Original Research Article

Assessment of post-operative pain relief after bupivacaine infiltration in paediatric patients

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Abstract

Background: Pain assessment is the most important and critical component of pain management. Assessing pain in children is an ever challenging as well as a difficult task. **Aim:** To assess the post-operative pain relief after bupivacaine infiltration in paediatric patients. **Material and Methods:** A total of 70 patients were grouped as: Group I: (n=35): Patients in which wound was infiltrated with bupivacaine hydrochloride at the end of surgery. Group II: (n=35): Patients in which wound was not infiltrated. Assessment of pain in children of age group 1-5 years was done by simple linear analogue pain diagram of facial expression, by vital parameters and with the help of pain score assessed by parents and was represented in their own words. Assessment of pain in children of age group 6-12 years was done by vital parameters and with the help of visual analogue scale. **Results:** In both groups from 20 minutes onwards differences were statistically significant upto 4 hrs ($p<0.05$). The duration of analgesia by all three methods was same. All the methods used to assess the pain were comparable ($p>0.05$). **Conclusion:** All the three methods of assessment used were found to be useful. Thus, a combination of self-report and at least one other measure may be a better approach than using a single tool.

Key Words: Bupivacaine infiltration, children, simple linear analogue pain diagram of facial expression, visual analogue scale, vital parameters, global assessment.

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INTRODUCTION

Pain assessment is the most important and critical component of pain management. Assessing pain in children is an ever challenging as well as a difficult task, mainly because so far no reliable method of assessing and measuring child's pain is available. The three main principles of assessing pain in children are self-reporting, measuring the perceived experience of pain by the parent or carer, and measuring physiological arousal consequent to pain.[1] Bupivacaine is a long-acting reliable local anesthetic agent that is used as a caudal analgesic. Local infiltration of bupivacaine requires less skill and sophisticated equipments. Also continuous monitoring is not required. Hence, this is better technique for postoperative pain relief in paediatric patients. Bupivacaine infiltration for postoperative pain relief has been used effectively by many workers.[2,3] The present study was undertaken to assess the post-operative pain relief after bupivacaine infiltration in paediatric patients.

MATERIAL AND METHODS

This prospective study was conducted over a period of two years in the Department of Anesthesiology of Government Medical College, Aurangabad. Informed consent of parent of each child was obtained.

Inclusion Criteria

1. Both male and female patients
2. Patient between the1-12 years of age
3. Patients with ASA grade I

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4. Patients undergoing surgery for congenital tallipusequinovarus, post-polio and post-traumatic contractures, hernia, hydrocele, bladder stone

Exclusion Criteria

1. Patients presenting with upper respiratory tract infections
2. Patients with history of convulsions
3. Patients with history of liver, heart diseases
4. Patients with history of allergic reactions and bleeding disorders
5. Patients undergoing major surgery

A total of 70 patients were grouped as:

Group I: (n=35): Patients in which wound was infiltrated with bupivacaine hydrochloride at the end of surgery.

Group II: (n=35): Patients in which wound was not infiltrated. All the included patients were not premedicated and operated under general anaesthesia. Induction was done with thiopentone sodium (2-5 mg/kg) or ketamine (2 g/kg). Intubation was done under the effect of suxamethonium chloride (2 mg/kg). Maintenance was done with oxygen + halothane + pancuronium bromide. Vital parameters were monitored continuously. No analgesics were given intraoperatively. At the end of the surgery, subcutaneous infiltration of incisional wound with bupivacaine hydrochloride (2 mg/kg) was done in 35 children (Group I). The dilution of bupivacaine was done according to length of incision. In remaining 35 patients (Group II), wound was not infiltrated with bupivacaine. The patients were decurarised with neostigmine (0.04 mg/kg) and atropine (0.01 mg/kg). Local antibiotics were not applied after closure of wound. Every patient was observed in recovery room for one hour as the peak level after infiltration of bupivacaine reach at 10.4 minutes (Epstein *et al*. 1988). Duration of analgesia was noted as time from infiltration of drug till child starts complaining of severe pain or cries due to pain. Assessment of pain in children of age group 1-5 years was done by simple linear analogue pain diagram of facial expression, by vital parameters and with the help of pain score assessed by parents and was represented in their own words. Assessment of pain in children of age group 6-12 years was done by objective and subjective methods. In objective method, vital parameters such as pulse rate and respiratory rate were used. Subjective assessment was done with the help of visual analogue scale. Assessment of pain was carried out at 0 minutes, 20 minutes, 30 minutes, 40 minutes, 60 minutes, 2 hrs, 4 hrs, 5 hrs and 6 hrs after infiltration of drug till the pain became very severe.

