ORIGINAL ARTICLE

Comparison of Caudal Bupivacaine And Bupivacaine-Tramadol for Postoperative Analgesia in Children Undergoing Hypospadias Surgery

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ABSTRACT

Objective: To compare the effectiveness of caudal bupivacaine and bupivacaine-tramadol for postoperative analgesia in children undergoing hypospadias surgery.

Study Design: Quasi experimental study.

Place and Duration of Study: The Postgraduate Medical Institute, Hayatabad Medical Complex, Peshawar, from February 2006 to August 2007.

Methodology: The study was conducted on 60 male children undergoing elective hypospadias surgery at the study centre. Patients were divided into two groups of 30 each. Patients in group 'B' (bupivacaine) were given 0.5 ml/kg of 0.25% plain bupivacaine, while patients in group 'BT'(bupivacaine and tramadol) were given 0.5 ml/kg of 0.25% bupivacaine in combination with 1 mg/kg of tramadol in caudal epidural space just after induction of anaesthesia. ASA status, duration of anaesthesia,duration of surgery, type of anaesthesia and maintenance of anaesthesia were similar for both groups. In the recovery room, patients were compared for pain scores, sedation score, need for rescue analgesia and any unwanted side effects for 24 hours postoperatively. All patients were assessed haemodynamically at regular intervals intraoperatively in both groups. A t-test was used to compare the mean values of the group with significance at $p < 0.05$.

Results: Mean age of the children was 4.2±2.35 and 5.5±1.51 years in group B and BT respectively. Their weight ranged from 10-30 kg. A lower pain score was observed in the bupivacaine–tramadol group during the first 24 hours in the recovery room, as well as in the postoperative ward. The mean duration of analgesia was significantly prolonged and the requirement for rescue analgesics were significantly less in the bupivacaine-tramadol group ($p < 0.0001$) postoperatively. Demographic data, haemodynamic variables, sedation score, and minor complications were not significantly different in the two groups.

Conclusion: Caudal tramadol with bupivacaine provides prolonged and good quality postoperative analgesia compared to plain bupivacaine in children undergoing hypospadias surgery.

Key words: *Caudal analgesia. Hypospadias surgery. Analgesics tramadol. Anaesthetics bupivacaine.*

INTRODUCTION

Treatment of acute pain is one of the most important tasks of perioperative pediatric anaesthesia. Pain-relieving agents are usually administered on the basis of the concept of balanced analgesia, which involves a combination of analgesics with either synergistic or additive effects.[1] Postoperative analgesia through the caudal route is considered to be the most appropriate and satisfactory analgesia for small children undergoing anoperineal, inguinal and urogenital surgery.[2,3] It is usually provided by injecting bupivacaine which is a long acting local anaesthetic. The maximum analgesic effect of bupivacaine is upto 6-12 hours.[4,5]

Several adjuvants are being tried to increase the duration, as well as to improve the quality of analgesia in caudal block include midazolam, bicarbonate, ketamine, opioids, neostigmine and clonidine.[6,7] Each has its merits and demerits.[8] Tramadol has been shown to provide long lasting analgesia after extradural administration in adults as well as in children.[9] The mechanism by which tramadol acts is its affinity for the u receptors, inhibiting serotonin uptake and noradrenaline, resulting in analgesia almost equivalent to that of pethidine in potency while lacking the depressant effects on the respiratory system.[10] Caudal morphine and pethidine along with bupivacaine were used to provide analgesia but side effects i.e. nausea, vomiting, pruritis, itching, flushing, urinary retention and respiratory depression were noted in cases of caudal opioids, while hypotension and psychometric changes were observed with the use of clonidine and ketamine respectively, although this provide prolong analgesia when

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used as adjuvants for caudal bupivacain in children.[11,12] The aim of this study was to compare the effectiveness of bupivacaine and bupivacaine in combination with tramadol for caudal analgesia in children undergoing hypospadias surgeries.

METHODOLOGY

A quasi experimental study was conducted in the operation theatre of the Postgraduate Medical Institute of Hayatabad Medical Complex, Peshawar, from February 2006 to August 2007 after taking approval from Institutional Ethical Committee and informed written consent of the parents. Sixty healthy male children of American Society of Anaesthesiologists (ASA) I and II aged between 2-6 years and weighing 10-30 kg coming for elective hypospadias surgery were enrolled. Patients with a history of cardiovascular, respiratory, neurological, renal or hepatic disease, any coagulation disorder or hypersensitivity to local or general anaesthetics, systemic or local skin infection and parents refusal to undergo the study were excluded. The expected success rate in bupivacaine plus tramadol and plain bupivacaine groups were 85% and 45% respectively; ratio in the two groups being 1:1, for a risk of 5% and study power of 80, the sample size for each group was 26. An additional 4 subjects were added to each group to cover refusal.

Since each patient's allocation was determined in advance by their sequence of presentation, 60 sealed envelopes, 30 for each group, were made and a randomly-selected envelope was opened when the patient presented.

