Comparison of Caudal Tramadol-Bupivacaine and Ketamine-Bupivacaine For Postoperative Analgesia In Children

Rukhsana Samad, Tahira Hakim Shah

ABSTRACT

Objective — *To compare the duration of postoperative analgesia and side effects of caudal tramadol – bupivacaine with ketamine – bupivacaine in children.*

Study design — *Randomised controlled trial.*

Place & Duration of study — *Department of Anesthesiology and Intensive Care, Kuwait Teaching Hospital Peshawar, from September 2010 to March 2011.*

Methodology — *Thirty four children, American Society of Anesthesiologist (ASA) physical status Iand II, aged 3-8 year undergoing inguinoscrotal surgeries were randomly assigned to receive a caudal injection of either tramadol 2 mg/kg plus bupivacaine 0.5 mg/kg of 0.25% (group-A, n=17) or ketamine 1 mg/kg plus bupivacaine 0.5 mg/kg of 0.25 % (group- B, n=17) immediately after induction of general anesthesia. No analgesics were given intraoperatively. Postoperative analgesia was evaluated by modified objective pain scoring system (MOPS) and sedation was assessed by five point sedation score at predetermined time point. Postoperative analgesia was supplemented with syrup paracetamol or syrup ibuprofen when (MOPS) was = 4. Cardiorespiratory data, respiratory depression, nausea, vomiting, urinary retention, psychomotor effects and motor block were recorded in all patients.*

Results — *Caudal tramadol with bupivacaine produced significantly increased postoperative analgesia. The duration of postoperative analgesia was 17.88± 1.96 hours in tramadol – bupivacaine group as compared to 12.05 ±1.63 hours in ketamine – bupivacaine group. The sedation score was high in tramadol – bupivacaine group only during 1st hour postoperatively. No other side effects like respiratory depression, urinary retention, pruritus were found in any group. The demand for rescue analgesia was high (n=2.41 ± 0.50) in ketamine - bupivacaine group as compared to tramdol-bupivacaine group (n=0.41 ± 0.6). Four children in ketamin - bupivacaine group experienced psychomotor effects.*

Conclusion — *Caudal tramadol-bupivacaine provided longer time of postoperative analgesia without having significant side effects but with higher sedation score for one hour postoperatively.*

Key words — *Caudal analgesia, Post-operative pain, Bupivacaine, Tramadol, Ketamine.*

INTRODUCTION:

Postoperative pain is the most distressing symptom experienced by the patient. Pain induces metabolic, hormonal and cardiorespiratory response that affect the outcome of surgery.[1] Metabolic stress response can be avoided if analgesia is provided thirty minutes prior to incision which stays well into postoperative period and saves the patients from the hazards of neuroendocrine stress response.[2]

The importance of adequate analgesia is well established in adults but since children cannot express their feeling of pain, they were frequently ignored and given secondary importance.[3] In recent years pain control in children has received

Correspondence:
Dr. RukhsanaSamad
Department of Anaesthesiology & Intensive care
Kuwait Teaching Hospital/Peshawar Medical College
Peshawar.
E-mail: jia_kgmc@hotmail.com

considerable attention particularly with evolution of regional anesthetic techniques. Analgesia introduced into subarachnoid, epidural or caudal space cause little change in body chemistry and minimal stress response.[4] Bupivacaine is the most often used local anesthetic for caudal blocks in children. It provides analgesia which lasts for only 4-12 hours. Rescue analgesia is thus required when effect of block wears off.

Different drugs like morphine, tramadol, fentanyl, ketamine, clonidine and midazolam were added to caudal space to prolong the postoperative analgesia. They were used in varying concentrations in different studies to achieve maximum benefit.[5-8] Addition of morphine to caudal bupivacaine provides excellent analgesia but the incidence of side effects is high like respiratory depression, nausea, vomiting and urinary retention.[9] Other combinations like clonidine and midazolam have potential risks of hypotension and sedation although they provide improved analgesia.[10,11] Several studies have been done to demonstrate analgesic efficacy of using caudal tramadol and caudal ketamine in postoperative period. In this regard different doses of caudal tramadol and ketamine have been used yielding varying results. The objective of present study was to compare the analgesic efficacy and side effects of tramadol and ketamine when used with caudal bupivacaine and to determine the better analgesic option for postoperative pain reflief in children.

