

COMPARATIVE EVALUATION OF CAUDAL FENTANYL AND CLONIDINE AS ADJUVANT TO BUPIVACAINE FOR POST- OPERATIVE ANALGESIA IN PEDIATRIC GENITOURINARY AND INGUINAL SURGERIESVikas Kumar Gupta¹, Tripti Vatsalya², Shikha Mehrotra³**HOW TO CITE THIS ARTICLE:**

Vikas Kumar Gupta, Tripti Vatsalya, Shikha Mehrotra. "Comparative Evaluation of Caudal Fentanyl and Clonidine as Adjuvant to Bupivacaine for Post- Operative Analgesia in Pediatric Genitourinary and Inguinal Surgeries". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 34, August 11; Page: 9072-9080, DOI: 10.14260/jemds/2014/3170

ABSTRACT: Post-operative analgesia in children is a challenging task before the anesthesiologist. Caudal analgesia is an accepted and popular method of providing intraoperative and postoperative analgesia for genitourinary and inguinal surgeries in children. Because of short duration of action of Bupivacaine, various adjuncts have been tried by many anesthesiologists. Fentanyl and Clonidine are used along with local anesthetics to prolong duration of analgesia. Hence we are comparing 1 mcg/kg of Fentanyl and 1 mcg/kg of Clonidine as adjuvants to 0.25% bupivacaine at a volume of 0.75 ml/kg in children undergoing genitourinary and inguinal surgeries. **AIMS AND OBJECTIVES:** To compare the efficacy of Fentanyl and Clonidine as adjuncts to Bupivacaine for postoperative analgesia in pediatric patients and to evaluate the sequel and side effects of both. **MATERIALS AND METHODS:** Study design – Comparative randomized controlled study. **Sample size:** 120 children aged between 2-7 years posted for genitourinary and inguinal surgeries. **Group I (B)** received 0.75 ml/kg of 0.25% Bupivacaine alone caudally. **Group II (BF)** received 0.75 ml/kg of 0.25% Bupivacaine and 1 µg/kg Fentanyl caudally. **Group III (BC)** received 0.75 ml/kg of 0.25% Bupivacaine and 1 µg/kg Clonidine caudally. Postoperatively the duration of analgesia, motor blockade and sedation was assessed by Modified Objective Pain Scale, Ramsay Sedation Score and modified Bromage scale respectively. Side effects and complications, if present were recorded. Tests used for statistical analysis were Fishers exact test and student t test. **RESULTS:** The mean duration of analgesia in group BC (601.5 + 60.17 minutes) was much higher than group BF and B but with side effect of sedation. We observed that there was a statistically increased duration of analgesia in Clonidine group as compared to Fentanyl and plain Bupivacaine group with no difference in duration of motor blockade. There was increased sedation in group BC. Group BF had nausea and vomiting, shivering and pruritus as side effects. Hence we conclude that Clonidine is a better adjunct than Fentanyl in prolonging duration of analgesia of Bupivacaine in pediatric caudal block.

KEYWORDS: Bupivacaine, Clonidine, Fentanyl, Caudal block.

INTRODUCTION: Children suffer pain in the same way as adults though they may be unable to describe the pain or their subjective experience. Postoperative analgesia in children is a challenging task before the anesthesiologist. Good postoperative analgesia not only relieves pain in children but also relieves anxiety in parents.

Caudal analgesia is an accepted and popular method of providing intra operative and post-operative analgesia for genitourinary and inguinal surgeries in children, as it is safe, reliable and easy to administer. Bupivacaine is the most commonly used local anesthetic for this purpose but its limitation is short duration of action, about 4-6 hours when administered as a single shot technique.

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Prolongation of caudal block can be achieved by addition of various adjuncts like epinephrine, ketamine, opioids, Clonidine and neostigmine. The addition of adjuncts not only increases the effectiveness of a local anesthetic by prolonging and intensifying the sensory blockade but also causes reduction in dose of local anesthetic agents.

Ketamine has potential for neurotoxic effects,¹ if inadvertently injected intrathecally and neostigmine is accompanied by 30% incidence of vomiting.² Opioids and local anesthetics administered together have synergistic analgesic effects³ but carries the risk of respiratory depression.^{4,5} Because of its rapid onset of action and high lipid solubility, fentanyl is considered to be a suitable opioid for caudal administration.