RESULTS

Average of the patients in group I was 3.85±3.46 years and in group II was 4.21±2.28 years. There were 25 males and 10 females in group I and II. Weight of the patients ranged between 6-25 kgs. Both the groups were comparable as far as age and sex were considered. In group I, 16 patients had congenital talipusequinovarus, 9 had postpolioand post traumatic contracture of knee and hip joints, 5 patients had inguinal hernia and 5 had bladder stone. In group II, 12 patients had congenital talipusequinovarus, 6 had postpolio and post traumatic contracture of knee and hip joints, 11 patients had inguinal hernia and 6 had bladder stone.

Table 1: Patients with pain (pain score 3) at different intervals in postoperative period

Time after administration of drug	Group I (Pain score 3)	Group II (Pain score 3)
00 min	0	0
20 min	0	10
30 min	0	13
40 min	0	25
60 min	0	35
2 hrs	1	0
3 hrs	10	0
4 hrs	25	0
5 hrs	35	0

Difference in pain score of two groups upto 5 hours was significant (Table 1).

Table 2: Analgesia at different time with pain relief score (VAS/LAPD of facial expression)

Time	Group I Mean ± SD	Group II Mean ± SD	RD	P
00 min	4±0	4±0	0	>0.5
20 min	3.88±0.32	0.82±0.56	30.6	0.0002
30 min	3.42±0.60	0.71±0.57	20.84	0.0002
40 min	3.14±0.60	0.28±0.45	22.69	0.0002
60 min	2.65±0.78	0	20.10	
2 hrs	1.68±0.52			
3 hrs	0.85±0.49			
4 hrs	0.25±0.49			
5 hrs	0			

In both groups, pulse rate and respiratory rate was comparable in preoperative period and was also comparable up to 20 minutes. After 20 minutes, the difference in group I and II was statistically significant. Also increase in pulse rate in group I and II was statistically significant. The increase in the pulse rate in both the groups corresponds with the severity of the pain. (Table 3 and 4).

Table 3: Pulse rate changes at different time in postoperative period

Time	Group I Mean ± SD	Group II Mean ± SD	RD	P
Preop.	(A) 105.08±9.00	103.94±7.87	1.14	70.05 NS
00 min	105.94±8.70	107.91±7.11	1.09	70.05 NS
20 min	105.94±8.70	107.91±7.11	1.09	70.05 NS
30 min	106.94±8.22	112.11±8.20	2.63	<0.05 (S)
40 min	107.08±8.40	115.25±7.00	4.04	<0.05 (S)
60 min	110.05±9.02	116.91±6.66	3.62	<0.05 (S)
2 hrs	112.34±8.99	(A-B)	7.64	<0.05 (S)
3 hrs	114.42±9.40			
4 hrs	115.77±9.09			
5 hrs	(B) 116.83±8.95	(A-B)	47	<0.05 (S)

