

COMPARISON OF CAUDAL BLOCK ALONE WITH CAUDAL BLOCK PLUS INTRAVENOUS DEXAMETHASONE FOR POSTOPERATIVE ANALGESIA IN CHILDREN UNDERGOING ORCHIDOPEXY UNDER GENERAL ANAESTHESIA

BANGASH L.R., AFZAL F., HUSSAIN S. AND ALI K.

Department of Anaesthesia, King Edward Medical University / Mayo Hospital, Lahore, Pakistan

ABSTRACT

Background: Caudal block involves injection of local anaesthetic in the caudal epidural space and is commonly used for providing analgesia in children undergoing infra-umbilical surgeries like orchidopexy. The role of intravenous dexamethasone in prolonging the duration of caudal block is a new concept. Prolonged duration of analgesia not only keeps the patient pain free for an extended period of time but also reduces the cost of treatment when it comes to analgesic drugs and duration of hospital stay.

Objective: To compare the efficacy of caudal block alone with caudal block plus intravenous dexamethasone for postoperative analgesia in children undergoing orchidopexy under general anaesthesia.

Methodology: In this randomized controlled trial 100 children (ages 1 – 5 years) planned to undergo orchidopexy were randomly allocated to two groups A and B. In both groups after induction with halothane and succinylcholine 1.5 mg/kg, caudal block was performed by injecting 0.25% bupivacaine 0.5 ml/kg using a 22 gauge needle. Patients in group A were also given injection dexamethasone 1.5 mg/kg intravenously. Surgery was allowed to proceed 10 minutes after caudal block in both groups. Postoperative pain was assessed in both groups using FLACC score 5 minutes after extubation and then after every 30 minutes till a FLACC score of 5 was obtained at which point first dose of acetaminophen was given. Time to first analgesic dose was noted in both groups and compared using Independent sample t test.

Results: Mean duration of analgesia turned out to be 621.60 ± 25.743 and 402.40 ± 34.792 in group A and group B respectively with a P value of < 0.0001 .

Conclusion: Dexamethasone, when given intravenously just after caudal block is administered, effectively prolongs the duration of caudal block in paediatric patients undergoing orchidopexy.

Key Words: Caudal block, dexamethasone, analgesia, postoperative, orchidopexy, children.

INTRODUCTION

About 2 – 5% of full term male babies have cryptorchidism (undescended testes). Cryptorchidism if left untreated not only leads to infertility but also increases the risk for testicular carcinoma.¹ The condition is surgically treated, by a procedure called orchidopexy. Pain after surgical procedure is one of the most common problems encountered. During any surgical procedure, tissue destruction occurs which results in activation of various enzymatic reactions leading to production of prostaglandins and other mediators of pain. This process not only occurs at the site of injury but also via blood borne mechanism centrally.² Poorly controlled postoperative pain can have various effects on the patient like nausea, vomiting, elevated blood cortisol levels leading to increase in heart rate and hypertension which are particularly devastating for patients with pre-existing cardiovascular compromise. Urinary retention

and reduced immune response leading to increased risk of infection are among the other effects.³ For mild to moderate pain non-steroidal anti-inflammatory drugs (NSAIDs) are used. Acetaminophen, ibuprofen, salicylates and diclofenac are some of the examples of NSAIDs. They inhibit prostaglandin synthesis centrally and peripherally by inhibiting cyclooxygenase – I and cyclooxygenase – II. They are administered most commonly by oral route. A few of them can be administered intravenously as well e.g. ketorolac. Opioids have also been used for pain management in children; however they have many undesirable side effects including sedation, respiratory depression, nausea, vomiting, constipation, dependence and hyperalgesia.⁴ It must be noted that both opioids and NSAIDs demonstrate a “ceiling effect” and further pain relief is not possible once that level is achieved.⁵ Over the past few decades, the concept of regional anaesthesia in chil-

dren has dramatically changed. It not only provides excellent analgesia but also shortens the duration of hospital stay.⁵ These blocks also provide an opportunity to limit the use of opioids, thereby avoiding their side effects which are very distressing at times for the patients.⁶

Several treatment modalities are being used to reduce the postoperative pain associated with infraumbilical surgeries in children such as orchidopexy. Caudal block being the most common among them.⁷ Dexamethasone, apart from being an antiemetic for postoperative nausea and vomiting, also has analgesic and anti-inflammatory properties.⁸ Several studies have shown that dexamethasone prolongs the analgesic effect of non steroidal anti-inflammatory drugs. Glucocorticoids exert their analgesic effects by inhibiting phospholipase and COX II, thus blocking the synthesis of prostaglandins.²

Jokela et al showed in their study that intravenous dexamethasone, 15 mg, given prior to induction of anaesthesia reduces the consumption of oxycodone in first 24 hours of postoperative period. During first 2 hours after surgery, dexamethasone 10 mg reduces the oxycodone consumption as effectively as the 15 mg dose.⁸

Hong et al suggested that intravenous dexamethasone when given with caudal block, prolonged its duration by 50%.⁷ Need of administering first dose of oral acetaminophen was significantly delayed in the dexamethasone group than in control group (646 ± 149 vs. 430 ± 205 min)⁹.

