Original Research Paper

Volume-7 | Issue-10 | October-2017 | ISSN - 2249-555X | IF : 4.894 | IC Value : 79.96

Paediatrics

COMPARATIVE STUDY OF PEDIATRIC CAUDAL ADJUVANTS DEXMEDITOMIDINE AND CLONIDNE FOR LOWER ABDOMINAL SURGERIES:A RANDOMIZED CONTROL TRIAL.

***Dr.Kannan Bojaraaj**

MD.,DA., Associate Professor, Government Theni Medical College,Theni.
*Corresponding Author

ABSTRACT

Background: Caudal block is the commonest technique for pediatric analgesia.But the caudal block with ropivacaine has short duration of action.So addition of adjuvants like dexmeditomidine or clonidine to caudal block will increase the duration of analgesia.

Aim: The aim of the study is to compare the efficacy of the adjuvants dexmeditomidine and clonidine with ropivacine in pediatric caudal anaesthesia for lower abdominal surgeries.

Materials and methods: Study was conducted among 60 pediatric patients between age group 1 and 6.The caudal block was administered with inj.ropivacaine0.25% 1ml/k g with inj.clonidine 1µg/kg(groupRC) and inj. ropivacaine 0.25% 1 ml/kgwith inj.dexmeditomidine 1µg/kg(groupRD) after induction of general anaesthesia.Haemodynamic parameters were noted before during and after surgical procedure.The duration of post operative analgesia ,the rescue analgesic dose required,pain score and side effects were also recorded.

Results: The mean duration of effective analgesia in group RD was14.98±0.85 h versus 10.2±0.9h in groupRC with p value of 0.0001 which is statistically signifigant.There is no significant difference occurs in haemodynamic parameters and side effects between these groups.

Conclusion: Dexmeditomidine as an adjuvant to ropivacaine increases the duration of caudal analgesia than clonidine in infraumbilical surgeries.

KEYWORDS : Caudal analgesia,pediatric patients,ropivacaine,dexmeditomidine,clonidine,post operative period.

INTRODUCTION:

The caudal epidural block is the commonest ,reliable and safe technique in pediatric analgesia for infra umbilical surgeries.The main disadvantage of caudal block is short duration of action after single injection[1].The caudal catheter administration is not popular because of concern about infection.So the addition of adjuvants like ketamine, adrenaline,opioids and α2 agonists to single shot technique will prolong the duration of analgesia.[2]

Both clonidine and dexmeditomidine belongs to α2 agonist group.Dexmeditomidine has 1600 times grater affinity to α2 receptor.These drugs interact with local anaesthestics by three possible mechanisms.First ,by blocking Aδ and C fibres as a consequence of an increase in potassium conductance in isolated neurons,thus intensifying local anaethetics conduction block[3]. Secondly, bycausing local vasoconstriction decreasing the local anaesthetics spread and removal around neural structures.This effect is mediated by the drug action on post synaptic α2 receptor[4].Thirdly it combines with spinal local anaesthetics or used in peripheral nerve block intensifies and prolongs the analgesia.[5].Spinal α2 adrenergic agonist may also induce analgesia by activating spinal cholinergic neurons resulting acetyl choline release.Dexmeditomidine has 8-fold grater affinity for α2a receptor than clonidine,which is responsible for the hypnotic and analgesic effect of this drug.

Considering the above facts we designed this study to compare the analgesic effects and side effects of dexmeditomidine and clonidine added with ropivacaine for pediatric caudal analgesia in infraumbilical surgeries.

MATERIALS AND METHODS:

After obtaining institutional ethical committee approval, written informed consent was obtained from parents of the children belonging to this study.

Study design:

This was a randomized, prospective, parallel group double blinded study.

Sample size:

Sixty patients were studied.

Inclusion criteria:

ASA 1 and 2 patients between 1 and 6 years of age undergoing lower abdominal surgeries were included.

Exclusion criteria:

Patients with known allergic to study drugs, suspected coagulopathy,infection at the site of caudal block,history of developmental delay,neurological disease and skeletal deformities were excluded.

Allocation:

The patients were randomly allocated in to two groups.

Group RD(n=30) :receving 0.25% ropivacaine 1 ml /kg with dexmeditomidine 1µg/kg.

GroupRC(n=30) :receving 0.25% ropivacaine 1ml/kg with clonidine 1µg/kg.