The role of Clonidine as an analgesic administered by caudal route is now well established in children. Co-administration of caudal Clonidine with Bupivacaine has been found to prolong analgesia without significant respiratory depression after epidural administration. Clonidine exerts analgesic action by stimulating the descending noradrenergic medullospinal pathways and inhibiting release of nociceptive neurotransmitters in the dorsal horn of spinal cord.⁶ However the duration of post-operative analgesia using caudal Clonidine – Bupivacaine mixtures is highly variable in different published studies.

This study was conducted to assess the efficacy and safety of Fentanyl and Clonidine in low doses as an adjuvant to Bupivacaine for postoperative analgesia in pediatric genitourinary and inguinal surgeries.

AIMS AND OBJECTIVES

1. To compare the efficacy of Fentanyl and Clonidine as adjuncts to Bupivacaine for post-operative analgesia in pediatric patients undergoing genitourinary and inguinal surgeries.
2. To evaluate the sequelae and side effects of Fentanyl and Clonidine.

MATERIALS AND METHODS: The present study was carried out in the Department of Anesthesiology, Gandhi Medical College, Bhopal.

Study Design: Comparative randomized controlled study.

Inclusion Criteria: Children 2-7 years, ASA I, admitted to undergo genitourinary and inguinal surgeries.

Exclusion Criteria: Parent unwillingness, infection at block site, bleeding diathesis, pre-existing neurological/ spinal diseases, congenital anomaly of lower back, any cardio-respiratory or other systemic diseases.

Group Division: The children were allocated randomly into three groups of 40 patients each.

Group I received 0.75 ml/kg of 0.25% Bupivacaine alone caudally.

Group II received 0.75 ml/kg of 0.25% Bupivacaine and 1 µg/kg Fentanyl caudally.

Group III received 0.75 ml/kg of 0.25% Bupivacaine and 1 µg/kg Clonidine caudally.

Pre-operative preparation: After obtaining ethical clearance for the study, the patients had undergone pre anesthetic checkup as per the protocol in relation to history and investigations.

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A written consent was obtained from the parents after they were informed about the procedure and its merits and demerits.

The children were pre medicated with inj. Glycopyrrolate 0.01 mg/kg IV and inj. Midazolam 0.05 mg/kg IV after securing an IV access. Baseline cardio-respiratory parameters (NIBP, pulse rate and SPO₂) were recorded.

Patients were induced with Sevoflurane using Jackson Rees circuit and intubation was facilitated with inj. Suxamethonium 2 mg/kg IV. Patients were intubated and kept on controlled ventilation on oxygen, nitrous oxide, Sevoflurane and inj. Atracurium 0.5 mg/kg as first dose, followed by maintenance dose of 0.1 mg/kg.

After induction, patients were positioned in left lateral position with hips and knees flexed. Under strict aseptic precautions identifying sacral hiatus, a 22G/ 24G (according to age) hypodermic needle was inserted in the caudal space using loss of resistance technique and confirmed by whoosh test. The injection was made after gentle aspiration to rule out any intrathecal or intravascular placement. The vitals were recorded every 15 minutes for 1 hour, every 1 hour for 4 hours and then every 2 hours for up to 12 hours.

The surgical incision was made 10 minutes after administering the caudal block. Meanwhile, the children were surgically prepared and draped. Adequate caudal analgesia was defined as hemodynamic stability as indicated by absence of increase in heart rate and mean blood pressure of more than 15% compared with the baseline values obtained just before surgical incision. On completion of surgery, the residual effect of muscle relaxant was reversed with inj. Neostigmine 0.05 mg/kg and inj. Glycopyrrolate 0.01 mg/kg and patients were extubated, when fully awake

Children were shifted to the post-operative ward, where monitoring of SPO₂, pulse rate and NIBP was continued. The quality of analgesia and sedation was assessed hourly for the first 4 hours and then every 2 hours up to 12 hours. The intensity of pain was measured using Modified Objective pain scale (MOPS). A log was kept at the bedside for noting the occurrence of possible complications including nausea, hypotension, bradycardia and respiratory depression.

Patients were administered rescue analgesia with Paracetamol 15 mg/kg suppository on evidence of pain i.e. if the MOPS score reached a value of 5. The duration of analgesia was calculated from the time of injection of the drug in the caudal space to the time when MOPS score reached 5.

