*Original Research Article*

Indian Journal of Anesthesia and Analgesia
2018; 5(3): 425-429
DOI: http://dx.doi.org/10.21088/ijaa.2349.8471.5318.12

# Neostigmine as an Adjuvant to Paediatric Caudal Analgesia

**Subha R.[1], Vidhya Prakash S.[2]**

[1, 2]Assistant Professor, Department of Anesthesia, Karpagam Faculty of Medical Sciences & Research, Coimbatore–641032, Tamilnadu, India.

**Abstract**

Caudal analgesia is one of the most popular method for intra and post-operative method for abdominal, perennial and lower limb surgeries for children's. For local anesthetic common drug used is Bupivacaine. In children caudal epidural block is one of the common anesthetics techniques in children. It is the general, simple and safe procedure for local anesthetics. It is administered as single shot technique. Several adjuncts such as opioids, ketamine, midazolam,clonidine and neostigmine have been used with bupivacaine to prolong its action & thus extend the duration of post-operative analgesia provided by the 'single shot' caudal technique.

**Keywords:** Caudal Analgesia; 'Single Shot' Caudal Technique; Post-Operative Analgesia and Bupivacaine.

## Introduction

In neuraxial blocks alpha 2 agonist clonidine and peripheral nerve blocks are used for prolong use of bupivacaine. These two are commonly used additive for caudal analgesia in children. Clonidine is shown to be one of the safe procedure without any respiratory depressions after systemic, epidural or spinal administration. Although epidural clonidine may also cause hypotension, bradycardia and sedation in higher doses, serious adverse effects are uncommon in the dose range normally used in children (1-2 μg/kg) [2]. These are explained in three possible actions.

First methods include clonidine blocks in A and C fibers as a consequence of increased potassium conductance in isolated neurons thus intensifying local anesthetic block. Second method clonidine is used as local vasoconstriction thus it decreases the local spread and remove block around neural structures. This method shows little evidence in clinical doses. Third method uses combined clonidine with spinal local anesthetic of prolongs analgesia.

However in different studies it is shown that clonidine has improving and prolonged analgesia procedure for caudal bupivacaine. Also in post-operative analgesia mixtures of caudal clonidine varies. With this in mind, we conducted this study to assess the efficacy of clonidine in prolonging the action of bupivacaine when used for caudal epidural analgesia in childrenundergoing surgeries

## Literature Review

A study was conducted in 100 patients, ASA status 1 and 2, age 1-3 years, undergoing sub-umbilical surgeries under general anaesthesia. They were randomised into two groups. Group A

**Corresponding Author: Vidhya Prakash S.,** Assistant Professor, Department of Anesthesia, Karpagam Faculty of Medical Sciences & Research, Coimbatore – 641 032, Tamil nadu, India.
E-mail: surendararavindhan@ieee.org

**Received on** 04.12.2017, **Accepted on** 17.01.2018

(control group) received 1 ml/kg of 0.25% bupivacaine in normal saline and Group B patients received 1 ml/kg of 0.25% bupivacaine with 1μg/kg of clonidine in normal saline. It was concluded that clonidine in a dose of 1 μg/kg added to 0.25% bupivacaine for caudal analgesia and administered as a 1 ml/kg mixture in children for sub-umbilical surgery significantly prolongs the duration of post operative analgesia when compared to 1 ml/kg of 0.25% bupivacaine alone without any side effects. In adoubleblined studies which was conducted in 46 childrens for 104 months under hypospadias repair were randamised into two groups ASA 1 or 2 aged the iv group received clonidine 2μg/kg i.v. and simultaneously the same volume of saline caudally. The caudal group received clonidine 2μg/kg caudally and a similar volume of saline i.v. It was concluded that the analgesic effect of clonidine 2μg/kg as an adjunct to caudal block with bupivacaine 0.25%, 0.5 ml/kg is similar whether administered i.v. or caudally.

A study of 60 ASA status 1 and 2 patients of age 6 months to 6 years who were undergone abdominal surgeries are randamised into three groups. Group A received bupivacaine 0.25%(1ml/kg) with dexmedetomidine 2μg/kg in 1 ml normal saline. Group B received bupivacaine 0.25%(1 ml/kg) with clonidine 2 μg/kg in 1 ml normal saline & Group C received bupivacaine 0.25%(1ml/kg) with 1 ml normal saline. It was concluded that the addition of 2μg/kg of dexmedetomidine or clonidine 2μg/kg to caudal bupivacaine 0.25%, 1 ml/kg significantly promoted analgesia after anaesthetic recovery in children aged 6 months to 6 year. Moreover, dexmedetomidine did not offer significant advantage over clonidine as regards to the analgesia duration.

