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Research Article

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A comparative study of two different doses of fentanyl with 0.125% bupivacaine through caudal route for pediatric anesthesia and analgesia

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ABSTRACT

Regional anesthetic techniques have become more popular in the recent years with the primary advantage being lowering of general anesthetic requirement and provision of good postoperative pain relief. Single shot caudal epidural anesthesia is the most commonly performed regional technique in pediatric anesthesia. The objective of this study is to compare the efficacy of postoperative analgesia, comparison of pain scores and duration of analgesia between two different doses of inj.fentanyl along with bupivacaine through caudal route for pediatric patients undergoing elective infraumbilical surgery. Our study was done in 50children randomly divided into two groups of 25 each. Group I received 1ml/kg of 0.125%bupivacaine plus fentanyl 0.5µg/kg and group II received 1ml/kg of 0.125%bupivacaine plus fentanyl1µg/kg for caudal block post induction. Postoperatively patients were assessed for efficacy of analgesia with comparison of pain scores (MOPS) and duration of analgesia with requirement of rescue analgesic for duration of 24hours.MOPS was 0-2 in 40 %(Group I) compared to 93.3 %(Group II). Difference in the duration of analgesia was statistically significant with mean duration of 390±50.28min in Group I compared to 440±48.73min in Group II. Requirement of rescue analgesic was also more in Group I (96%).compared to Group II (72%). We hereby conclude that 1µg/kg of fentanyl with bupivacaine 0.125% provides postoperative analgesia for longer duration with less requirement of rescue analgesics as compared to 0.5µg/kg of fentanyl with bupivacaine0.125%without any major postoperative complications.

Key words: Caudal anesthesia, fentanyl, bupivacaine. pain

INTRODUCTION

Pain is perhaps the most feared symptom of disease, which a man is trying to alleviate and conquer since ages. It is defined by the international association for study of pain as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage[1].Regional anesthetic techniques in pediatric patients have the primary advantage of lowering general anesthetic requirements intraoperatively and provision of good pain relief[2].Single shot caudal epidural anesthesia is the most commonly performed regional technique in pediatric anesthesia. This technique is popular due to its simplicity and high success rate[3, 4].

The disadvantage of single shot caudal blockade is relatively short duration of postoperative analgesia[5,6] even with the use of relatively long acting anesthetic agents eg.bupivacaine[5].Prolonging the duration of analgesia by increasing

the concentration or volume of the drug increases the risk of toxicity. Placement of a catheter in to the caudal epidural space adds to the risk of infection owing to its proximity to the anus and possibility of fecal contamination. It also tends to prevent early mobilization[7].Therefore most children undergoing sub umbilical operations require further analgesia during the post operative period[8].

The present prospective randomized control study was conducted to compare the duration of postoperative analgesia with two different doses of inj.fentanyl added to inj.bupivacaine for caudal epidural anesthesia in pediatric patients undergoing infraumbilical surgeries.

EXPERIMENTAL SECTION

A prospective randomized control study was done after obtaining institutional committee approval and written informed consent of ASA 1 aged between 1-10years of age posted for routine pediatric short surgeries below umbilicus in Goa Medical College, Goa.Children less than 1 year of age with co-existing medical illness, anatomical abnormalities of the spine, History of allergy to local anesthetics or infection at the local site were excluded from the study.

Patients were randomly divided in ti two groups of 25 each,
Group I-1ml/kg of 0.125%bupivacaine plus fentanyl 0.5µg/kg for caudal block.
Group II-1ml/kg of 0.125%bupivacaine plus fentanyl 1µg/kg for caudal block.

A randomization list was prepared using a mechanical randomization device. After securing intravenous access with appropriate sized cannula, all children were premeditated with oral midazolam 0.5microgm/kg, inj.glycopyrrolate0.01mg/kg before induction.