The use of dexamethasone can effectively prolong the effect of caudal block to nearly double the time as proven in international literature. Data regarding this is not available in our setup, as genetic variability has been noted regarding response to various modes of analgesia,⁷ so this study will provide the base line information that benefits the patient in our population in terms of analgesia and cost effectiveness.

MATERIALS AND METHODS

After approval of the ethical committee and informed parental consent 100 ASA I and II male children of ages 1 - 5 years and weight up to 20kg planned to undergo orchidopexy under general anaesthesia were included in the study (Non probability purposive sampling). Children with hypersensitivity to any local anaesthetic based on history, bleeding diathesis by doing PT/APTT and bleeding time, and infections at the puncture site or neurological deficit were not included. Patients were allocated to group A and B using a random number table.

Data Collection Procedure: After arrival in the operation theatre standard monitors such as pulse oximeter, electrocardiogram (ECG) and non-invasive blood pressure monitor (NIBP) were applied. Inhalational induction with halothane in oxygen was carried out. Intravenous (I/V) line was then secured. After giving inj. suxamethonium, 1.5 mg/kg, intubation was done using appropriate sized endotracheal tube. Anaesthesia was maintained with isoflurane 2% and 50% nitrous oxide in oxygen. Patients were placed in lateral position and caudal block was performed by the anaesthetist using short beveled 22 gauge needle. After aseptic measures and identifying the space by loss of resistance method with normal saline and negative aspiration for blood and cerebrospinal fluid, patients received injection bupivacaine plain 0.25%, 0.5 ml/kg body weight. After performing caudal block, the patients in group A were given intravenous dexamethasone 1.5 mg/kg in 5ml while patients in group B received same volume of normal saline. Surgery was allowed to start 10 minutes after the block. At the end of surgery patients were given 100% O₂ and were extubated when awake. Pain was assessed 5 minutes after extubation and then every 30 minutes till the FLACC score became 5 at which point first dose of acetaminophen was given to the patients and time noted starting from 5 minutes after extubation to the first dose of oral analgesic. Both researchers who administered I/V injection

Table 1: *The FLACC Pain Scale.*

Categories	Scoring		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant frown, clenched jaw, quivering chin
Leg	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back n forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers, occasional complaints	Cry steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or talking to, distractible	Difficulty to console or comfort

and those who recorded FLACC score and time were not aware of the group of the patients thus ensuring blindness.

Data Analysis: All data was entered and analyzed in SPSS version 16.0. Time to first rescue analgesia in two groups was noted in terms of minutes, mean and standard deviation calculated and compared using independent sample t test. P-value ≤ 0.05 was considered significant with confidence level of 95%.

RESULTS

The demographic profile of the patients in both groups with regards to age was comparable in both groups. Each group had patients with age ranging from 1 to 5 years. The mean age of patients in group A turned out to be 3.14 ± 1.702 years while that in group B it was 3.24 ± 1.546 . The analgesia due to caudal block lasted for a minimum and maximum period of 570 and 660 minutes respectively in group A while the figures turned out to be 320 and 420 minutes for group B. Comparison of mean duration of analgesia was 621.60 ± 25.743 and 402.40 ± 34.792 minutes in group A and group B respectively with a P value of < 0.0001 .

DISCUSSION

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.¹⁰ Children with significant postoperative pain may demonstrate anxiety, fright, insomnia which often exacerbate their pain perception rendering the postoperative recovery period an unpleasant and traumatic experience. Other deleterious consequences of pain include sleep disturbance, nausea, vomiting, prolonged hospital stay and parental dissatisfaction.¹¹⁻¹³ So providing them comfort in postoperative period is a highly desirable yet challenging task. Oral analgesics cannot be given to the children in immediate postoperative period. Also, there are side effects of opioids such as nausea, vomiting, itching and above all respiratory depression. Similarly, non-steroid anti-inflammatory drugs are at times contraindicated because the renal function is not fully mature in the early years of life.¹⁴⁻¹⁶ Regional anaesthesia not only provides an extended pain free period but also reduces the stress responses of surgery.¹⁴ Caudal block has been found to be an excellent and safe technique for providing postoperative analgesia in paediatric population with a high success rate. However the single shot of caudal block provides analgesia for a limited period of time. To increase this duration, various methods have been uti-

Table 2: Distribution of cases by age.

