



TO COMPARE THE EFFICACY OF CAUDAL BUPIVAICAIN AND CAUDAL BUPIVACAINE WITH CLONIDINE IN LOWER ABDOMINAL SURGERIES IN CHILDREN

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ABSTRACT

To compare duration of caudal analgesia, hemodynamic change, degree of sedation & to study the side effects of drugs if any during intraoperative and postoperative period. 60 children between age group of 2-10 years belonging to ASA I or II undergoing various elective lower abdominal surgeries were randomly allocated to two groups of 30 each. Group A received (0.25% plain bupivacaine 1ml/kg + 1 ml Normal Saline) and Group B received (0.25% plain bupivacaine 1ml/kg + 1µg/kg clonidine + 1 ml Normal Saline). Postoperative pain, duration of analgesia, time of first rescue analgesic, total number of rescue analgesic doses, hemodynamic changes, complications and sedation were recorded. The duration of analgesia in the post operative period was more in Group B (8.98±.76) Hrs as compared to Group A (4.91±.84) Hr. The mean sedation scores were higher in Group B as compared to Group A. It was observed that Addition of clonidine 1µg/kg to bupivacaine (0.25%) 1ml/kg for caudal block prolong the duration of analgesia in children.

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INTRODUCTION

Caudal epidural block is one of the most popular, reliable, and safe techniques in paediatric analgesia that can provide intra- and post-operative analgesia for abdominal, perineal and lower limb surgeries in children. Bupivacaine is the most commonly used local anaesthetic for this purpose. The limitation of bupivacaine is the short duration of action, about four to six hours, when administered as a 'single shot technique'. Several adjuncts such as opioids, ketamine, midazolam, clonidine and neostigmine have been used with bupivacaine to prolong its action, 1-5 and thus extend the duration of post-operative analgesia provided by the 'single shot' caudal technique. The use of opioids is associated with an increased incidence of pruritus and post-operative nausea and vomiting. 6 Clonidine, an alpha 2 agonist has extensively been used in neuraxial blocks 7-10 and peripheral nerve blocks to prolong the action of bupivacaine. It is one of the most commonly used additives with bupivacaine for caudal analgesia in children. 11

Clonidine action, similar to local anaesthetic action, and its interaction with local anaesthetics have been explained by three possible mechanisms. First, clonidine blocks A and C fibres as a consequence of an increase in potassium conductance in isolated neurones, thus intensifying local anaesthetic conduction block. 12 Secondly, clonidine may cause local vasoconstriction, thus decreasing local anaesthetic spread and removal around neural structures. This effect is mediated by drug action on post-synaptic 2 receptors, although there is little evidence of this mechanism with clinical doses. 13 Thirdly, clonidine combined with spinal local anaesthetics or used in peripheral blocks intensifies and

prolongs analgesia. 14 Spinal 2 adrenergic agonists may also induce analgesia by activating spinal cholinergic neurones resulting in acetylcholine release. 15

MATERIAL AND METHODS

The present study was conducted in 60 children belonging to ASA I or II undergoing various elective lower abdominal surgeries after obtaining written informed consent from parents and permission from hospital ethical committee.

Inclusion Criteria

1. Age of patient - 6 months to 6 years
2. Either gender
3. Written & informed consent
4. ASA grade I and II

Exclusion Criteria

1. Patient with anatomical abnormalities- spina bifida or scoliosis
2. Patient with bleeding disorder or coagulopathy
3. Patient with known allergy to any of study drugs
4. Any signs of infection at the site of caudal block
5. Patients with history of developmental delay or mental retardation

All children were randomly allocated to two groups of 30 each.

Group A- (0.25% plain bupivacaine 1ml/kg + 1 ml Normal Saline)

Group (B)-received (0.25% plain bupivacaine 1ml/kg + 1µg/kg clonidine + 1 ml Normal Saline).