Preoperative HR, BP, RR and Spo2 were recorded using routine monitors. After preoxygenation with 100% oxygen for 3 minutes, anesthesia was induced with i.v.ketamine1-2mg/kg.Anesthesia was maintained with O2+N2O+Sevoflurane and spontaneous respiration with Jackson Ree's modification of Ayre's T-piece. Intravenous fluid administration was done using Holliday Segar formula. After this all the children were administered caudal block in the left lateral position before the start of surgery using appropriate drugs depending on the group to which they were assigned. Duration and type of surgery were noted. Hemodynamic parameters like HR,MAP were recorded every 5 min for first 30 min, every 10 min till the completion of 2 hours, followed by every 2 hours till 24 hours. Total duration of analgesia with requirement of rescue analgesia in the first 24 hours were recorded between the two groups. Comparison of pain score was done using MOPS between the study groups. Modified Objective Pain Score (MOPS) designed by Wilson Doyle is a modification of Objective Pain Score (OPS) to assess pain in children which includes crying, movement, agitation, and posture, verbal and posture assessment for BP. Any untoward side effects between the two groups were also recorded in the 24 hours duration. Rescue analgesia was provided by paracetamol suppository 15-20 mg/kg.

The data are expressed as distribution of cases with respect to hemodynamic parameters, total duration of analgesia, comparison of pain scores and side effects. Incidence of study results were analyzed using Students t test and categorical data was analyzed by Chi-square test. The level of significance was taken up as $p<0.05$-significant,$p>0.05$-insignificant.

RESULTS

The study enrolled 25 patients in each age group. There was no significant differences between the two groups in patient characteristics and surgical procedures(Table 1&2).Mean pulse rate and mean arterial pressure was less in group II compared to group I children at all times which was statistically significant($p<0.05$). Mean duration of analgesia was 390.4±50.28min in group I compared to 440.0±48.73min in group II which was statistically significant with requirement of single rescue analgesic(72% in group I v/s 96% in group II and more than 2 doses(20% in group I v/s 5% in group II) which was also statistically significant. Comparison of pain scores was statistically significant with results showing less pain score (MOPS) in group 2 children. MOPS score 0-2 (40% group1vs93.3% group2) and 3-5(60% group1 vs8% group2).No side effects like nausea and vomiting, motor blockade, urinary retention, respiratory depression was observed in any child in both the groups.

Table 1: Patient characteristics and duration of surgery

Group	I	II	P-value
n(no of cases)	25	25	
Age(years)	4.20±1.91	3.84±1.57	>0.05
Sex	M-22, F-3	M-24,F-1	>0.05
Weight(kgs)	13.96±4.48	13.6±3.67	>0.05
Duration of surgery(min)	18.92±3.75	19.4±4.84	>0.05

Table 2: Types of surgeries

Type of surgery	Group I	Group II
Herniotomy	18	19
Orchidopexy	3	2
Circumcision	4	4

p>0.05 Not significant

Table 3: Mean heart rate and standard deviation

	Group I	Group II	p-value	Significance
Preoperative	129.52±4.29	128.96±4.00	< 0.05	S
5 min	129.04±4.00	127.36±4.64	< 0.05	S
10 min	126.72±4.03	124.96±4.65	< 0.05	S
15 min	119.12±4.65	116.00±5.09	< 0.05	S
20 min	116.56±4.22	114.00±4.35	< 0.05	S
25 min	115.28±4.23	111.92±4.41	<0.05	S
30 min	113.76±4.40	110.80±5.09	< 0.05	S
40 min	112.48±3.84	109.04±4.90	< 0.05	S
50 min	111.28±3.50	108.00±5.74	< 0.05	S
60 min	112.08±4.41	107.12±6.32	< 0.05	S
120 min	113.20±4.28	111.20±5.94	< 0.05	S
240 min	115.12±4.36	113.68±5.37	< 0.05	S
360 min	116.32±3.77	115.68±5.70	< 0.05	S
480 min	118.96±4.24	116.48±5.42	< 0.05	S
720 min	120.00±4.04	117.36±5.64	< 0.05	S
1080 min	121.44±3.72	119.60±4.65	< 0.05	S
1440 min	122.72±4.03	121.28±4.19	< 0.05	S