Around a study of 60 boys aged 1 to 10 years undergone orchidopexy were recived three solutions of injections. Group A received 0.25% bupivacaine 1 ml/kg with adrenaline 5 μg/ml (1/200000), Group C received 0.25% bupivacaine 1 ml/kg with clonidine 2 μg/kg and Group K received 0.25% bupivacaine 1 ml/kg with ketamine 0.5 mg/kg. The median duration of caudal analgesia was 12.5 hrs in Group K compared with 5.8 hrs in Group C and 3.2 hrs in Group A. There were no differences between the groups in the incidence of motor block, urinary retention or post operative sedation

In a randomized surgery of upper abdomen surgery two groups of CB and MB are taken. which CB Group received clonidine 2 μg /kg in 1.25 ml/kg of bupivacaine 0.2%. Group MB received morphine 30 μg/kg in 1.25 ml/kg of bupivacaine 0.2%(total bupivacaine did not exceed 2.5 mg/kg). The total volume of injectate was 1.25 ml/kg. It was concluded that the addition of clonidine 2 μg/kg to bupivacaine administered caudally provided an increase in sedation and duration of postoperative analgesia compared with the addition of morphine 30 μg/kg to bupivacaine.

For a group of 60 boys of age 2 to 10 years who undergonehypospadias repair surgery where admimistrated as Group 1 received a caudal injection of 0.25% bupivacaine 1 ml/kg. Group 2 received an identical local anesthetic dosage mixed with neostigmine 2 μg/kg. Group 3 received caudal neostigmine 2 μg/kg diluted in 0.9 Naclsolution to a total volume of 1 ml/kg. It was concluded that caudal neostigmine 2 μg/kg provide post-operative analgesia comparable to 1 ml/kg of caudal bupivacaine 0.25% in children undergoing hypospadias repair surgery. Co-administration of the two drugs is associated with extended duration of post-operative analgesia & reduced need for supplementary analgesics.

A randomised prospective, parallel group , double blinded study, 60 children were recruited and allocated into two groups: Group R(n=30) received 0.25% ropivacaine 1 ml/kg+0.5 ml normal saline and Group RD(n=30) received 0.25% ropivacaine 1 ml/kg with dexmedetomidine 2 μg/kg, making the volume to 0.5 ml. It was concluded that caudal dexmedetomidine (2μg/kg) with 0.25% ropivacaine(1 ml/kg) for paediatric lower abdominal surgeries achieved significant post operative pain relief that resulted in a better quality of sleep and prolonged duration of arousable sedation and produced less incidence of emergence agitation following sevofluraneanaesthesia.

A randomised double blind study was conducted in a total of 44 ASA-1 pediatric patients between the ages of 1-9 years, scheduled for elective hernia surgery. They were randomised into two groups and caudal block was given: Group 1 received 0.25% ropivacaine and Group 2 received 0.25% ropivacaine and clonidine 2 μg/kg after induction of general anaesthesia. It was concluded that the duration of analgesia was significantly prolonged in Group 2. It was concluded that caudal block with 0.25% ropivacaine isobaric combined with 2 μg/kg of clonidine provides efficient analgesia intra-operatively and prolonged duration of analgesia post-operatively.

A randomised, prospective double blind study was conducted in a total of 90 children of ASA 1-2 aged 3-8 years scheduled for infraumbilical surgical

procedures. They were randomised into two groups: Group 1 received 0.25% ropivacaine 1 ml/kg + clonidine 2 μg/kg and Group 2 received 0.25% ropivacaine 1ml/kg + fentanyl 1 μg/kg. It was concluded that the analgesic properties of clonidine and fentanyl as additives to ropivacaine in single shot caudal epidural in children are comparable but clonidine offers a more favourable side effect profile and increased patient comfort.

A randomised prospective parallel group open level study was conducted on 50 children aged 2-8 years undergoing infra-umbilical surgery. Group B received 0.25% bupivacaine 0.75 ml/kg and Group BM received a combination of 0.25% bupivacaine 0.75 ml/kg and morphine 0.03 mg/kg. It was concluded that 0.25% bupivacaine along with low dose morphine (0.03 mg/kg) provided effective and longer duration of analgesia in comparison to 0.25% bupivacaine alone.

*Objectives of Study*

This study is clinical profile of an alpha 2 agonist clonidine with bupivacaine administered caudually. The parameters are

1. To compare the onset of analgesia.
2. To compare the ability to provide smooth intraoperative and post operative analgesia.
3. To compare the duration of analgesia provided.
4. To compare the side effects
5. To compare sedation.