After arrival in operating room, monitoring which included

ECG, pulse oximetry, NIBP were applied and baseline values were recorded. Intravenous cannula was inserted into a suitable vein and inj. Isolyte P was started. Premedication was given in the form of Inj. Glycopyrrolate (4 µg/kg) intravenously. Pre-oxygenation was done by a facemask and JR circuit with fresh gas flow of 6 L/min oxygen. Anaesthesia was induced with 4-5 mg/kg Inj. Thiopentone sodium i.v. and Inj. Succinylcholine 1.5-2 mg/ kg i.v. After intermittent IPPV, trachea was intubated with appropriate LMA/ET tube. Maintenance of anaesthesia was done by Oxygen, Nitrous Oxide, Sevoflurane. Inj. Atracurium (0.5 mg/kg) i.v. was given as a muscle relaxant. After induction, patients were placed in the lateral decubitus position, and a single dose caudal block was performed under aseptic and antiseptic conditions using a 23G hypodermic needle and standard loss of resistance technique. The drugs were given in caudal block according to the groups after negative aspiration for blood and cerebrospinal fluid.

Haemodynamic parameters (heart rate, ECG, blood pressure), respiratory rate and SPO2 were recorded before induction, after induction and then immediately after caudal anaesthesia, and every 10 minutes during surgery.

Duration of anaesthesia, defined as time from induction of anaesthesia to the time of extubation and duration of postoperative analgesia, defined as time from single shot caudal injection of drug to the FLACC pain score of more than 4, were also noted. Perioperative bradycardia defined as heart rate below 80/min for age less than 1 year and less than 60/min for age above 1 year and was treated with Inj. Atropine 0.01 mg/kg.

At end of surgery, neuromuscular block was reversed with Inj. Glycopyrrolate 8 µg/ kg and Inj. Neostigmine 0.05 mg/ kg. Trachea was extubated after oral and endotracheal suction/ LMA removed. Pulse, blood pressure, SpO2, respiratory rate, sedation score, FLACC score were recorded postoperatively at 0 minutes, 15 minutes, 30 minutes and every 30 minutes for next 6 hour and then every 1 hour for next 6 hours in POCU.

Analgesia was assessed using FLACC pain scale and sedation was assessed by sedation score. Children who had a pain score of more than 4 were administered Acetaminophen 15 mg/kg suppository. Time of first micturation and time of administration of rescue analgesia were also noted.

FLACC score

0			
Face	No expression or Smile	Occasional grimace or frown, Withdrawn, uninterested	Freq to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tensed	Kicking or legs drawn up
Activity	Lying quietly normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid, jerky
Cry	No cry (awake or asleep)	Moans or whimper, occasional	Crying, steadily, screams or sobs, frequent

		complaint	complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort

Sedation score

1. Eyes open spontaneously
2. Eyes open in response to verbal command
3. Eyes open in response to physical stimulation
4. Unarousable

OBSERVATION AND RESULTS

Table -1 Demographic Data

Variables	GROUP B (n=30)	GROUP C (n=30)	P value
Age(years) Mean± SD	4.52± 1.41	4.71± 1.29	0.14
Weight(Kg) Mean± SD	14.83± 8.01	15.11± 5.31	0.33
Sex ratio M:F	18:12	21:9	0.41

As per the table, two groups were comparable in respect to age, weight and sex ratio without any significant difference (p > 0.05).

Table-2 Mean duration of caudal analgesia in hours

Mean duration Of analgesia(Hours) Mean±SD	Group A	Group B	P-value
	3.98±0.71	9.87±0.49	0.001

Table 2 shows the mean duration of caudal analgesia in two groups. This duration was significantly prolonged by addition of Clonidine to bupivacaine (group B) in comparison to bupivacaine alone (group A). There was statistically significant difference in duration of caudal analgesia between both the groups (p<0.05).

Table 3 Flacc Score

	GROUP A	GROUP B	P-VALUE
AFTER 1 HOUR	2.98±0.59	1.37±0.61	0.001
AFTER 4 HOURS	3.28±0.91	2.29±0.68	0.001

The above table and graph shows the comparison of FLACC scores at 1 hour and 4 hours post operatively. Adding clonidine significantly reduce the FLACC scores in group B as compared to group A. There was statistically significant difference in FLACC scores at 1 hour and 4 hours between group A & group B (p<0.05)

Table 4 Postoperative Mean Sedation Score

TIME(Hours)	Mean Sedation score		P value
	A group	B group	
0	1.94 ± 0.37	4.93 ± 0.81	0.001
1	1.68 ± 0.65	3.58 ± 0.78	0.019
2	0.95 ± 0.32	3.27 ± 0.81	0.001
3	0.31 ± 0.18	2.91 ± 0.19	0.001
4	0.22 ± 0.16	1.01 ± 0.13	0.001

Table 4 shows that mean sedation score was higher in group B as compared to group A at various intervals and the difference was statistically significant.