All patients underwent pre-anaesthetic check up the day before surgery and all routine and specific investigations were noted.The children were kept nil by mouth 6 hours prior to surgery. An intravenous line was secured,and Isolyte p was started.Standard monitors like ECG,pulse oximeter ,non invasive blood pressure were applied.

All children were premedicated with inj. atropine 0.02mg/kg , inj.ondensetron 0.1mg/kg and oral midazolam 0.5mg/kg body weight.All base line parameters like PR,BPand Spo2 were recorded.After induction of anaesthesia ETT of appropriate size was intubated.Then caudal block was performed in all patients according to the group.Maintanance of anaesthesia with oxygen ,nitrous oxide.and sevoflurane mixture. PR, BP,and Spo2were monitered at 5 minutes interval till the end of surgery.The hypotension requiring fluid bolus and bradycardia requiring atropine were noted.

At the end of the surgery all anaesthetic gases were turned off and the patients were extubated in a fully awake condition.The PR,BP, Spo2 and pain sedative score were recorded postoperatively at 4 hour interval for 24 hours.The pain and sedation score was

Opening of eyes spontaneously =3
Opening of eyes to verbal commonds=2
Opening of eyes to physical shacking=1
Not arousable =0

The pain intensity was assessed with FLACC pain score.If the score was 4 or more,syrup paracetamol 15mg/kg was administered.The duration of analgesia(from the time of caudal injection to time at which FLACC score was 4 or more) was also recorded.All the observations

were recorded and all the results were analysed. Statistically data were presented as a mean±standard deviation. A value of P ≤0.05 was considered as a satistically significant difference with unpaired students t-test.

RESULTS: As per the (table 1) mean age ,weight, sex distribution in both groups are nearly same without any significant differences.P ≥0.05

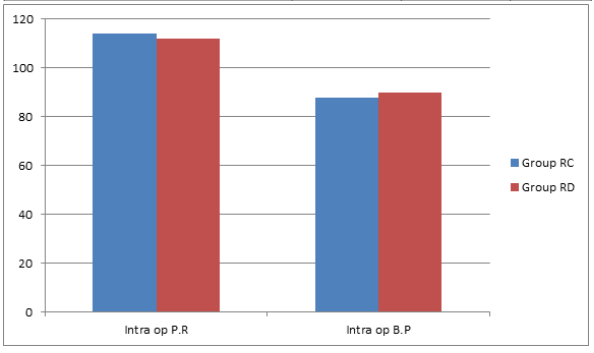
TABLE -1 DEMOGRAPHIC DATA

VARIABLES	GROUP- RC	GROUP-RD	P value
Age in years Mean ±SD	4.76±2.33	5.34±2.26	0.33
Weight in KG Mean ±SD	13.26±4.16	14.12±4.21	0.42

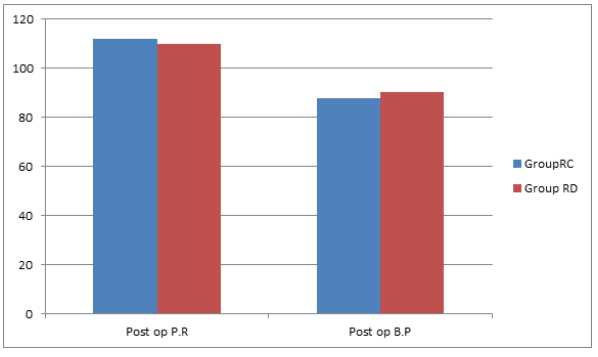
TABLE -2 shows no significant difference between the groups with mean intraoperative and postoperative BP,PR.

TABLE-2 HEMODYNAMIC DATA:

PREOPERATIVE VITALS (mean±SD)	Group RC	Group RD	P value
PULSE	115.6±11.58	115.4±10.22	0.943
BP(in mmHg)	91.04±8.46	91±6.81	0.98
INTRA OPERATIVE VITALS (mean±SD)	Group RC	Group RD	P value
PULSE	114±9.8	112±11.5	0.47
BP(in mmHg)	88.3±5.44	89.9±6.84	0.3201



POSTOPERATIVE VITALS (mean±SD)	Group RC	Group RD	P value
PULSE	112±8.85	110±9.3	0.39
BP	88.1±6.13	90.4±6.01	0.147

