



Anesthesiology

A COMPARATIVE STUDY OF BUPIVACAINE WITH DEXMEDITOMIDINE AND ROPIVACAINE WITH DEXMEDITOMIDINE IN PAEDIATRIC CAUDAL BLOCK FOR INFRAUMBILICAL SURGERIES.

Dr.M.Sakuntala

Assistant Professor of Anaesthesia Department of Anaesthesiology, Government Thi Medical College, Theni

Dr. G.Vijaya

Associate Professor of Anesthesia Department of Anaesthesiology, Government Thi Medical College, Theni - Corresponding Author

ABSTRACT

AIM:The objective of this study were to compare the effects of pediatric caudal ropivacaine and dexmedetomidine with bupivacaine and dexmedetomidine for infraumbilical surgeries. **METHODS:** In a randomised, prospective, parallel group, double blinded study, 60 were recruited and allocated into two groups: GROUP RD (n=30) received 0.25% ropivacaine 1mg/kg with dexmedetomidine 1microgram/kg and GROUP BD (n=30) received 0.25% bupivacaine 1ml/kg with dexmedetomidine 1microgram/kg. After intubation caudal block performed in all patients. The patients were observed for hemodynamic stability, sedation with Ramsays sedation scale, and pain was assessed with face, leg activity, cry, consolability, (FLACC) pain score.

RESULTS: The mean duration of effective analgesia in Group RD patients was 13.98± 0.95hrs versus 9.88 ±0.9hrs in Group BD patients with P value of 0.0001 which is statistically significant

CONCLUSION: Dexmedetomidine as an adjuvant to ropivacaine increases the duration of caudal analgesia with out increase in adverse effects in children undergoing infraumbilical surgeries.

KEYWORDS : anesthesia, dexmedetomidine, ropivacaine, bupivacaine, pediatric patients.

1.INTRODUCTION:

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 well being. Till date, various methods have evolved for providing post op pain relief in pediatric population in that some methods have some side effects which inhibit their use in children for(eg) narcotics could cause respiratory depression, oral analgesics cannot be given for sometime after GA because of the fear of vomiting and aspiration and fear of needle stick in the case of parenteral analgesics. The regional anesthetic techniques especially caudal route is one of the simplest and safest technique in pediatric surgery for decreasing the postop pain, systemic analgesic requirement, attenuate the stress response to surgery, facilitate the rapid smooth recovery various additives such as morphine, fentanyl, clonidine, and ketamine with local anesthetics have been investigated. [1,2] Ropivacaine, a long acting amide LA. It structurally similar to bupivacaine and provide less motor blockade and less cardiotoxic than bupivacaine, which make it more suitable agent for pediatric caudal analgesia, following day care surgery.[1,2,3] Dexmedetomidine is an alpha2 agonist having a greater affinity for alpha2 adrenergic receptors than clonidine and much less alpha1 effects. A major advantage of dexmedetomidine is its higher selectivity compared with clonidine for alpha 2 A receptors which is responsible for hypnotic and analgesic effects. [4] The objective of this study were compare the effects of dexmedetomidine with ropivacaine and dexmedetomidine with bupivacaine to provide postop analgesia in pediatric caudal block for infraumbilical surgeries.

2.METHODS AND MATERIALS:

After obtaining approval from ethical committee, a written informed consent was obtained from all parents of children who participate in this study. **INCLUSION CRITERIA:** Study was conducted in 60 children of ASA I and aged 1-6 years, undergoing infraumbilical surgeries **STUDY DESIGN:** This was randomised, prospective, parallel group, double blinded study. **SAMPLE SIZE:** 60 Patients were studied. **EXCLUSION CRITERIA:** Patients with allergy to study drugs, suspected coagulopathy, infection at the site of caudal block, H/o developmental delay, neurological diseases, and skeletal deformities, were excluded. **ALLOCATION:** The children were randomly allocated into two groups. **GROUP RD(n=30)** 0.25% ropivacaine 1ml/kg with dexmedetomidine 1microgram/kg **GROUP BD (n=30)** 0.25% bupivacaine 1ml/kg with dexmedetomidine 1microgram/kg. All these patients underwent the preanesthetic checkup the day before surgery, and all routine and specific investigations were noted. The children were electively kept nil by mouth for 6hrs. An intravenous line was secured, and Isolate P was started. Standard monitors such as ECG, Pulse oximeter, noninvasive blood pressure, were applied All children were premedicated with inj.atropine 0.02ml/kg and inj.ondansetron 0.1ml/kg. Under general anesthesia with controlled ventilation, pt intubated orally.

Maintenance with N₂O+O₂ and sevoflurane. Then caudal block was performed in all patients accordingly to the groups. In the intraop period no other narcotics, analgesics, or sedatives were used. H.R, Mean arterial pressure and oxygen saturation (spo₂) were recorded before surgery and every 5min till the end of surgery. Pain intensity was assessed at the end of surgery, and every 4hrs for 24hrs after operation by FLACC pain score. If the score was ≥4, syrup.paracetamol 15mg/kg was administered. Duration of analgesia (from the time of caudal analgesia to the time at which FLACC score was ≥4) was recorded.

