ORIGINAL ARTICLE

A Comparison of Caudally Administered Single Dose Bupivacaine and Bupivacaine-Tramadol Combination for Postoperative Analgesia in Children

Yasser Majid, Khairat Mohammad

Abstract

Fifty children of ASA-I physical status undergoing elective inguinal and penoscrotal procedures under general anesthesia were randomized into two groups. After induction of anesthesia, group A received caudal bupivacaine (0.25%) whereas group B received caudal bupivacaine (0.25%) plus Tramadol (1mg/kg). The children were assessed after awakening from general anesthesia post extubation at 1, 2,4,6,8 and 12 hours as per the observer pain score. Pain scores were comparable in the first 6 hours post awakening but at 8 & 12 hours post awakening group B children had significantly lower observer pain scores than group A children. The need for rescue analgesics was significantly lower in group B (16% & 48% at 8 & 12 hours respectively) than in group A patients (64% & 92% at 8 & 12 hours respectively). We conclude that addition of tramadol to bupivacaine in the caudal analgesic technique provides longer lasting analgesia and lesser need for rescue analgesics in the postoperative period than when bupivacaine was used caudally as a sole agent.

Key Words

Caudal, Postoperative analgesia, Bupivacaine, Tramadol

Introduction

The use of caudal route for providing postoperative analgesia using longer acting local anesthetics or opioid analgesics or a combination of both has become a standard practice in many hospitals. The ease of placing a caudal block, its safety & reliability in providing good postoperative analgesia are well known. The purpose of this study was to compare the duration of postoperative analgesia using caudally administered bupivacaine and bupivacaine-tramadol combination in children undergoing inguinal herniotomies, orchidopexies, andcircumcision procedures under general anesthesia. Bupivacaine is an amide local anesthetic with a slow onset but longer duration of action as compared to lignocaine. Its mechanism of action is similar to other local anesthetics i.e. prevention of transmission of nerve impulses (conduction blockade) by inhibiting the passage of sodium ions through ion selective sodium channels in nerve membranes

Tramadol is a centrally acting analgesic that has a low affinity for opioid receptors but is only 5-10 times less potent than morphine as an analgesic. An atypical opioid, tramadol is a racemic mixture of two enantiomers (+)

From the Department of Anaesthesiology & Critical Care , SKIMS, Srinagar (J&K) India.
Correspondence to : Dr.Yasser Majid; Senior Resident, Dept.of Anaesthesiology & Critical Care SKIMS Srinagar.

tramadol and (-) tramadol. The (+) enantiomer has a moderate affinity for the opioid receptor, greater than that of the (-) enantiomer. In addition the (+) enantiomer inhibits serotonin uptake and the (-) enantiomer is a potent noradrenaline inhibitor, complementary properties which result in a synergistic antinociceptive interaction between the two enantiomers (1).

Materials and Methods

Fifty patients of ASA- I physical status (Age: 3-14 years) undergoing inguinal and penoscrotal surgeries were studied. The patients were seen and assessed preoperatively. Patients unsuitable for caudal anesthesia, e.g. those with spina bifida or local sepsis were not included in the study. No premedication was used in any patient. Anesthesia was induced using thiopentone sodium - 5mg/kg body weight via an indwelling intravenous cannula. If problems were anticipated with obtaining an i/v access gaseous induction was performed, using halothane in oxygen and i/v access was obtained post induction. Endotracheal intubation was facilitated using succinylcholine 2mg/kg b.w.Ventilation was controlled and muscle relaxation achieved by using i/v atracurium or pancuronium .Maintenance of anesthesia was accomplished using nitrous oxide and halothane in oxygen .Post induction and intubation caudal block was performed in the left lateral position. After ascertaining correct needle position (negative aspiration and positive "whoosh" test). The patients were randomly divided into two groups- A & B. In group A bupivacaine 0.25% was administered caudally under usual precautions as per the regimen prescribed by Armitage (2).The dose of bupivacaine 0.25% was 0.5 ml / kg for circumcision, 1 ml / kg for inguinal herniotomy, and 1.25 ml / kg for orchidopexy. In group B bupivacaine 0.25% was used in the same dosage as group A but inj. tramadol was added in a dose of 1 mg / kg (3).The volume of injectate was again governed by the Armitage formula as in group A .Rate of injection was 0.5ml /second in both groups. Epinephrine 1:200,000 was used in both solutions. Since all caudal blocks were performed after induction of general anesthesia the following criterion was used to evaluate block efficacy ,i.e,if the inspired halothane concentration could be reduced to 0.5% or less within 20-30 minutes after the onset of surgery ,the caudal block was assumed to be functional (4). Vital signs- heart rate, non-invasive arterial blood pressure and arterial blood oxygen saturation were monitored throughout the operative procedure and continued in the immediate post operative period. Postoperatively the time at which the child regained consciousness was noted. After the child was awake a blinded observer carried out assessment of pain at 1, 2, 4, 6, 8 & 12 hours as per the observer pain scale (5):

Table 1:Observer Pain Scale

ITEM	SCORE
No Pain	
Laughing Euphoric	1
Happy Contented	2
Calm or Asleep	3
Mild-Moderate Pain	
Crying Grimacing Restless Can distract with toy or parental presence	4
Severe Pain	
Crying Screaming Inconsolable	5

Results

Patients and operative data : Both the groups were comparable for age, weight and operative time with no statistical difference between the two groups as shown by student's–t test.