Table 4: Respiratory rate changes at different time in postoperative period

Time	Group I Mean ± SD	Group II Mean ± SD	RD	P
Preop.	(A) 24.48±2.99	(a) 24.97±2.59	0.74	>0.5
00 min	25.51±2.97	26.48±2.48	1.4	>0.5
20 min	25.51±2.97	26.48±2.48	1.4	>0.5
30 min	25.62±2.86	27.25±2.41	2.62	<0.05
40 min	25.65±3.83	28.11±2.41	2.18	<0.05
60 min	26.05±2.86	24.68±2.82	2.9	<0.05
2 hrs	25.91±3.32	(a-b)	4.46	<0.05
3 hrs	26.34±3.58			
4 hrs	26.57±3.31	(A-B)	2.46	<0.05
5 hrs	27.09±3.82			

In both groups from 20 minutes onwards differences were statistically significant up to 4 hrs ($p<0.05$) (Table 2).The analgesia up to 40 minutes in group II might be due to residual effect of anaesthetic agent. The drug had analgesic effect up to 4-5 hours. (Table 3).

Table 5: Average duration of analgesia with VAS/LAPD and global assessment

Group	Pain score (3) Mean ±SD min	VAS/LAPD Mean ±SD min	RD	P
I	238.28±49.31	243.42±41.01	0.47	0.6284
II	39.14±15.41	40.0±14.95	0.23	0.8180
	p= 0.0002	p= 0.0002		

DISCUSSION

Pain is a subjective experience, and it is possible that a child might not be able to report pain precisely in unfamiliar surroundings, therefore, pain assessment in children is extremely challenging. Most professional bodies recommend that parents should be involved with their child's pain assessment; but the evidence that parents can accurately report pain on behalf of their children is mixed. In this study, an attempt was made to assess the post-operative pain relief after bupivacaine infiltration in paediatric patients. In the present study, we have used the LAPD of facial expression pain relief score (5 point) for the assessment of pain in children of age group 1-5 years. Tree-Trakenand Pirayavaraporns L had also used simple LAPD of facial expression for assessment of pain in children of 1-5 year age group.[4] We have used VAS pain relief score for the assessment of pain in children of age group 6-12 years. Bailey B *et al* had also used VAS pain relief score for the assessment of pain in children above 6 years of age.[5]In the present study, we have also used the pain score i.e., global assessment for all children included in the study, up to 5 years pain score was assessed by mother and above 5 years by child itself. Munuksela EL *et al* had also used a verbal 4 points pain score for the assessment of pain in their study.[6] We have used vital parameters (PR and RR) for the assessment of pain in children. Munuksela EL *et al* had also used vital parameters for assessment of pain.[6] We have observed the duration of analgesia by VAS pain relief score/LAPD to no relief i.e., patient complained of severe pain and by pain free score from the no pain '0' score to severe pain score '3'. In case (group I) group, duration of analgesia by VAS/LAPD was 243.42±41.01 minutes and by pain score was 238.28±47.31 minutes. In the control group (group II), the duration of analgesia by VAS/LAPD was 40±14.95 minutes and by pain score was 39.14±15.47 minutes. In both the groups differences were statistically significant up to 4 hours ($p<0.05$) hence, bupivacaine has analgesic effect upto 4-5 hrs. The analgesia in control group was up to 40 minutes might be due to residual effect of anaesthetic agent used during anaesthesia. Stoelting had also observed the duration of action of bupivacaine up to 4 hrs. The duration of analgesia by all three methods was same. All the methods used to assess the pain were comparable ($p>0.05$). Hence, all the three methods used were found to be useful. Voepel-Lewis and colleagues have previously reported a reasonable correlation between pain scores given by cognitively impaired children and their parents when using a structured pain assessment tool, although some parents tended to overestimate their child's pain.[7] Parents may benefit from being taught pain assessment tools if they are to be effective in assessing and managing their child's pain.[8] This is especially useful in paediatric ambulatory surgery, where parents undertake a significant component of postoperative care at home. Parents should be provided with information that is easily understood. Whatever tools are used to assess pain, factors such as age, anxiety, language, ethnic background, the child's level of cognition, and level of parental education need to be taken into account by health care professionals before making an informed choice.[9]Thus, a combination of self-report and at least one other measure may be a better approach than using a single tool.

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