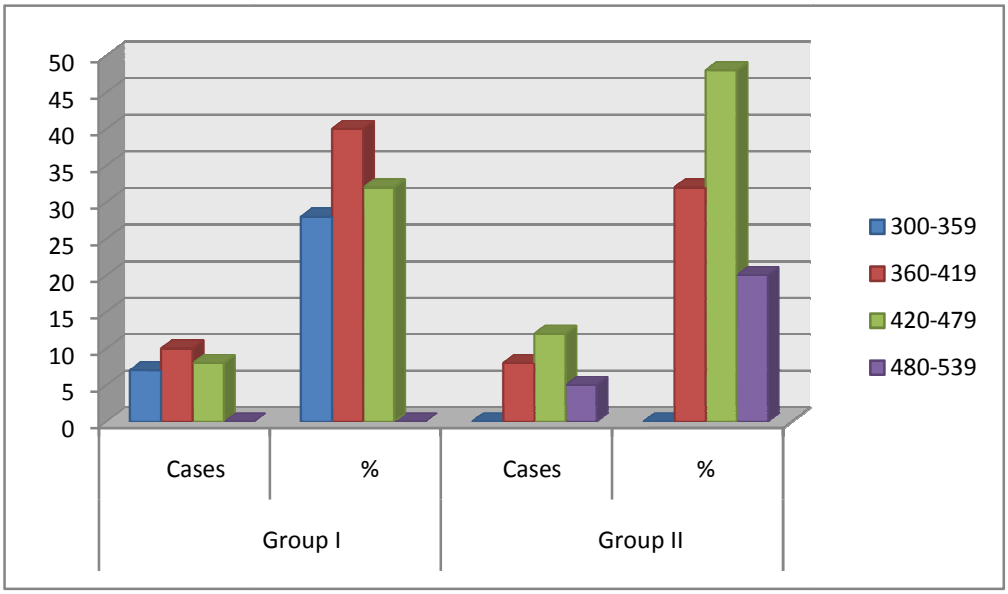
Table 4: Mean arterial pressure and standard deviation

	Group I	Group II	p-value	Significance
Preoperative	80.08±5.22	76.56±5.84	<0.05	S
5 min	77.60±5.68	74.48±5.36	<0.05	S
10 min	76.64±6.15	72.40±5.62	<0.05	S
15 min	74.96±5.83	71.44±5.24	<0.05	S
20 min	74.56±5.55	70.96±5.07	<0.05	S
25 min	73.44±5.33	70.32±5.12	<0.05	S
30 min	72.88±5.77	70.80±4.69	<0.05	S
40 min	72.32±5.87	70.64±5.73	<0.05	S
50 min	71.20±6.19	71.20±5.71	<0.05	S
60 min	70.96±5.29	68.76±6.30	<0.05	S
120 min	69.92±5.81	68.78±5.74	<0.05	S
240 min	69.92±5.36	68.76±4.94	<0.05	S
360 min	69.28±5.71	68.12±4.76	<0.05	S
480 min	69.60±5.13	68.50±5.18	<0.05	S
720 min	69.60±5.26	68.20±4.53	<0.05	S
1440 min	69.84±5.62	68.42±4.75	<0.05	S

Table: 5 Duration of analgesia

Duration of analgesia (minutes)	Group I		Group II	
	Cases	%	Cases	%
300-359	7	28	0	0
360-419	10	40	8	32
420-479	8	32	12	48
480-539	0	0	5	20
Total	25	100	25	100
Mean ± SD	390.4 ± 50.28		440.0 ± 48.73	