Intensity of motor blockade was assessed by Modified Bromage scale. Duration of motor block was calculated from the time of injection of the drug in the caudal space to the time when Modified Bromage scale reached the value of 1.

Post-operative sedation score was done using Ramsay sedation scale, every 1 hour for 4 hours after extubation and then every 2 hours up to 12 hours. Excessive sedation was defined as a Ramsay score of V or VI.

Respiratory depression was defined as decrease of SPO₂ <93% and required supplemental O₂ by mask.

The statistical software used for data analysis is IBM SPSS, version 20. Taking 95% confidence interval and 0.05 as level of significance, tests applied were Fishers exact test and student t test.

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RAMSAY SEDATION SCORE:

Six point sedation score was assigned as follows.

SCORE	CLINICAL DESCRIPTION
I	Anxious, agitated
II	Co-operative, oriented, tranquil.
III	Responds only to verbal commands.
IV	Asleep with brisk response to light stimulation.
V	Asleep with sluggish response to stimulation.
VI	Asleep without response to stimulation.

MODIFIED OBJECTIVE PAIN SCALE:

CRITERIA	FINDINGS	POINTS
Crying	None	0
	Consolable	1
	Not consolable	2
Movements	None	0
	Restless	1
	Thrashing	2
Agitation	Asleep	0
	Calm	0
	Mild	1
	Hysterical	2
Posture	Normal	0
	Flexed	1
	Holds injury site	2
Verbal	Asleep	0
	No complaints	0
	Complains but cannot localize	1
	Complains and can localize	2

MODIFIED BROMAGE SCALE:

CRITERION	SCORE
No motor block, child moves limbs freely	0
Inability to raise legs	1
Inability to flex knees	2
No movement possible in legs	3

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OBSERVATIONS: The number of children in each group, mean age and mean duration of surgery were comparable in all the three groups.

	GROUP B	GROUP BF	GROUP BC
No. of children	40	40	40
Mean age in years	5.35 ± 2.55	5.175 ± 2.417	5.175 ± 2.8
Mean duration of surgery (minutes)	44 ± 14.671	44.125 ± 13.869	44.625 ± 13.756

TABLE: 1

Table 2 shows that the duration of analgesia was significantly more in group BC than in group B and BF.

	GROUP B	GROUP BF (p value)	GROUP BC (p value)
Duration of analgesia (minutes)	241.25 ± 28.476	342.375 ± 34.676 (0.0001)	601.5 ± 60.17 (0.00001)
Duration of motor blockade (minutes)	120.25 ± 24.67	127.8 ± 25.76 (0.18)	126.725 ± 23.38 (0.23)

TABLE: 2

It is evident from table: 3 that at any time during observation, the MOPS score of patients was significantly lower in group BC as compared to group B and BF.

	MOPS SCORE		
TIME (in min)	GROUP B	GROUP BF (p value)	GROUP BC (p value)
60	1.15 ± 0.65	0.85 ± 0.52 (0.02)	0.5 ± 0.5 (<0.0001)
120	2.05 ± 0.63	1.8 ± 0.45 (0.04)	0.825 ± 0.38 (<0.0001)
180	2.95 ± 0.80	2.8 ± 0.45 (0.30)	1.7 ± 0.46 (<0.0001)
240	4.425 ± 0.99	3.775 ± 0.473 (0.001)	2.1 ± 0.3 (<0.0001)
360	4.5 ± 1.06	4.9 ± 0.73 (0.049)	3.1 ± 0.3 (<0.0001)
480	-	5 ± 0.47	3.7 ± 0.64
600	-	-	4.38 ± 0.48
720	-	-	4.875 ± 0.33

TABLE: 3

As shown in table 4, numbers of patients with sedation score of III or IV were more in group BC than group B and BF. No patient had sedation score of V or VI requiring oxygen supplementation.

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	NO. OF PATIENTS		
	GROUP B	GROUP BF	GROUP BC
I	01	NIL	NIL
II	24	20	04
III	12	15	20
IV	03	05	16
V	NIL	NIL	NIL
VI	NIL	NIL	NIL

TABLE: 4

Table 5 shows that nausea and vomiting and pruritus were more pronounced in group BF.

