemic diseases, patients with bleeding disorder and patients of ASA III and above were excluded from the study.

After approval of institutional ethical committee and obtaining written and informed consent, 60 patients fulfilling the inclusion criteria were considered for the study. A pre-anesthetic checkup was done for all patients which included a detailed history, general physical and systemic examination and investigations were carried out.

Patients were kept nil per oral for 6 hours and after shifting the patient to operation theatre, an intravenous (IV) access was secured. Patient were given Injection glycopyrrolate 0.004mg/kg, Injection ondansetron 0.1mg/kg and Injection midazolam 0.05mg/kg intravenously as a premedication prior to induction of anaesthesia. All the baseline parameters like pulse rate (PR), mean arterial pressure (MAP) and arterial oxygen saturation (SpO<sub>2</sub>) were observed and recorded. Patient was pre-oxygenated with 100% oxygen for 5 minutes. Anesthetic induction was achieved by Injection thiopentone 5mg/kg and Injection succinylcholine 2mg/kg. Patient was intubated with appropriate

size endotracheal tube. Anaesthesia was maintained with O<sub>2</sub>, N<sub>2</sub>O, sevoflurane and atracurium. Intra-operative haemodynamic monitoring was done at regular intervals. After the completion of surgery, the patient was turned to left lateral position for performing caudal block.

Under all aseptic and antiseptic precautions, caudal anaesthesia was given. Group A patients (n=30) received Inj. ropivacaine 0.2% (1 ml/kg) with Inj. dexmedetomidine (1 µg/kg) while group B patients (n=30) received Inj. ropivacaine 0.2% (1 ml/kg) with Inj. Dexamethasone (0.1mg/kg) and after performing caudal block patient was turned to supine position. The inhalational anaesthetic agents were turned off. Injection neostigmine (0.05mg/kg) with Injection glycopyrrolate (0.008mg/kg) was used as reversal agent for muscle relaxant after checking for spontaneous respiration. Patient was extubated after full recovery from general anaesthesia.

The patient was then shifted to Post Anesthesia Care Unit (PACU) where vital parameters were observed such as heart rate, systolic and diastolic blood pressure every 2 hourly upto 8 hours.

The pain intensity of patient was observed using the paediatric observational face, legs, activity, cry, consolability (FLACC) pain score every 2 hourly till the FLACC score is 4 or more. When the FLACC pain score reaches 4, syrup paracetamol 15 mg/kg was given. The duration of analgesia (from the time of caudal injection to the time at which FLACC score ≥ 4) was recorded.

## Results

There was no significant difference observed between the two groups with respect to demographic parameters such as mean age, weight, gender and ASA physical status.

There was no statistically significant difference observed between two groups with respect to haemodynamic parameters such as heart rate, systolic and diastolic blood pressure.

Time interval(hours)	FLACC Score ≥ 4	
	No. of Patients in Group A	No. of Patients in Group B
0	0	0
2	0	0
4	5(16.6%)	2(6.6%)
6	26(86%)	20(66.6%)
8	30(100%)	27(90%)

### Changes in Pain Score

The Paediatric observational FLACC Pain Score was below 4 at the end of first 4 hours in both the groups and did not require any analgesia.

At the end of 6 hours, 26 patients (86%) in group A achieved a FLACC score of  $\geq 4$  and required the administration of analgesia while 20 patients (66.6%) achieved FLACC score of  $\geq 4$  and required analgesia

in group B, the difference was not significant. At the end of 8 hours, all the patients in group A achieved FLACC score of  $\geq 4$  as against 27 patients (90%) achieved score  $\geq 4$  in group B.

### Duration of Post Operative Analgesia

The duration of analgesia was comparable in both the groups with a p value 0.08.

Group	Mean duration of analgesia(minutes)	Standard deviation	p value	Statistical significance
A	360.2	17.84	0.08	NS
B	370.6	27.4		

### Discussion

Post-operative analgesia not only offers pain relief but also inhibits trauma- induced nociceptive impulses so as to blunt autonomic response. It allows the patients to breathe freely and ambulate early to enhance early restoration of function [7].

Anand V et al [1] in 2011 used dexmedetomidine 2 $\mu$ g/kg with 0.25% ropivacaine in caudal block and observed that the patients had prolonged duration of sedation post operatively. Hence to prevent excessive sedation, we used dexmedetomidine in the dose of 1 $\mu$ g/kg. Kim et al [14] in 2014 used either 0.15% ropivacaine alone or in conjunction with 0.1mg/kg dexamethasone with no significant haemodynamic changes or side effects.

In the present study, both the groups were similar with respect to age, weight, gender and ASA status. There were no significant differences with respect to these parameters. There were no females in the study. This could be due to the fact that common paediatric infra-umbilical surgeries are circumcision, herniotomy and orchidopexy which are male-specific surgeries or more common in males. Our study was similar to a study conducted by Cook et al [3] and kamal M et al [11].

In present study, the baseline heart rate, systolic blood pressure and diastolic blood pressure at the time of giving caudal block as well as during study period were comparable and no significant differences were observed between these two groups. Our findings were similar to study conducted by Elham et al [5].

In group A, percentage of patients who reached higher pain scores in a shorter duration was more as compared to group B. Our study had similar results when compared to study done by Santosh chaudhary et al [2] and M solanki Nilesh [15].

The mean total duration of analgesia in both the groups was comparable (p 0.08).

Similar observation was made by Raghvendra S et al [6] and Elham M et al [5].

Dexmedetomidine, an imidazole compound, is the pharmacologically active dextroisomer of medetomidine that displays specific and selective  $\alpha_2$ -adrenoceptor agonism. The mechanism of action is unique and differs from those of currently used sedative agents. Activation of the receptors in the brain and spinal cord inhibits neuronal firing, causing analgesia [13].

The mechanisms by which dexamethasone increased the duration of nerve blockade and analgesic effect are not fully understood, though it is commonly attributed to anti-inflammatory and immunosuppressive actions. This is supported by the finding that the block length is increased by glucocorticoid potency and is completely reversed by administration of a specific glucocorticoid receptor antagonist [9,11].

The effect of dexamethasone on the spinal cord is due to the presence of transcription factor nuclear factor-kappa B (NF- $\kappa$ B), present throughout the nervous system [4]. Dexamethasone by regulating NF- $\kappa$ B inhibits central sensitisation after surgery and potentiates analgesia of the caudal block.

No side effects or any complications were observed in our study. Results were similar to study done by Kamal M et al [11].

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