Graph 1: Duration of analgesia



Graph 2: Comparison of pain score

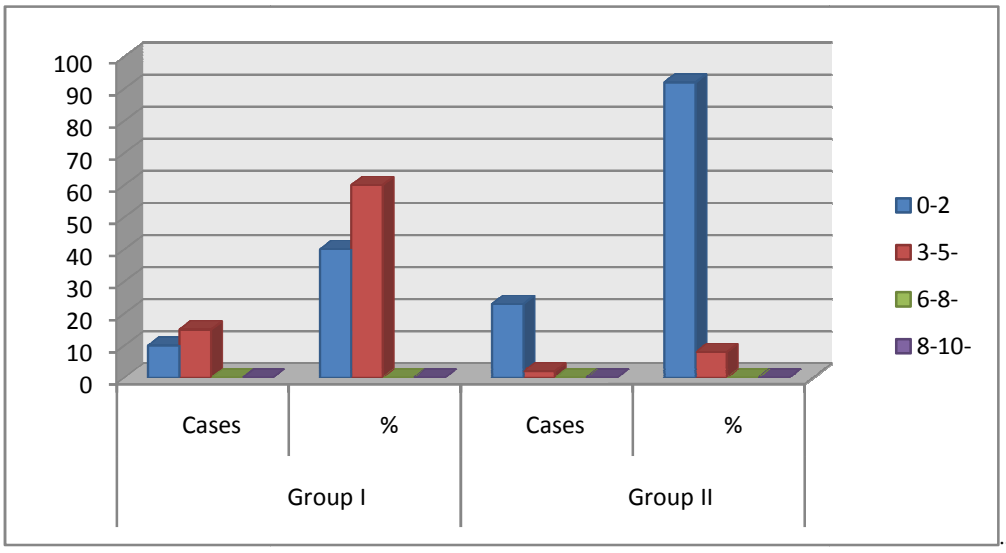


Table 6: Rescue analgesia in 24 hours

Number of rescue analgesics	Group I		Group II	
	Cases	%	Cases	%
1	18	72	24	96
2	5	20	1	4
3	2	8	0	0
Total	25	100	25	100

Table 7: Comparison of pain score

MOPS score 1-10	Group I		Group II	
	Cases	%	Cases	%
0-2	10	40	23	92
3-5	15	60	2	8
6-8	0	0	0	0
8-10	0	0	0	0
Total	25	100	25	100

DISCUSSION AND CONCLUSION

Caudal analgesia offers an excellent pain relief to children in the postoperative period. Prevention of pain is always much easier than cure. Early post operative pain relief hastens the recovery and minimizes the hospital stay.

Our study was undertaken to evaluate the efficacy of two doses of fentanyl added to bupivacaine in caudal block to provide postoperative analgesia in pediatric patients.

Our study results significant differences in the duration of analgesia(390.4±50.28min group1 vs 440.0±48.73min group2),more children in need of rescue analgesia in group1 compared to group2.Our study was comparable to the study of Desai DJ et al[9] who have concluded that both the doses 1µg/kg and 0.5µg/kg of fentanyl with bupivacaine 0.25% when administered caudally provided satisfactory surgical anesthesia without any hemodynamic disturbances with prolonged duration of analgesia with fentanyl 1µg/kg as compared to 0.5µg/kg without any postoperative complications. Our study did not correlate with the study of Gaitini LA et al[10] in which they found out that addition of fentanyl to bupivacaine compared to bupivacaine alone did not influence plasma levels of epinephrine and nor epinephrine nor does it improve the analgesic intensity of the block.

Constant I et al[11] in their study found out that addition of clonidine or fentanyl to local anesthetics prolongs the duration of surgical analgesia after single shot caudal block in children. Our study results correlates with the results of Yeddanapudi et al[12] in which they concluded that addition of 1µg/kg but not 0.5µg/kg of fentanyl yo caudal bupivacaine prolonged the postoperative analgesia in children undergoing genitourinary surgery and herniotomy.

Different studies have shown addition of various drugs in various concentrations to local anesthetics to prolong the duration of analgesia in caudal epidural block. The optimum concentration of local anesthetic would therefore be the concentration that combines minimal anesthetic supplementation and maximal pain relief with minimal side effects and results in the early ambulation and discharge[13].

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