**Materials & Methods**

In double blined controlled study of 60 patients of ASA 1 and ASA2 status agrd between 1 to 12 years who were undergone elective surgery satisfy all criteria.

Group A (n=30) Patients receiving 1 ml/kg 0.25% bupivacaine in normal saline. Group B (n=30) Patients receiving 1 ml/kg of 0.25% bupivacaine with 1 μg/kg of clonidine in normal saline.

*Inclusion Criteria*

1. ASA Grade 1 and 2 status.
2. 1 to 12 years of age.
3. Parents giving informed written consent.
4. Patients scheduled to undergo elective sub-umbilical, perineal and lower limb surgeries.

*Exclusion Criteria*

1. ASA 3 or greater.
2. Age more than 12 years.
3. Any contraindications to epidural anaesthesia like sacral spine abnormalities, local site infection & coagulation abnormalities.
4. Patients with haematological diseases, neurologic, psychiatric disease, severe renal and hepatic derangement.
5. Patients on anticoagulants, anti psychotic drugs, tricyclic antidepressants, alpha 2 adrenergic agonists and beta blockers.

*Method of Study*

The solution used for study will be prepared by anaesthesiologist who were not involved in patient care. The patients are blinded by the study solution. In the pre anesthetic evaluation in patients the test were conducted a day before surgery. The patient with inclusive criteria were taken and written in a valid consent in following groups.

1. *Group A:* (n=30) Patients receiving 1 ml/kg of 0.25% bupivacaine in normal saline.
2. *Group B:* (n=30) Patients receiving 1 ml/kg of 0.25% bupivacaine with 1 μg/kg of clonidine in normal saline.

In the operation theatre peripheral intravenous access is secured bu using 22 G or 24 G cannula depending on patient age. For non-invasive blood pressure baseline, pulse rate, oximetry will be removed. About 20 minutes before surgery all patients were made to receive 0.5-0.75 mg/kg orally (standard formulation mixed with sweet fruit syrup) or rectally (standard formulation).

As a preloading solution berilyte–p or ringer lactate is given before surgery that to depend on age group. The intravenous fluids is given depending upon the body weight and operative loss requirements.

The airway management is lifted to discretion to all patients with facemask, laryngeal mask or endotracheal tube with or without relaxants for children's maintaining with 70 percentage nitrous oxide in oxygen and 0.5 to 2.5 percentage halothane. Patients are put in lateral positions and single shot is given under aseptic precaution using23G hypodermic needle.

Patients in Group A will receive 0.25% isobaric bupivacaine 1 ml/kg in normal saline and Group B will receive 1 ml/kg of 0.25% bupivacaine with 1

μg/kg clonidine in normal saline. One millilitre of clonidine contains 150 μg/ml which is diluted with 9 ml saline in a 10 ml syringe. For each child two syringes are prepared : one syringe contained the diluted clonidine(15 μg/ml) to give a dose of 1 μg/kg (a total volume of 0.07 ml/kg), and the other contained the same volume of normal saline.

*Parameters Observed*

Baseline pulse rate, respiratory rate, non invasive blood pressure will be recorded. Cardio-respiratory parameters will be monitored continuously and recordings will be made every 5 minutes until 30 minutes and at 10 minute interval, there after up-to 60 minute and then at 15 minute interval until the completion of the surgery. Intraoperatively and post operatively, incidence of bradycardia( Heart rate less than 80 beats/minute) will be treated with atropine (0.02 mg/kg) and hypotension (SBP less than 70 mm/Hg) or systolic BP falling more than 20% will be treated with Injection mephentermine bolus( 0.3 mg/kg). Post operatively the heart rate and blood pressure will be measured at 15, 30, 45, 60, 90 and 120 minutes. The following parameters will be assessed at 15, 30, 45, 60, 90, 120 mins, 4hrs, 6hrs, 12hrs and 24hrs postoperatively.

1. Pain severity
2. Sedation

- Pain severity will be assessed using FLACC scale where in FLACC includes Face, Leg, Activity, Cry and Consolability.

0: No Pain

1-3: Mild Pain

4-7: Moderate Pain

-10: Severe Pain

Each of the five categories is scored from 0-2, resulting in total range of 0-10, FLACC=Face, Leg, Activity, Cry, Consolability.