Sedation score was assessed using RAMSAY's sedation scale (8) as follows:

1. anxious and agitated or restless or both.
2. cooperative, oriented and calm.
3. response to commands only.
4. exhibiting brisk response to light glabellar tap or loud auditory stimulus.
5. exhibiting sluggish response to light glabellar tap or loud auditory stimulus.
6. unresponsive.

The following times were recorded:

1. The anesthesia time (time from induction of anesthesia to the end of surgery).
2. The time from caudal block to the end of surgery.
3. Emergence time (time from the end of surgery to the opening of eyes on calling)

Complications such as nausea, vomiting (PONV), respiratory depression, urinary retention, hypotension, bradycardia were also noted. 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 statistically significant difference with unpaired students t-test.

3.RESULTS:

Mean age, weight, sex distribution in both groups are nearly same without any significant differences. P ≥0.05. there was no significant difference between the groups with mean intraoperative and postoperative BP, PR.

the mean duration of caudal analgesia in group BD was 9.88±0.90. The mean duration of caudal analgesia in group RD was 13.98±0.95. It shows the duration was significantly prolonged in group RD (P0.0001)

the mean FLACC pain score was less in pts belonging to RD group throughout the initial 12hrs of the postop period. The mean FLACC score of group BD was 6.49±1.72 while that of group RD was

5.82±1.02: with p value of 0.0716, which was statistically insignificant.

TABLE-1 HEMODYNAMIC DATA

PREOPERATIVE VITALS (mean±SD)	Group BD	Group RD	P value
PULSE	115.6±11.58	115.4±10.22	0.943
BP	91.04±8.46	91±6.81	0.98
INTRA OPERATIVE VITALS (mean±SD)			
PULSE	114±9.8	112±11.5	0.47
BP	88.3±5.44	89.9±6.84	0.3201
POSTOPERATIVE VITALS (mean±SD)			
PULSE	112±8.85	110±9.3	0.39
BP	88.1±6.13	90.4±6.01	0.147

TABLE-2 DURATION OF CAUDAL ANALGESIA

	GROUP RD	GROUP BD
MEAN DURATION OF CAUDAL ANALGESIA	9.88±0.90	13.98±0.95
P value	0.0001	

FIGURE 1 : DURATION OF CAUDAL ANALGESIA AND FLACC SCORE

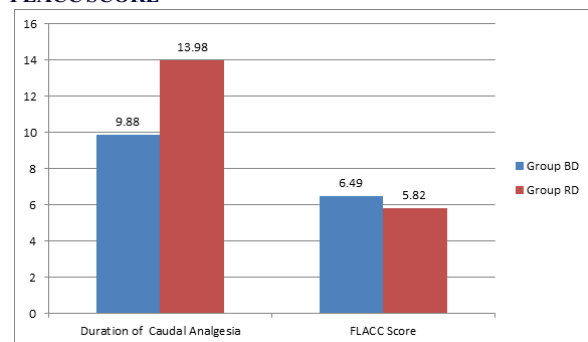


TABLE-3: POSTOPERATIVE COMPLICATIONS

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

4.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 mean 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 in comparison to Bupivacaine has a wider margin of safety, less motor blockade, less cardiovascular and neurological toxicity. It can be safely used for regional anesthesia in the ambulatory setting in pediatrics. Like clonidine, dexmedetomidine also enhance the effects of LA without increasing the incidence of side effects. 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 dexmedetomidine 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. Pharmacodynamic effects of dexmedetomidine have been studied thoroughly in adults. Nowadays investigations on pediatric group described the

pharmacokinetics and pharmacodynamic effects in randomised controlled trials. The advantage of dexmedetomidine than other sedatives 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. Administered dexmedetomidine and clonidine in a dose of 2microgram/kg with 0.25% bupivacaine caudally. They found that the duration of analgesia was higher in groups receiving adjuvants (median 95% CI) 16hrs index and median (95% CI) 12hrs in clonidine than the group with plain bupivacaine (median 95% CI) 5hrs. Noogi et al compared clonidine 1microgram/kg and dexmedetomidine 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 in dexmedetomidine group. The incidence of adverse effects was statistically insignificant between three groups. We observed from our study that the duration of postop analgesia in group BD was 9.8±0.90 compared with 13.98±0.95 hrs in group RD with a P value of (0.0001). Group BD patients achieved higher FLACC score than group RD patients. The preop, intraop, and post op hemodynamic variables between groups were comparable and were not statistically significant. No significant postoperative complication such as PONV, respiratory depression, urinary retention, pruritus, hypotension, bradycardia were observed. The results of our observations shows that the addition of dexmedetomidine to ropivacaine provides longer duration of postop analgesia than the addition of dexmedetomidine with bupivacaine. In addition to that the dexmedetomidine with ropivacaine group has low FLACC score than dexmedetomidine with bupivacaine group. Addition of dexmedetomidine in both groups provide stable hemodynamics which are in concordance with the reports published by several authors.