DISCUSSION

Pain is an unpleasant subjective sensation which can only be experienced and not expressed, especially in children, who rely completely on their parents or care givers for their wellbeing. The concept of post-operative pain relief and its utilization in the paediatric age group has improved dramatically over recent years.

Caudal block is a useful alternative to general anaesthesia and total I.V. anaesthesia as it provides effective post-operative analgesia. Unfortunately, motor block produced by caudal block may be a cause of distress to children in the post-operative period 16.

In the present study we attempted to compare Bupivacaine alone with bupivacaine with clonidine in order to assess analgesic efficacy and duration of caudal analgesia in children undergoing infra umbilical operations.

Sharpe P, Klein JR, Thompson JP *et al* 17 speculated that small volume of Bupivacaine (0.5 ml/kg) may not be enough to deliver Clonidine up to the spinal cord leaving only direct action on the nerve routes in caudal area. These findings suggest that the addition of Clonidine 2µg/kg to low volume of caudal anaesthetics has limited clinical benefit in children undergoing circumcision. Akilandeswari Manickamet, Mahesh V, Aruna P *et al* 18 had also suggested that ropivacaine 0.1 % 1 ml/kg with clonidine 1 µg/kg in caudal analgesia. We choose a standard dose of 1 ml/kg 0.25% Bupivacaine in both groups. Study by Motsch J, Bach A, Martin E *et al* 19 had also shown a mean duration of analgesia of (Mean ± SD) 20.9 ± 7.4 hours in children receiving caudal Clonidine with Bupivacaine, but a dose of 5µg/kg of Clonidine was used.

In our study we had used doses of clonidine 1 µg/kg. Neogi, Bhattacharjee DP, Dawn *et al* 20 compared clonidine 1 µg/kg as adjuncts to ropivacaine 0.25% for caudal analgesia in paediatric patients and concluded that addition of clonidine with ropivacaine administered caudally significantly increases the duration of analgesia. In our study we had also selected 1 µg/kg dose of clonidine.

In our study, duration of caudal analgesia using plain bupivacaine was (Mean ± SD) 3.98 ± 0.71 hours, which increased by adding clonidine (Mean ± SD) 9.87 ± 0.49 hour ($p < 0.05$, significant).

Aruna Parameswari, Anand M, Mahesh *Vet et al* 21 and Akilandeswari Manickam, Mahesh V, Aruna P *et al* 18 in their study, reported higher FLACC score at 4 hours in plain bupivacaine or ropivacaine group. Thus, addition of clonidine delayed the first dose of rescue analgesic.

In our study the period of sedation was significantly longer in children who received clonidine.

In the immediate post-operative period Sedation score was higher in the clonidine group. Patients were sedated but arousable.

Our study shows that addition of 1 µg/kg of Clonidine to Bupivacaine slightly reduces pulse rate and MAP (3 - 10%) after 15-30 minutes of caudal administration but does not have significant effect on the patient's hemodynamic status

Findings of Jamali S, Monis S, Begon S *et al* 22 and Archnakoul, Deepajali P, Jayshree Sood *et al* 23 also noted in

their result a slight drop in pulse rate and MAP after administration of clonidine.

CONCLUSION

From the above study it can be concluded that Addition of clonidine to caudal bupivacaine significantly prolongs the duration of post-operative analgesia and produces arousable sedation without any deleterious effects.

Hence, we find clonidine (1 µg/kg dose) is safe and effective adjuvant to bupivacaine in caudal block.