**Table 1:** FLACC Scale for Pain Assessment

| Category | Scoring 0 | 1 | 2 |
|---|---|---|---|
| Face | No particular expression or smile | Occasional grimace or frown, withdrawn, disinterested | Frequent too 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 and 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; distractable | Difficult to console |

- Sedation &Post operative nausea and vomiting will be assessed using sedation score and Post operative nausea and vomiting score(PONV score) respectively.

*Sedation Score*

0 : Alert and Aware

1 : Asleep, Arousable by verbal contact

2 : Asleep, Arousable by physical contact

3 : Asleep, not arousable and it was noted whether the child was in normal sleep,recorded as X.

Duration of analgesia will be recorded as the time interval from the completion of anaesthesia to the time when the patient complains of pain.In the post anaesthesia care unit, the necessity for rescue medicine was decided by the pain score. Rescue medication was administered when the FLACC score was greater than or equal to 4. Rescue analgesia will be provided by paracetamol suppository with a loading dose of 40 mg/kg followed by 20 mg/kg every 6 hrs.

The number of doses of rescue medication required and the time to first administration of rescue medication will be also noted. In the post-operative period, patients will be also monitored for adverse effects, including respiratory depression, vomiting, hypotension and bradycardia.

During surgical procedure adverse effects like vomiting, hypotension(defined as systolic BP less than 70 mm/Hg), bradycardia(heart rate less than 80 beats/minute) and respiratory depression (defined as $O_2$ saturation less than 93%, requiring oxygen via face mask) will be recorded.

*Statistical Analgesia*

Appropriate statistical analysis of data will be done using the following tests.

1. Student t test for parametric data
2. Chi-square test for non-parametric data

$P<0.05$ will be considered as statistically significant.

## References


1. Parameshwari A, DhevAnand M, Vakamudi M. Efficacy of clonidine as an adjuvant to bupivacaine in caudal analgesia in children undergoing sub-umbilical surgery. Indian J Anaesth. 2010;54(5):458-63.
2. Hansen TG, Henneberg SW, Walther-Larsen S, LundJ, Hansen M. Caudal bupivacaine supplemented with caudal or intravenous clonidine in children undergong hypospadias repair: a double-blind study. Br J Anaesth. 2004;92(2):223-7.
3. El-HennawyAM, Abd-ElwahabAM, Abd-Elmaksoud AM, El-OzairyHS, BoulisSR. Addition of clonidine or dexmedetomidine to bupivacaine prolongs caudal analgesia in children. Br J Anaesth. 2009;103(2): 268-74.
4. Cook B, Grubb DJ, Aldridge LA, Doyle E. Comparison of the effects of adrenaline, clonidine and ketamine on the duration of caudal analgesia produced by bupivacaine in children. British Journal of Anaesthesia. 1995;75(6):698-701.
5. Singh R, Kumar N, Singh P. Randomised controlled trial comparing morphine or clonidine with bupivacaine for caudal analgesia in children undergoing upper abdominal surgery. British Journal of Anaesthesia. 2011;106(1):96-100.
6. Abdulatif M, El-sanabary M. Caudal neostigmine, Bupivacaine and their combination for Post-operative Pain Management a After Hypospadias Surgery in children. AnesthAnalg. 2002;95(5):1215-8.
7. Anand VG, Kannan M, Thavamani A. Bridgit MJ. Effects of dexmedetomidine added to caudal ropivacaine in paediatric lower abdominal surgeries. Indian J Anaesth. 2011;55(4):340-6.
8. Bajwa SJS, Kaur J, Bajwa SK, Bakshi G, Singh K, Panda A. Caudal ropivacaine-clonidine: A better post-operative analgesic approach. Indian J Anaesth. 2010;54(3):226-30.
9. B. Saichandana, G. Rachana sri, A. Surendar and B. Suniltej "controlling of wall lamp using arduino", International Journal of Pure and Applied Mathematics, 2017;116(24):349-354, ISSN: 1311-8080 (printed version); ISSN: 1314-3395 (on-line version).
10. Gupta SD, Mandal S, Chhandasi N, Sudakshina M, Kanak KK, Sunil KS. Caudal epidural bupivacaine alone versus bupivacaine-low dose morphine combination in paediatric infra umbilical surgeries for post-operative analgesia. J AnaesthClinPharmacol. 2009;25(2):183-186.
11. Prabu, G., Surendar, A. Virus detection by using a pattern matching algorithm for network security, International Journal of Applied Engineering Research, 2015;10(10):9565-9569.
12. Surendar, A., Arun, M., Periasamy, P.S. Hardware based algorithms for bioinformatics applications - A survey, International Journal of Applied Engineering Research, 2013;8(6):745-754.