Patients in group 'B' (Bupivacaine) were given 0.5 ml/kg of 0.25% plain bupivacaine while patients in group 'BT' (Bupivacaine and Tramadol) were given 0.5 ml/kg of 0.25% bupivacaine in combination with 1 mg/kg of tramadol in the caudal epidural space just after induction of anaesthesia. All children were kept nil per oral for at least 4 hours and no pre-medication was done in either group. An intravenous line was maintained after induction with inhalational anaesthetics i.e. 50% oxygen, 50% nitrous oxide and 8% sevoflurane. A laryngeal mask airway (LMA) was inserted and patients were maintainted on spontaneous breathing through LMA with halothane 1% and nitrous oxide 60% in oxygen. No analgesia was given pre- or intraoperatively. After induction the patient was placed in left lateral recumbent position, caudal space was identified, cleaned with antiseptic solution and drapped. A small guage 23 size needle was inserted through the skin and subcutaneous tissue into the epidural space. After negative aspiration for blood and cerebrospinal fluid (CSF), and confirmation of the caudal epidural space by Whoosh test, either of the preparation was injected into the caudal epidural space.

Effectiveness of the block was assessed by haemodynamic stability and decreased requirement for inhalational anaesthetics. Block was considered adequate when there was no increase in respiratory rate , heart rate and systolic blood pressure by 15%, just after surgical incision compared to pre-operative values. All patients were monitored haemodynamically throughout the procedure at regular intervals of 5 minutes. At the end of surgery when patient was recovered fully, laryngeal mask airway was removed and patient was shifted to the recovery room.

In the recovery room all patients were assessed for pain scores (Wong-Bakers faces pain score) having five criteria, each scores 2, ranging from 0-10 (0 = no hurt, 2 = hurts little bit, 4 = hurts little more, 6 = hurts even more, 8 = hurts whole lot, 10 = hurts worst) Sedation score using objective score based on eye opening (spontaneous = 0, in response to verbal commands = 1, in response to physical stimulation = 2), and the need for rescue analgesia at intervals of 30 minutes,1st, 2nd, 4th, 6th, 12th, and 24th hour postoperatively in the recovery room and in the ward in both groups. Duration of analgesia was taken as time between caudal block and first administration of rescue analgesia. Paracetamol suppository was given as rescue analgesia whenever the child first complained of pain, or if the pain score was more than 4.

Statistical analysis were performed using a statistical soft ware (SPSS) version 10. All results were expressed as mean ± SD (standared deviation). Unpaired t-test was used to compare demographic variables (age and weight), duration of anaesthesia, duration of surgery and intraoperative hemodynamic variables (heart rate, systolic and diastolic blood pressure and oxygen saturation). P-values were generated using Chi-square test for comparison of proportions. A p-value less than 0.05 was considered statistically significant.

RESULTS

The mean age of children was 4.2 ± 2.35 and 5.5 ± 1.51 years in group B and BT respectively. ASA status, duration of anaesthesia, duration of surgery, type of anaesthesia and maintenance of anaesthesia were similar for both groups (Table I).

Caudal block were successful in almost all of the patients in both groups. No significant changes in the studied parameter were observed throughout the operating procedure in both groups.

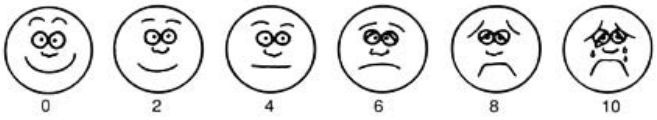
Lower pain score was observed in bupivacaine –tramadol group during the first 24 hours. The mean duration of analgesia was significantly ($p < 0.001$) and the requirement for rescue analgesics were significantly less in the bupivacaine-tramadol group ($p < 0.001$) postoperatively (Tables II and III).

Sedation score was not significantly different, as all patients were active and alert postoperatively in both groups. The occurrence of adverse effects were observed in only one patient in bupivacaine–tramadol group while two patients in bupivacaine group had vomited postoperatively and were treated with intravenous injection of chlorpheniramine.

Table I: Comparison of age, weight, duration of anaesthesia and surgery in two groups.

	Bupivacaine n=30 mean + SD	Bupivacaine tramadol n=30 mean + SD	p-value
Age (in years)	5 ± 2.47	4 ± 1.46	0.0612 N.S
Weight (in kgs)	15 ± 2.86	16 ± 3.77	0.2518 N.S
Duration of anaesthesia (in minutes)	54.5 ± 6.58	56.2 ± 5.76	0.2914 N.S
Duration of surgery (in minutes)	42.8 ± 3.89	44.6 ± 5.39	0.1434 N.S

Table II: Post operative Wong-Baker faces pain score in both groups.



No hurts = 0; Hurts little bit = 2; Hurts little more = 4; Hurts even more = 6; Hurts whole lot = 8; Hurts worst = 10.