Groups	Group A	Group B
Total Number of Cases	50	50
Maximum Age (Years)	5	5
Minimum Age (Years)	1	1
Mean Age	3.14	3.24
Standard Deviation	± 1.702	± 1.546

Table 3: Comparison of minimum and maximum duration of analgesia in two study groups.

Group	Minimum duration of analgesia (minutes)	Maximum duration of analgesia (minutes)
Group A Caudal + I/V dexamethasone	570	660
Group B Caudal block alone	320	450

Table 4: Comparison of mean duration of analgesia in two study groups.

Group	Mean duration of analgesia (minutes)	Standard deviation
Group A Caudal plus I/V dexamethasone	621.60	25.743
Group B Caudal block alone	402.40	34.792
P Value	< 0.0001	

lized. The use of catheter technique did not gain popularity because of risk of infections.^{14,17,18} Various additives have been tried successfully till now to increase the duration of caudal block including epinephrine, clonidine, dexmedetomidine, neostigmine, ketamine, morphine, tramadol and fentanyl. However they do have their share of undesirable side effects.^{17,19,20}

Our study shows that intravenous dexamethasone significantly prolongs the duration of caudal block (P < 0.0001). Thus those patients who were given intravenous dexamethasone along with caudal block (group A) enjoyed a much longer period of postoperative analgesia than those in group B who received caudal block alone. Patients were given analgesia at a FLACC score of 5 or more. There were no failed blocks in our study and all patients had effective caudal block for a minimum duration of 5 hours approximately.

The results in our study were comparable to those of Hong et al who showed that the mean duration of analgesia after caudal block reaches up to 646 minutes if intravenous dexamethasone is administered to the patients.¹²

The proposed mechanism of this prolongation in duration of caudal block is the strong anti-inflammatory property of dexamethasone.^{8,9,21}

Use of dexamethasone for prolonging the caudal block is a new concept. However Bigat et al showed in their study that addition of 8 mg of dexamethasone to lignocaine (3 mg/kg) for intravenous regional anaesthesia significantly lowers the pain score and hence the need for analgesia in first 24 hour after surgery. The number of patients who requested for analgesia in postoperative period were significantly lower in lingo-caine plus dexamethasone group ($P = 0.033$).²¹

Jokela et al concluded in their study that intravenous dexamethasone in a dose of 15 mg administered before induction of anaesthesia decreased the consumption of oxycodone in the first 24 hours of laparoscopic hysterectomy.⁸

Dexamethasone unlike other intravenous adjuncts or additives to caudal block does not cause problems like prolonged sedation, vomiting or urinary retention, rather dexamethasone has anti emetic properties and is used for prevention of postoperative nausea and vomiting.²²⁻²⁴ Also as dexamethasone in our study is used intravenously and not in caudal space, concerns regarding its neurotoxicity are not valid.

Dexamethasone in high doses or in continuous use can produce side effects like hyperglycemia and adrenocortical suppression but single dose of 1.5 mg/kg used in our study is not likely to produce such harmful effects. Therefore in the absence of any contraindications to its use intravenous dexamethasone can be used as an effective, safe and economical adjunct to caudal block. Further studies to investigate effect of dexamethasone on onset of block and duration of motor block can also be carried out.

It is **concluded** that dexamethasone, when given intravenously just after caudal block is administered, effectively prolongs the duration of caudal block in pediatric patients undergoing orchidopexy.

ACKNOWLEDGMENTS

We are thankful to the administration of King Edward Medical University / Mayo Hospital Lahore, all the respected faculty of Department of Anaesthesiology and medical, para-medical staff working in the Paediatrics Operation theatre and Ward for the help, support and facilitation to complete this study.

CONFLICT OF INTEREST

There is no conflict of interest among the authors of this article.