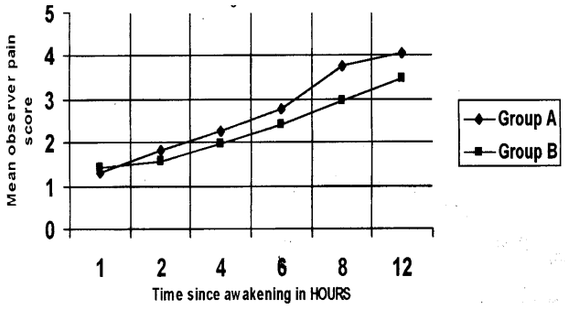
Table 2: Details of patients & operations

	AGE (years)	Weight (kgs)	Operative time (minutes)	Operation data
GROUP A	3-14	12-40	30-80	Orchidopexy 12 Hermiotomy 10 Circumcision 03
Mean (S.D)	8.04(3.61)	25.12(7.33)	33.44(6.81)	Total 25
GROUP B	3-13	15-38	30-75	Orchidopexy 10 Hermiotomy 11 Circumcision 04
Mean (S.D)	7.04 (3.11)	23.6 (5.95)	32.68 (5.96)	Total 25

Table 3: The average observer pain scores of patients in both group A & B

	1 hour	2 hours	4 hours	6 hours	8 hours	12 hours
Group A	1.32	1.84	2.28	2.76	3.76	4.04
Mean (S.D)	(0.42)	(0.53)	(0.46)	(0.42)	(0.54)	(0.26)
Group B	1.44	1.56	1.96	2.4	2.96	3.48
Mean (S.D)	(0.49)	(0.49)	(0.34)	(0.46)	(0.38)	(0.96)

Fig. 1: Showing mean observer pain scores at various times post awakening



No significant differences were noted in both groups in postoperative awakening from general anesthesia. Pain evaluation as per the observer pain scale was carried out after the children were awake at 1, 2, 4, 6, 8 and 12 hours post awakening and the following observations were made:

1) Evaluation of pain after 1 hour of awakening: Patients in both groups had good analgesia in the first hour post awakening with an average observer pain score of less than 2 .None of the patients required rescue analgesia in both groups. The incidence of postoperative vomiting was statistically similar in both groups (student's t test).

2) Evaluation of pain after 2 hours of awakening: The average pain scores in both the groups A & B were comparable 1.84(± 0.53) & 1.56(±0.49) respectively .There was no statistically significant difference in the time of first passage of urine in the two groups as shown by student's t test.

3) Evaluation of pain after 4 hours of awakening : The patients in group A displayed a mean observer pain score of 2.28 (±0.46) at 4 hours post awakening while as patients in group B displayed a mean observer pain score of 1.96(±0.34) . None of the patients in either group required rescue analgesic.

4) Evaluation of pain after 6 hours of awakening: The patients in group A demonstrated an average observer pain score of 2.76(±0.42) whereas patients in group B demonstrated an average observer pain score of 2.4(±0.46). One patient in group A required rescue analgesic (Diclofenac sodium 1mg/kg i.m). None of the patients in group B required rescue analgesics .

5) Evaluation of pain after 8 hours of awakening: The patients in group A had an average observer pain score of 3.76(±0.54) while as patients in group B had an average observer pain score of 2.96(±0.38). Three (12%) patients in group A displayed an observer pain score of 5 with thirteen (52%) patients had an observer pain score of 4 .All these sixteen patients of group A received rescue analgesic (diclofenac sodium 1mg/kg i.m) .In group B only four patients (16%) had an observer pain score of 4 requiring rescue analgesia .

6) Evaluation of pain after 12 hours of awakening: Group A patients had an average observer pain score of 4.04 (±0.26) where as group B patients demonstrated an average observer pain score of 3.48 (±0.96). In group A twenty-three (92%) patients had an observer pain score of >4 and required rescue analgesia. In group B, only 12 patients (48%) had observer pain scores of 4 and required rescue analgesics.

The requirement of rescue analgesia after 8 hours in group A was noted in 64% of the patients while as in

group B this requirement was noted in only 16% of the patients. Similarly, after 12 hours rescue analgesic was required in 92% of patients in group A whereas it was only 48% in group B. The reduced incidence of need for rescue analgesics at the end of 8 & 12 hours post awakening was statistically significant i.e. ($p < 0.05$) in group B.

Discussion

Children who have caudal blocks placed after the induction of general anesthesia have less post operative agitation and decreased analgesic requirement during recovery than matched controls who had general anesthesia (4). The placement of a caudal epidural block post induction prior to surgical stimulation is an easy, safe and effective means of controlling pain in the postoperative period. Various studies establishing the efficacy of using longer acting local anesthetic (bupivacaine) in the management of post operative pain have been conducted (4,5). Several workers have used bupivacaine in combination with a variety of drugs e.g. dimorphine (6), clonidine (7), tramadol (8-10) etc and claimed to achieve longer lasting analgesia when a combination of these drugs was used.

In our study, we observed that caudal bupivacaine alone and caudal bupivacaine with tramadol were equally effective in controlling postoperative pain in children in the first few hours of the postoperative period. However significantly lower pain scores were observed in children receiving both bupivacaine and tramadol at 8 & 12 hours post recovery from general anesthesia. The overall need for rescue analgesics was significantly lower in the bupivacaine-tramadol group. Respiratory depression observed with other opioids used caudally was not observed and no episode of arterial oxygen desaturation was noted.

Thus, use of tramadol as a caudally administered analgesic along with bupivacaine is a safe and useful alternative to the established opioids. In our opinion caudal bupivacaine and tramadol combination can be used to provide prolonged postoperative analgesia in children undergoing inguinal or penoscrotal procedures including orchidopexies, hypospadias correction etc.

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