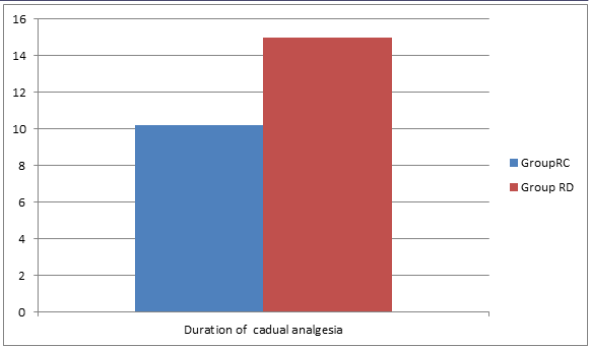


As per table(3) the mean duration of caudal analgesia in group RC was 10.2±0.9

The mean duration of caudal analgesia in group RD was 14.98±0.85. It shows the duration was significantly prolonged in group RD (P0.0001)

TABLE-3 DURATION OF CAUDAL ANALGESIA

	GROUP RC	GROUP RD
MEAN DURATION OF CAUDAL ANALGESIA(hrs)	I0.2±0.9	14.98±0.85
P value	0.0001	



As per table(4) the sedation and pain score was statistically insignifigant in both groups with p value >0.05

TABLE-4:PAIN AND SEDATION SCORE

SCORE	GROUP RC	GROUP RD
1	6	4
2	9	8
3	15	18

As per table 5 the incidence of nausea, vomiting, respiratory depression are almost same on both groups.

TABLE-5 : POSTOPERATIVE COMPLICATIONS:

POSTOP COMPLICATIONS	GROUP RC	GROUP RD
Nausea, vomiting	5	4
Respiratory depression	Nil	Nil

DISCUSSION:

The caudal epidural analgesia is one of the most popular and commonly used regional blocks in pediatric anesthesia.It is reliable and safe technique that can be used with general anesthesia for intra operative and postoperative analgesia for intra abdominal and lower limb surgeries.

The main disadvantage of caudal anesthesia is the shorter duration of action after single injection of local anesthetic solution. The use of caudal catheters to administer the repeated doses or infusion of LA is not popular because of the risk of infection . Double caudal technique whereby the caudal is topped up at the end of the procedure has recently been advocated.

Ropivacaine has a wider margin of safety, less motor blockade, lesscardiovascular and neurological toxicity. It can be safely used for regional anesthesia in the ambulatory setting in pediatrics. In 1984 the analgesic action of regional clonidine was first demonstrated [6,7].The use of epidural clonidine in adults led to its evolution in pediatric caudal block.The studies shown caudal clonidine has increase the duration of post operative analgesia[8,9,10].The dexmeditomidine commonly used as an intravenous agent,can be used epidurally for increasing the post operative analgesia in human[11,12,13].

Clonidine is used for potentiating the analgesic action of various local anaesthetics administered regionally.The aim of our study is to evaluate the efficacy of caudal dexmeditomidine over caudal clonidine when combined with 0.25% solution of ropivacaine.The results showed that the caudal bolus injection of 0.25% ropivacaine 1ml/kg dexmeditomidine 1µg/kg provides better analgesic action than caudal bolus inj.0.25%ropivacaine 1ml/kg with clonidine 1µg/kg.

Clonidine produces analgesia via a nonopioid mechanism. [14] Klimscha et al., had studied the effectiveness of caudal clonidine in potentiating the postoperative analgesic effect and found that in small children with a mean age of 3 years who underwent an elective lower abdominal day care surgeries, the addition of clonidine 1-2 µg/kg to ropivacaine 0.25% significantly prolonged the median duration of analgesia and reduced the total dose of postoperative analgesic compared with ropivacaine alone or ropivacaine plus epinephrine 5 µg/ml ($P < 0.05$).[15] The findings of our study are almost similar with observations of Klimscha et al., as postoperative analgesia was significantly prolonged in the patients receiving dexmedetomidine or

clonidine as an adjuvant to ropivacaine. Clonidine causes dose-dependent post-operative sedation in children as demonstrated by Lund and his colleagues in their study on adding 2 µg/kg clonidine to caudal ropivacaine .In our study, the difference in sedation scores was not statistically significant as the all patients were easily arousable in all the the groups which is consistant with the findings of other studies.[16,17,18]

Like clonidine [19,20] dexmedetomidine also enhance the effects of LA without increasing the incidence of side effects[21]. Dexmedetomidine compare to clonidine is a much more selective alpha 2 adrenoceptor agonist for sedation and analgesia without vascular effects from activation of alpha1 receptors. Dexmedetomidine is a shorter acting drug than clonidine and its sedative effects is reversed by atipamazole. These properties render dexmedetomidine suitable for sedation and analgesia during the whole perioperative period.