Duration	Bupivacaine group (n=30)	Bupivacaine-tramadol group (n=30)	P-Value
	Faces pain score Mean±SD	Faces pain score Mean±SD	
30 minutes	0	0	
1st hour	0	0	
2nd hour	0	0	
4th hour	4±1.54	0	
6th hour	4±1.75	0	
12th hour	6±2.25	2±2.10	< 0.0001 (S)
24th hour	8±2.85	4±1.80	< 0.0001 (S)

Table III: Requirement for rescue analgesia in two groups.

Duration	Bupivacaine n=30		Bupivacaine tramadol group n=30		p-value
	Postoperative rescure analgesia	Percentage	Postoperative rescure analgesia	Percentage	
30 minutes	0		0	0	
1st hour	0		0	0	
2nd hour	0		0	0	
4th hour	15	50%	0	0	
6th hour	20	66%	0	0	
12th hour	30	100%	0	0	
24th hour	30	100%	10 (33%)	33%	< 0.001

DISCUSSION

Postoperative analgesia provided through the caudal route in children undergoing urogenital surgeries is used widely these days. Bupivacaine, a long acting local anaesthetic, is used because of its long duration of action i.e. upto 6-12 hours. Recently, several adjuvants to bupivacaine are being used to further prolong the duration and improve the quality of analgesia in many surgical procedures in children.[2]

In this study, the effectiveness of caudal bupivacaine in combination with tramadol was compared to plain bupivacaine for postoperative analgesia in children coming for elective hypospadias repair. Satisfactory results were observed in the bupivacaine-tramadol group compared to bupivacaine alone. The duration of analgesia was significantly longer and the quality of analgesia was better as confirmed by low pain scores in the BT group. These results were comparable to several studies done previously. Senel and colleages observed prolonged analgesia provided by tramadol plus bupivacaine in children undergoing herniorrhaphy.[13] Gunes and colleagues reported ropivacaine and tramadol as providing prolonged analgesia compared to ropivacaine alone in children undergoing genitourinary surgeries.[9] Choudhuri and colleagues reported that caudally administered 0.5 ml/kg bupivacaine (0.25%) plus ketamine or bupivacaine (0.25%) plus tramadol 1 mg/kg provided significantly longer duration of analgesia without an increase in the adverse effects when compared to bupivacaine alone.[14] Recent studies by Memis and Turan suggested bupivacaine plus tramadol and bupivacaine plus clonidine to provide more effective analgesia than bupivacaine alone during the early postoperative period when given intraperitoneally in total abdominal hysterectomy operations as tramadol and clonidine have specific effects on peripheral nerves when used alone.[15] Studies in rats showed tramadol to act just like opioids at the spinal level and depresses spinal nociceptive receptors hence reduces the analgesic requirements by caudal route compared to intravenous tramadol which is to be given more frequently.[16] Prakash and colleagues observed dose related analgesic effects of tramadol, longer duration of postoperative analgesia and reduced requirement for rescue analgesics with higher doses of tramadol in combination with bupivacaine in children undergoing inguinal herniotomy under caudal block.[17] Ozcengiz *et al.* got satisfactory results regarding postoperative pain relief in children undergoing inguinal surgeries by tramadol-bupivacaine mixtures in caudal blocks.[18] Batra *et al.* found tramadol-bupivacaine to provide prolong and satisfactory analgesia in postoperative period by caudal route in children operated for hypospadias.[19] Murthy and colleagues noticed epidural tramadol to be more effective than intravenous tramadol for postoperative pain relief.[20] Chrubasik found epidural tramadol to provide good analgesia postoperatively after abdominal surgeries and observed very low concentration of tramadol in systemic circulation compared to intravenous administration.[21] Inspite of several studies done in favour of tramadol to be effective in epidural block, Prossor D.P. and colleagues observed no significant effects of tramadol on prolongation of analgesic effects of bupivacaine when administered caudally.[10] Moreover, even systemic absorbtion of

extradural dose may be necessary for its action as serum levels of tramadol 2-8 hours after either intravenous or caudal injection of tramadol are not significantly different.[10]

In this study, 0.25% bupivacaine was used, but lower concentrations have also tried in some studies, showing 0.25% bupivacaine to be more effective and has clinical advantages over the 0.2% solutions for paediatric epidural anaesthesia.[22] Silvani and Camporesi has observed that caudal block with a "high volume, low concentration" regimen produces prolonged analgesia and less motor block, compared to a "low volume, high concentration" regimen in children undergoing hypospadias repair.[23] Khalid and Siddique appreciated the use of single shot tramadol as an additive with local anaesthetics safely in children when administered caudally to prolong the postoperative analgesic period.[24] There were no unwanted side effects in the studied groups. Parents satisfaction score was in favour of tramadol-bupivacaine group.

CONCLUSION

Caudal administration of additional tramadol provides prolong and satisfactory postoperative analgesia compared to plain bupivacaine.

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