METHODOLOGY:

It was randomized controlled trial carried out from September 2010 to March 2011 at the Department of Anesthesiology and Intensive Care Unit, Kuwait Teaching Hospital Peshawar. Thirty four children undergoing elective inguinoscrotal surgeries aged three to eight year, ASA physical status I and II were recruited into the study.

Active infectious process, neurological disorder, bleeding and coagulation disorders, anti coagulant therapy, aspirin ingestion in preceding week, infection at the site of injection, abnormality of vertebral column and raised intracranial pressure were taken as the exclusion criteria. No premedication was given to the children. Patients were induced with inhalational anesthetic agent halothane in O_2 and N_2O or with intravenous (IV) propofol and appropriate sized endotracheal tube passed after using injection atracurium 0.5 mg/kg body weight. No intraoperative opioids or benzodiazepines were used. Monitoring was done with SPO_2 with pulse oximeter, blood pressure and respiratory rate intraoperatively at 5 minutes interval and postoperatively half hourly for first six hours and then two hourly thereafter.

After induction of GA caudal block was performed using 23 guage needle under aseptic conditions. After negative aspiration for blood and CSF, drugs were injected into the caudal epidural space. Children were randomized to one of the two groups for caudal anesthesia. Patients in group-A (n=17) received tramadol 2 mg/kg plus bupivacaine 0.5ml/kg of 0.25% and those in group-B (n=17) received ketamine 1 mg/kg plus bupivacaine 0.5 ml/kg of 0.25%. The anesthetist was not blinded to the drugs used. After completion of the block children were turned to supine position and surgical incision made. Anesthesia was maintained till the dressing was applied to the incision. Duration of operation was noted. i.e. time from skin preparation to application of dressing. Anesthetic agents stopped when dressing was applied to the wound and time to spontaneous eye opening noted. Sedation was assessed at 30 min, 1, 2, 4 and 6 hours using an objective score based on eye opening.

Eye opening spontaneously = 0
Eye opening in response to verbal stimulation = 1
Eye opening in response to physical stimulation = 2
Unresponsive = 3

Pain was assessed by Modified Objective Pain score (MOPS). MOPS is an observational pain scoring system which has been validated for use by parents.[12] Score describes five points: crying, agitation, movement, posture, localization of pain. Each observation scores from 0-2 to get a total of 0-10. The score would appear to have some limitations in preverbal children so it was a better pain assessment tool in this study where minimum age of the children was three years. When MOPS reached 4 or more, rescue analgesia was given in the form of syrup paracetamol 15 mg/kg 6 hourly or syrup ibuprofen 5 mg/kg 6 hourly by mouth.

Duration of analgesia was described as time between caudal injections to 1st dose of analgesia demanded. All the children remained in the hospital for 24 hours along with their parents. The existence of motor block, urinary retention, respiratory depression, nausea, vomiting, pruritus and psychomotor effects were noted. Duration of motor block was assessed by determining the time of caudal injection to time child started moving his legs. All results were expressed as mean± SD (Standard deviation). Student t-test was used for continuous variables and Chi square test for categorical variables with significant level set at $p < 0.05$.

RESULTS:

Age, weight, gender distribution, ASA physical status and duration of surgery were comparable in group-A and group-B (table I). Hemodynamic data and respiratory rate were statistically similar in both the groups (table II). There was not a single case of respiratory depression in any of the groups, although there were concerns regarding respiratory depression in tramadol group.

Mean duration of postoperative analgesia was significantly longer in group-A (17.88 ± 1.96 minutes) as compared to group-B (12.0 ± 1.63 minutes) as shown in table I. In group-A six (35%) children needed rescue analgesia during the first 24 hours postoperatively while in group-B all children needed supplementary analgesia. The doses of supplementary analgesia were also low in group-A (n=0.41 ± 0.61) as compared to group-B (n=2.41 ± 0.50). This is shown in table III.

The time for emergence from anesthesia to awakening i.e. spontaneous eye opening was not similar in both the groups. Patients in tramadol group took longer for spontaneous eye opening (33.88 ± 6.46 minutes) as compared to ketamine group (19.41 ± 3.04 minutes). After one hour postoperatively the sedation score was similar in both the groups (table III).