REFERENCES

- Petterson A, Richiardi L, Nordenskjold A, Kaijser M and Akre O. Age at surgery for un-descended testis and testicular cancer. *N Engl J Med*. 2007; 356: 1835-41.
- Kjetil H, Sem TK, Ellen S, Johan R. The prolonged post-operative analgesic effect when dexamethasone is added to a non-steroidal anti-inflammatory drug (refocoxib) before breast surgery. *Anesth Analg*. 2007; 105: 481-86.
- Postoperative pain [internet]. 2012 [cited 2012 Aug 04].
- Benyamin R, Trescot AM, Datta S, et al. Opioid complications and side effects. *Pain Physician* 2008; Opioid special issue: 105-20.
- Yaster M, Byerly SK. Acute pain management in children [internet]. 2009 Mar 14 [cited 2012 Aug 10].
- Suresh S, Barcelona SL, Young NM, et al. Postoperative pain relief in children undergoing tympanomastoid surgery: Is a regional block better than opioids? *Anesth Analg*. 2002; 94: 859-62.
- Hejazi MS. Comparison of pre and post surgical caudal block in reducing stress response in children. *Pak J Med Sci*. 2008; 24: 344-47.
- Jokela RM, Ahonen JV, Tallgren MK, Marjakngas PC, Korttila KT. The effective analgesic dose of dexamethasone after laparoscopic hysterectomy. *Anesth Analg*. 2009; 109: 607-15.
- Hong JY, Han SW, Kim WO, Kim EJ, Kil HK. Effect of dexamethasone in combination with caudal analgesia on postoperative pain control in day – case paediatric orchidopexy. *Br J Anaesth*. 2010; 105: 506-10.
- Strauss M, Lebowitz H, Boyle PJ, eds. *Clinical Anesthesiology*, 4th ed. New York: McGraw – Hill 2006: 361.
- Chatterjee US. Preemptive analgesia in paediatric surgery. *Afr J Paediatr Surg*. 2011; 8: 267-8.
- Jaichandran VV, Indermohan B, Jagadeesh V, et al. A multimodal approach to postoperative pain relief in children undergoing ambulatory eye surgery. *Indian J Anaesth*. 2008; 52: 794.
- 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: 340-6.
- Adarsh ES, Mane R, Sanikop CS, Sagar SM. Effect of pre-operative rectal diclofenac suppository on post-operative analgesic requirement in cleft palate repair: A randomized clinical trial. *Indian J Anaesth*. 2012; 56: 265-9.
- Kamath MR, Mehandale SG, Raveendra US. Comparative study of greater palatine nerve block and intravenous pethidine for postoperative analgesia in children undergoing palatoplasty. *Indian J Anaesth*. 2009; 53: 654-61.
- Singh R, Kumar N, Singh P. Randomized controlled trial comparing morphine and clonidine with bupivacaine for caudal analgesia in children undergoing upper abdominal surgery. *Br J Anaesth*. 2011; 106: 96-100.
- Parameswari A, Dhev AM, Vakamudi M. Efficacy of clonidine as an adjuvant to bupivacaine for caudal analgesia in children undergoing sub-umbilical surgery. *Indian J Anaesth*. 2010; 54: 458-63.
- Kumar P, Rudra A, Pan AK, Acharya A. Caudal additives in paediatrics: a comparison among midazolam, ketamine, and neostigmine co-administered with bupivacaine. *Anesth Analg*. 2005; 101: 69-73.

19. Schnabel A, Poepping DM, Kranke P, Zahn PK, Pogatzki-zahn EM. Efficacy and adverse effects of ketamine as an additive for paediatric caudal anaesthesia: a quantitative systemic review of randomized controlled trials. *Br J Anaesth.* 2011; 107: 601-11.
20. Bigat Z, Boztug N, Hadimioglu N, et al. Does dexamethasone improve the quality of intravenous regional anaesthesia and analgesia? A randomized, controlled clinical study. *Anesth Analg.* 2006; 102: 605-9.
21. Bajwa SJ, Kaur J, Bajwa SK, et al. Caudal ropivacaine – clonidine: A better postoperative analgesic approach. *Indian J Anaesth.* 2010; 54: 226-30.
22. Choudhary J, Bano S, Ahmed M, Zaidi MN. A prospective study of postoperative vomiting in children undergoing different surgical procedures under general anaesthesia. *Indian J Anaesth.* 2008; 52: 159-63.
23. Laiq N, Adnan, Khan MN, Khan S. Dexamethasone reduces postoperative nausea and vomiting in children undergoing tonsillectomy. *Ann Pak Inst Med Sci.* 2005; 1: 158-61.
24. Malhotra D, Gurcoo S, Qazi S, Gupta S. Randomized comparative efficacy of dexamethasone to prevent post-extubation upper airway complications in children and adults in ICU. *Ind J Anaesth.* 2009; 53: 442-9.