5.CONCLUSION:

Caudal dexmedetomidine 1microgram/kg with 0.25% ropivacaine 1ml/kg for pediatric lower abdominal surgeries provide longer duration of postop analgesia of 13.98±0.95hrs in comparison to 9.88±0.90hrs in caudal dexmedetomidine 1microgram/kg with 0.25% bupivacaine 1ml/kg. The dexmedetomidine with ropivacaine has low FLACC score than dexmedetomidine with bupivacaine. Because ropivacaine has a wider margin of safety, less cardiotoxic, less neurotoxic, and less motor blockade than bupivacaine, the pediatric Caudal dexmedetomidine with ropivacaine is the better and safety drug. So dexmedetomidine as an adjuvant to ropivacaine increases the duration of pediatric caudal analgesia without increase the adverse effects in infraumbilical surgeries.

6. REFERENCES :

- Deng XM, Xio WJ, Tang GZ, Luo MP, Xu KL. The minimum local anaesthetic concentration of fentanyl for caudal analgesia in children. *Anest Analg*. 2002;94:1465-8
- Birbircer H, Doruk N, Cinel I, Atici S, Avlan D, Bilgin E, et al. Could adding magnesium as adjuvant to ropivacaine in caudal anaesthesia improve postoperative pain control. *Pediatr Surg Int*. 2007;23:195-8 (Pub Med)
- Ray M, Mondol SK, Biswas A. Caudal analgesia in paediatric patients: Comparison between bupivacaine and ropivacaine. *Indian J Anaesth*. 2003;47:275-8.
- El-Hennawy AM, Abd-Elwahab AM, Abd-Elmaksoud A M, El-Ozairy HS, Boulis SR. Addition of clonidine or dexmedetomidine to bupivacaine prolongs caudal analgesia in children. *RJ Anaesth*. 2009;103:268-74
- Ibacheche M, Munoz H, Brandes V. Single-dose dexmedetomidine reduces agitation after sevoflurane anaesthesia. *Anaesth Analg*. 2004;98:60-3
- Aono J, Ueda W, Mamiya K. Grater incidence of delirium during recovery from sevoflurane in preschool boys. *Anaesthesiology*. 1997;87:1298-300.
- Merkel SI, Vooel-Lewus T, Shayevitz JR, Malviya S. The FLACC: A behavioral scale for scoring postoperative pain in young children. *Pediatr Nurs*. 1997;23:293-7
- Ramsay MA, Kuterman DL. Dexmedetomidine as a total intravenous anaesthetic agent. *Anaesthesiology*. 2004;101:787-90
- De Negri P, Ivani G, Visconti C, de Vivo P. How to prolong post operative analgesia after caudal anaesthesia with ropivacaine in children: S-ketamine vs clonidine. *Pediatr Anaesth*. 2001;11:679-83
- Ivani G, De Negri P, Lonnqvist PA, L'Erario M, Mossetti V, Difilippo A, et al. Caudal anaesthesia for minor paediatric surgery: A prospective randomized comparison of ropivacaine 2% vs levobupivacaine 0.2% *Pediatr Anaesth*. 2005;15:491-4.
- 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
- Hansen TG, hennenberg SW, Walther-Larsen S, Lund J, Hansen M. Caudal bupivacaine supplemented with caudal or intravenous clonidine in children undergoing hypospadias repair: A Double blind study. *Br J Anaesth*. 2004;92:223-7
- Yoshitomi T, Kohjitanai A, Maeda S, Higuchi H, Shimada M, Miyawaki T. Dexmedetomidine enhance the local anaesthetic action of lidocaine via an alpha2 Adrenoceptor. *Anaesth Analg*. 2008;107:96-101
- Petroz GC, Skich N, James M, van Dyk H, Shafer SL, Schily M, et al. A PHASE II, two-center study of the pharmacokinetics and pharmacodynamics of dexmedetomidine in children. *Anesthesiology*. 2006;105:1098-1100
- Tobias JD, Berkebosch JW. Initial experience with dexmedetomidine in pediatric aged patients. *Paediatr Anaesth*. 2002;12:171-5

16. Ard J, Doyle W, Bekker A. A wake craniotomy with dexmedetomidine in pediatric patients. *J Neurosurg Anaesthesiol.*2003;15:263-6
17. Berkenbosch JW,Wankum PC,Tobias JD.Propective evaluation of dexmedetomidine for noninvasive procedural sedation in children. *Pediatr Crit Care Med.*2005;6:435-39
18. Nichols DP, Berkenbosch JW, Tobias JD.Rescue sedation with dexmedetomidine for diagnostic imaging ;A preliminary report. *Paediatr Anaesth.*2005;15:199-203
19. Koroglu A,Tecksan H,Sagir O,Ycel A,Toprak HI,Ersoy OM. A comparison of the sedative,hemodynamic and respiratory effects of dexmedetomidine and propofol in children undergoing magnetic resonance imaging. *Anaest Analg.*2006;103:63-7
20. Koroglu A,DemirbilekS,Teksan H,Sagir O,But AK,Ersoy MO.Sedative,hemodynamic and respiratory effects of dexmedetomidine in children undergoing magnetic resonance imaging examination:Preliminary results. *Br J Anaesth.*2005;94:821-4.
21. 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.