SIDE EFFECTS	GROUP B	GROUP BF (p value)	GROUP BC (p value)
NUMBER OF PATIENTS			
NAUSEA & VOMITING	07	17 (0.02)	10 (0.58)
SHIVERING	04	05 (0.99)	04 (0.99)
PRURITUS	00	10 (0.001)	00
BRADYCARDIA	00	00	03 (0.24)
RESPIRATORY DEPRESSION	00	00	00
RIGIDITY	00	00	00
DRY MOUTH	00	00	03 (0.24)

TABLE: 5

It has been seen that there was no significant difference between the three groups regarding blood pressure, heart rate and oxygen saturation, although 3 children in group BC had bradycardia. No patient in any group developed respiratory depression.

DISCUSSION: In our study, we selected children from 2 – 7 years of age, as identification of caudal epidural space is difficult in children < 7 years of age leading to high failure rates as observed by Bernard et al.⁷ Various additives to local anesthetics have been used to enhance the duration of caudal block in children but differences in the dose of Fentanyl, Clonidine and local anesthetics, methods to assess pain and statistical analysis has led to variability in duration of analgesia.

We have used Bupivacaine 0.25%, Clonidine 1 mcg/kg and Fentanyl 1 mcg/kg in our study, which comprised of 3 groups of 40 children each receiving 0.75 ml/kg of drug volume.

In our study, we observed that the mean duration of analgesia was 241.25 ± 28.476 minutes in group B, 342.375 ± 34.676 minutes in group BF and 601.5 ± 60.17 minutes in group BC. The mean duration of motor blockade was 120.25 ± 24.67 minutes in group B, 127.8 ± 25.76 minutes in group BF and 126.725 ± 23.38 minutes in group BC. The incidence of sedation was more in group BC and

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there were no difference in hemodynamic parameters. Nausea and vomiting and pruritus were more in group BF.

Lee et al⁸ (1994) assessed the clinical value of combining Clonidine with Bupivacaine for caudal analgesia and found requirement of less supplementary analgesia with Clonidine, but associated with longer sedation. Jamali et al⁹ (1994) assessed the efficacy of Clonidine 1 mcg/kg as adjunct to Bupivacaine 1 ml/kg and found duration of postoperative analgesia significantly increased with Clonidine with no sedation.

Constant et al¹⁰ (1998) used Fentanyl 1 mcg/kg to compare with Clonidine 1.5 mcg/kg and Clonidine 0.75 mcg/kg + Fentanyl 0.5 mcg/kg as adjunct and found increased analgesia in all groups with no respiratory depression but vomiting was observed only in children who received Fentanyl. Klimscha et al¹¹ (1998) evaluated the analgesic efficacy and hemodynamic and respiratory safety of Clonidine 1 and 2 mcg/kg and showed increased sedation with Clonidine 2 mcg/kg than 1 mcg/kg and no difference in significant hemodynamic parameters.

Upadhyay et al¹² (2005) used Bupivacaine in the dose of 0.75 ml/kg with Clonidine 1 mcg/kg and found duration of analgesia with Clonidine without sedation or change in hemodynamic parameters. Tripi et al¹³ used Clonidine 1 mcg/kg with Bupivacaine 0.125%, 1 ml/kg and found that duration of postoperative analgesia with Clonidine was 8 hours as compared to plain Bupivacaine with 3.9 hours. Yildiz TS et al¹⁴ (2006) also concluded the addition of Clonidine to 0.125% Bupivacaine prolongs the duration of postoperative analgesia without any respiratory or hemodynamic side effects.

Cohen et al¹⁵ observed 30 % incidence of pruritus in group receiving Fentanyl caudally. Eisenach et al¹⁶ suggested that the risk of hypotension and bradycardia is an expected side effect of extradural Clonidine in adults but it is less pronounced in children. Wanda Joshi et al¹⁷ (2004) did not recommend adding Clonidine to Bupivacaine caudal block in children undergoing surgery.

Archana Kaul et al¹⁸ (2009) evaluated the analgesic the analgesic efficacy, hemodynamic and respiratory safety of Clonidine when added to Bupivacaine and found duration of analgesia with Clonidine to be 10.25 hours as compared to 4.55 hours in plain Bupivacaine group with no bradycardia, hypotension and sedation in Clonidine group.

CONCLUSION: Clonidine, an alpha – 2 agonist is a better adjuvant than Fentanyl in prolonging the duration of caudal analgesia with Bupivacaine in children undergoing genitourinary and inguinal surgeries.

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