References

1. De Beer DA, Thomas ML. Caudal additives in children solutions or problems? *Br J Anaesth.* 2003; 90:487-98.
2. Ansermino M, Basu R, Vandebek C, Montgomery C. Nonopioid additives to local anaesthetics for caudal blockade in children: A systematic review. *Paediatr Anaesth.* 2003;13:561-73
3. Kumar P, Rudra A, Pan AK, Acharya A. Caudal additives in pediatrics: A comparison among midazolam, ketamine, and neostigmine co-administered with bupivacaine. *Anesth Analg.* 2005;101:69-73
4. Lonnqvist PA. Adjuncts to caudal block in children: Quo vadis? *Br J Anaesth.* 2005; 95:431-3.
5. Tsui BC, Berde CB. Caudal analgesia and anesthesia techniques in children. *Curr Opin Anaesthesiol.* 2005; 18:283-8.
6. Vetter TR, Carvallo D, Johnson JL, Mazurek MS, Presson RG., Jr A comparison of single-dose caudal clonidine, morphine, or hydromorphone combined with ropivacaine in pediatric patients undergoing ureteral reimplantation. *Anesth Analg.* 2007; 104:1356-63.
7. Jamali S, Monin S, Begon C, Dubousset AM, Ecoffey C. Clonidine in pediatric caudal anesthesia. *Anesth Analg.* 1994;78:663-6
8. Lee JJ, Rubin AP. Comparison of a bupivacaine-clonidine mixture with plain bupivacaine for caudal analgesia in children. *Br J Anaesth.* 1994; 72:258-62.
9. Tripi PA, Palmer JS. Clonidine increases duration of bupivacaine caudal analgesia for ureteroneocystostomy: A double blind prospective trial. *J Urol.* 2005; 174:1081-3.
10. Yildiz TS, Korkmaz F, Solak M, Tokar K. Clonidine addition prolongs the duration of caudal analgesia. *Acta Anaesthesiol Scand.* 2006; 50:501-4.
11. Menzies R, Congreve K, Herodes V, Berg S, Mason D. A survey of pediatric caudal extradural anesthesia practice. *Paediatr Anaesth.* 2009; 19:829-36.
12. Butterworth JF, Strichartz GR. The 2 adrenergic agonists clonidine and guanfacine produce tonic and phasic block of conduction in rat sciatic nerve fibers. *Anesth Analg* 1993; 76:295-301.
13. Nishikawa T, Dohi S. Clinical evaluation of clonidine added to lidocaine solution for epidural anesthesia. *Anesthesiology* 1990; 73:853-9.
14. Gaumann DM, Brunet PC, Jirounek P. Clonidine enhances the effects of lidocaine on C-fiber action potential. *Anesth Analg* 1992; 74:719-25.
15. Nagurib M, Yaksh TL. Antinociceptive effects of spinal cholinesterase inhibition and isobalographic analysis of

- the interaction with μ and α_2 -receptor systems. *Anesthesiology* 1994; 80:1338-48.
16. Da Conceicao MJ, Coelho L. Caudal anaesthesia with 0.375% ropivacaine or 0.375% bupivacaine in paediatric patients. *Br J Anaesth.* 1998 Apr; 80 (4):507-8.
 17. Sharpe P, KleinJR, ThompsonJP, RushmanSC, SherwinJ *et al.* Analgesia for circumcision in a paediatric population: comparison of caudal bupivacaine alone with bupivacaine plus two doses of clonidine. *Paediatr Anaesth* 2001 Nov, 11 (6):695-700.
 18. AkilandeswariManickam, Mahesh Vakamudi, ArunaParameswari *et al.* Efficacy of clonidine as an adjuvant to ropivacaine for caudal analgesia in children undergoing subumbilical surgery. *J anaesthesiol clinical pharmacol* 2012; 28:185-9.
 19. MotschJ, BottigerBW, Bacha, BohrerH, Skoberne T *et al.* Caudal clonidine and bupivacaine for combined epidural and general anaesthesia in children. *Acta Anaesthesiol Scand.* 1997 Aug; 41 (7):877-83.
 20. Neogi M, Bhattacharjee DP, Dawn S, Chatterjee N. A comparative study between clonidine and dexmedetomidine used as adjuncts to ropivacaine for caudal analgesia in paediatric patients. *J Anaesthesiol Clin Pharmacol* 2010; 26:149-53.
 21. ArunaParameswari, Anand M Dhev, and Mahesh Vakamudi. Efficacy of clonidine as an adjuvant to bupivacaine for caudal analgesia in children undergoing sub-umbilical surgery. *Indian Journal of Anaesthesia* 2010; Sept-Oct 54(5):458-463.
 22. JamaliSamir, SylvaineMonin, ChristianBegon, Anne-Marie Dubousset *et al.* Clonidine in paediatric caudal anaesthesia. *Anaesth Analg* 1994; 78:663-666.
 23. ArchanaKoul, Deepanjali Pant, JayshreeSood. Caudal clonidine in day-care paediatric surgery. *Indian Journal of Anaesthesia* 2009; 53(4): 450-454.