No other complications like respiratory depression, pruritus, urinary retention occurred except emesis which occurred in three patients in group-A and two patients in group-B. Time to spontaneous leg movement and time to first micturition were not prolonged and there was no clinical difference among the two groups recovery characteristic are shown in table IV.

DISCUSSION:

The addition of tamadol to caudal bupivacaine in this study prolonged the duration of postoperative analgesia. These results are consistent with

Table I: Demographic Data

Drug Group	Group-B (n = 17)	Group-A (n = 17)	p-value
Age (year)	5.0 ± 1.76	5.52 ± 1.8	0.394
Gender M/F	13/4	14/3	0.657
Weight (Kg)	17.7 ± 3.47	18.35 ± 3.70	0.603
ASA Physical Status	I	I	

Table II: Changes in Intraoperative Variables From Baseline

Drug Group	Group B (n = 17)	Group A (n = 17)	p-value
Mean Arterial Pressure (Baseline) (mm Hg)	70.70 ± 4.70	68.47 ± 4.07	0.148
Mean Arterial pressure (Intraoperative) (mm Hg)	69.11 ± 6.30	66.11 ± 3.95	0.106
Mean Heart Rate/ min (Baseline)	94.29 ± 8.00	90.17 ± 7.71	0.137
Mean Heart Rate/min (Intraoperative)	89.70 ± 8.56	84.47 ± 6.29	0.158
Mean Respiratory Rate/min (Baseline)	14.82 ± 1.33	15.23 ± 1.85	0.463
Mean Respiratory Rate/min (Intraoperative)	14.64 ± 1.16	14.17 ± 1.28	0.273

Values are expressed as mean± SD

Table III: Comparison of Mean Duration of Analgesia And Mean Doses of Analgesia Required In First 24 Hours Postoperatively

	Group-B	Group-A	p-value
Duration of analgesia (hours) mean + SD	12.05 ± 1.63	17.88 ± 1.96	0.000
Doses of analgesia in first 24 hours. after surgery mean + SD	2.41 ± 0.50	0.41 ± 0.61	0.000

Values are expressed as mean ± SD

Table IV: Recovery Characterristics			
Group	**Group-B (n = 17)**	**Group-A (n = 17)**	**p-value**
Duration of Surgery (min)	24.76 ± 6.91	25.82 ± 5.60	0.627
Time to Spontaneous Eye Opening (min)	19.41 ± 3.04	33.88 ± 6.46	0.000
Time to Spontaneous Leg Movement (hours)	2.35 ± 0.48	2.38 ± 0.49	0.835
Time to first Micturition (hours)	3.56± 0.54	3.33 ± 0.57	0.253
Number of patients requiring Anti-emetics (n)	3 (17.6 %)	2 (11.7 %)	0.647

Values are expressed as mean ± SD

previously published results.[13,14] Khan RA and colleagues observed that tramadol was more effective than bupivacaine when used as a single shot caudal analgesia.[15] Similarly Ozkan et al had demonstrated that 2 mg/kg body weight of caudal tramadol was superior to caudal bupivacaine in analgesic efficacy and decreases the need for postoperative analgesia.[16]

Parkash and colleagues studied caudal tramadol plus bupivacaine. They have used different doses of 1mg, 1.5mg, and 2mg/kg plus 0.5 ml/kg of 0.25% bupivacaine. They observed that prolonged postoperative analgesic period was observed when 2mg/kg of tramadol was used.[17] In another study by Senel and colleagues the efficacy of caudal tramadol and bupivacaine in children undergoing inguinal herniorraphy the results showed that patients who received bupivacaine 0.25ml/kg body weight and tramadol 1.5mg/kg body weight had a significant longer time to administration of first analgesic (13±2 hours).[18] The difference in the duration of their analgesia as compared to present study is perhaps due to the low concentration of both the agents used.

The frequency of of nausea and vomiting was quite low in present study which was the concern in other study with a dose of 2 mg/kg of tramadol.[19] Ketamine has a risk of psychomimetic adverse effects such as hallucination, emergence delirium etc. In our study six children experienced hallucination or emergence delirium. This complication of caudal ketamine has been reported when doses like 0.5-1.0 mg/kg were used. Hallucinations were not experienced when a dose of 0.25mg/kg was used though when smaller doses are used, the required postoperative analgesic effect was not achieved.[20]

CONCLUSION:

Tramadol 2 mg/kg when administered caudally with bupivacaine provided prolonged analgesia and its use was safe in children.