In children the pharmacokinetics of 10 min iv infusion of dexmede tomidine 0.33, 0.60 or 1microgram/kg yielded a rapid redistribution (alpha phase) half life of 9min and slow (beta phase) elimination phase with half life of 2 hours , similar to adults[22].

Pharmacodynamic effects of dexmedetomidine have been studied thoroughly in adults[23,24]. Nowadays investigations on pediatric group described the pharmacokinetics and pharmacodynamic effects in randomisied controlled trials [25-27]. The advantage of dexmedet omidine than other sadatives is its respiratory effects which is minimal in adults and children. The respiratory rate, co2 tension, spo2 are well maintained with dexmedetomidine sedation in children.The patient awake with gentle stimulation in dexmedetomidine sedation.This can be used in procedures such as MRI in children [29,30].El-Hennawy et al. administered dexmedetomidine and clonidine in a dose of 2micro gram/kg with 0.25% bupivacaine caudally.They found that the duration of analgesia was higher in groups receiving adjuvants (median 95% cl) 16hrs (14-18) in dexmedtitomidine and median (95%cl) 12hrs (3-21) in clonidine than the group with plain bupivacaine (median 95% cl) 5hrs (4-6).

Noogi et al compared clonidine 1microgram/kg and dexmedeto midine 1microgram/kg with ropivacaine 0.25% for caudal anesthesia in children.They found that the duration of analgesia was more for adjuvants groups than plain ropivacaine group. The mean duration of analgesia was 6.32±0.46 hrs in ropivacaine group, 13.17±0.68 hrs in clonidine group and 15.26±0.86 hrs hours in dexmedetomidine group. The incidence of adverse effects was statistically insignificant between three groups.

We observed from our study that the duration of postoperative analgesia (table3) in group RC was 10.2±0.90 hrs compared with 14.98±0.85 hrs in group RD with a P value of(0.0001) .

No significant postoperative complication such as PONV, respiratory depression, urinary retension, pruritus, hypotension, bradycardia were observed. The results of our observations shows that the addition of dexmedetomidnie to ropivacaine provides longer duration of postop analgesia than the addition of cionidine to ropivacaine.

CONCLUSION:

The caudal dexmeditomidine 1µg/kg with ropivacaine 0.25% 1ml/kg produce the post operative analgesia of 14.98±0.85 hrs when compare to 10.2±0.9 hrs in caudal clonidine 1µg/kg with 0.25%ropivacaine 1ml/kg.So addition of adjuvant dexmeditomidine in pediatric caudal anaesthesia for lower abdominal surgeries provides longer duration of post operative analgesia than adjuvant clonidine.

REFERENCES:

1. Lloyd-Thomas AR. Pain management in paediatric patients. Br J Aanesth 1990;64:85-104.
2. Vetter TR, Carvallo D, Johnson JL, Mazurek MS, Presson RG Jr. A comparison of single dose caudal clonidine, morphine, or hydrompophone combined with ropivacaine in pediatric patients undergoing ureteral reimplantation. AnesthAnalg2007;104:1356-63.
3. Butterworth JF 5 th , Strichartz GR. The alpha 2 adrenergic agonists clonidine and guafacine produce tonic and phasic block of conduction in rat sciatic nervefibers. Anesth Analg1993;76:295-301.
4. Nishikawa T, Dohi S. Clinical evaluation of clonidine added to lidocaine solution for epidural anesthesia. Anesthesiology 1990;73:853-89.
5. Gaumann DM, Brunet PC, Jirounck P. Clonidine enhances the effects of lidocaine on C-fiber action potential. Anesth Analg 1992;74:710-25.
6. Nagurib M, Yaksh TL. Antinoceptive effects of spinal cholinesterase inhibiton and isobalographic analysis of the interaction with mu an alpha 2 receptor systems.Anaesthesiology1994;80:1338-48.
7. Asano T, Dohi S, Ohata S, Shimonaka H, Idia H. Antinociception by epidural and systemic alpha (2)-adrenoceptor agonists and their binding affinity in rat spinal cord and brain. Anesth Analg 2000;90:400-7.
8. Tamsen A, Gorgh T. Epidural clonidine produces analgesia. Lancet 1984;2312.
9. De May JC, Strobet J, Poelaert J, Hoebeke P, Mortier E. The influence of sufentanil and /or clonidine on the duration of analgesia after caudal block for hypospadias repair surgery in children. Eur J Anaesthesiol 2000;17:379-82.
10. Beer DA, Thomas ML. Caudal additives in children - solution or problems? Br J Anaesth 2003;90:487-98.
11. Vieira AM, Schnaider TB, Brandao CA, Perira FA, Costa ED, Fonseca CE. Epidural clonidine or dexmedetomidine for post-cholecystectomy analgesia and sedation. Rev Bras Anestesiol 2004;54:473-48.
12. Schnaider TB, Vieira AM, Brandao AC, Lobo MV. Intraoperative analgesic effect of epidural ketamine, clonidine or dexmedetomidine for upper abdominal suregery. Rev Bras Anestesiol 2005;55:525-31.
13 Saadawy I, Boker A, Elshahawy MA, Almazrooa A, Melibary S, Abdellatif AA, et al. Effects of dexmedetomidine on the characteristics of bypivacaine in a caudal block in paediatrics. Acta Anaesthesiol Scand 2009;53:251-6.
14. Bosenberg A, Thomas J, Lopez T, Lybeck A, Huizar K, Larsson LE. The efficacy of caudal ropivacaine 1, 2 and 3 mg into 1(-1) for postoperative analgesia in children. Paediatr Anaesth 2002;12:53-8.
15. Klimscha W, Chiari A, Michalek-Sauberer A, Wildling E, Lerche A, Lorber C, et al. The efficacy and safey of a clonidine/bupivacaine combination in caudal blockade for pediatric hernia repair. Anesth Analg 1998;86:54-1.
16. Hansen TG, Henneberg SW, Walther-Larsen S, Lund J, Hansen M.Caudal bupivacaine supplimented with caudal of intravenous clonidine in children undergoing hypospadias repair: A double blinded study. Br J Anaesth2004;92:223-7.
17. Ivani G, Bergendahl HT,Lampugnani E, Eksborg S, Jasonni V, Palm C, et al 4Plasma levels of clonidine following epidural bolus injection in children. ActaAnaesthesio lScand1998;42:306-11.
18. Ivani G, Mereto N, Lampugnani E, Negri PD, Torre M, Mattioli G, et al. Ropivacaine in paediatric surgery: Preliminary results. Paediatr Anesth 1998;8:127-9.
19. Eisenach JC,De Kock M,Klimscha W.Alpha sub 2-adrenergic agonist for regional anaesthesia:A clinical review of clonidine[1984-1995]Anaesthesiology.1996;85:655-74.[PubMed]
20. Hansen TG,henneberg SW,Walther-Larsen S,lund J,Hansen M.Caudal bupivaccine supplemented with caudal or intravenous clonidine in children undergoing hypospadias repair:A-Double blind study.Br J Anaesth.2004;92:223-7.[PubMed].
21. Yoshitimi T.K,KohjitaniA,Maeda S,HiguchH,Shimada M, Miyawaki T. Dexm ededetomidine enhance the local anaesthetic action of lidocaine via an a2A Adrenoceptor.Anaesth Analg.2008;107;96-101[PubMed].
22. Petroz GC,Skich N, James M,van Dyk H, Shafer SL,Schily M, et al.a PHASE I,two-center study of the pharmacokinetics and pharmacodynamics of dexmedetomidine in children. Anaesthesiology.2006;105:1098-110.[PubMed].
23. Tobias JD,Berkebbosch JW, Initial experience with dexmedetomidine in pediatric aged patients.Paediatr Anaesth.2002;12:171-5.[PubMED]
24. Nichols DP, Berkenbosch JW, Tobias JD.Rescue sedation with dexmedetomidine for diagnostic imaging ;A preliminary report. Paediatr Anaesth.2005;15:199-203.[PubMed]
25. Koroglu A,Tecksan H,Sagir O,Ycel A,Toprak HI,Ersoy OM. A comparison of the sedative,hemodynamic ,and respiratory effects of dexmeditomidine and propofol in children undergoing magnetic resonance imaging.Anaest Analg.2006;103:63-7.[Pub Med]
26. Koroglu A,DemirbilekS,Teksan H,Sagir O,But AK,Ersoy MO.Sedative,hemodynamic and respiratory effects of dexmeditomedine in children undergoing magnetic resonance imaging examination:Preliminary results.Br J Anaesth.2005;94:821-4. [PubMed]
27. Petroz GC,Sikich N,James M,van Dyk H,Schily M,et al. A phase 1,two-center study of the pharmacokinetics and pharmacodynamics of dexmedetomidine in children. Anaesthesiology.2006;105:1098-110.[PubMed]