REFERENCES:

1. Desborough JP. The stress responses to trauma and surgery. Br J Anaesth. 2000;85:109-17.
2. Sekar C, Rajasekaran S, Kannan R, Reddy S, Shetty TA, Pithwa YK. Pre emptive analgesia for post-operative pain relief in lumbosacral spine surgeries: A randomized controlled trial. Spine J. 2004;4:261-4.
3. Rana S. Pain: a subject ignored. Pediatrics. 1987;79:309.
4. Haider S, Sultan ST. Intrathecal anesthesia for transurethral resection of prostate. Our experience at Civil hospital Karachi. Med Spectrum. 2000;21:10-13.
5. Vergjese ST, Hannallah RS, Rice LJ, Belman AB, Patel KM. Caudal anesthesia in children: effect of volume versus concentration of bupivacaine on blocking spermatic cord traction response during orchidopexy. Anesth Analg. 2002;95:1219-23.
6. Passariello M, Almenrader N, Canneti A. Caudal analgesia in children: S (+) ketamine Vs S (+) ketamine + clonidine. Pediatr Anesth. 2004;14:851-5.
7. Somri M, Tome R, Teszler CB, Vaida SJ, Mogilna J, Snneeifi A. Does adding intravenous fentanyl to caudal block in children enhance the efficacy of multimodal analgesia as reflected in the plasma level of catecholamines? Europe J Anesthesiol. 2007;24:408-13.

8. Bano F, Haider S, Sultan T. Comparison of caudal bupivacaine and bupivacaine–midazolam for peri and post-operative analgesia in children. J Coll Physicians Surg Pakistan. 2004;14:65-8.

9. Ozcengiz D, Gunduz M, Ozbek H, Lsik G. Comparison of caudal morphine and tramadol for postoperative pain control in children undergoing inguinal herniorrihaphy. Pediatr Anesth. 2001;11:459-64.

10. Akin A, Ocalan S, Esmaoglu A, Boyaci A. The effects of caudal or intravenous clonidine on postoperative analgesia produced by caudal Levobupivacaine in children. Pediatr Anesth. 2010;20:350-5.

11. Mahajan R, Batra YK, Grover VK, Kaja L. A comparative study of caudal bupivacaine and midazolam bupivacaine mixture for post-operative analgesia in children undergoing genitourinary surgery. Int J Clin Pharmacol Ther. 2001;39:116-20.

12. Wilson GA, Doyle E. Validation of three pediatric pain scores for use by parents. Anesthesia.1996;51:1005-7.

13. Khalid A, Siddiqui Zafar S, Haider S, Aftab S. Single dose caudal tramadol with bupivacaine and bupivacaine alone in pediatric inguino-scrotal surgeries. J Coll Physicians Surg Pakistan. 2007;17:519-22.

14. Khan S, Memon Iqbal M. Comparison of caudal bupivacaine and bupivacaine – tramadol for post-operative analgesia in children with hypospadias repair. J Coll Physicians Surg Pakistan. 2008;18:601-4.

15. Khan RA, Hussain RM. A Comparative study of caudal epidural block: single dose bupivacaine versus tramadol for post-operative analgesia in children. Pak Armed Forces Med J. 2002;52:150-3.

16. Ozkan S, Pocan S, Bahar A, Cakin O, Gokben M. The effect of caudal bupivacaine versus tramadol in post-operative analgesia for pediatric patients. J Int Med Res. 2003;31:497-502.

17. Prakash S, Tyagi R, Gogia R, Singh R. Efficacy of three doses of tramadol with bupivacaine for caudal analgesia in pediatric inguinal herniotomy. Br J Anaesth. 2006;97:385-8.

18. Senel AC, Akyol A, Dohman D, Solak M. Caudal bupivacaine – tramadol combination for post-operative analgesia in pediatric herniorrhaphy. Acta Anesthesiol Scand. 2001;45:786-9.

19. Prosser DP, Davis A, Booker PD, Murray A. Caudal tramadol for post-operative analgesia in pediatric hypospadias surgery. Br J Anaesth. 1997;79:293-6.

20. Scmple D, Aldidge LM, Doyle E. The optimal dose of ketamine for caudal epidural blockade inchildren. Anesthesia. 1996;51:1170-2.