Original Research Article

Epidural anesthesia - Its efficacy, safety and cardiovascular stability in children

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Abstract

Background: A child awaking without pain is much easier to manage than one who wakes with pain. Regional anesthesia is also useful when general anaesthesia is technically difficult or is associated with an increased morbidity and mortality.
Aim: The present study was conducted to identify the efficacy, safety and cardiorespiratory stability under anesthesia in children undergoing various lower abdominal and lower limb surgeries.
Materials and methods: The study consisted of sixty patients of either sex, aged 1 to 12 years undergoing lower abdominal and lower limb surgeries under epidural block. Group A patients were premedicated with Inj. Glycopyrrolate I/V 0.1 mg to 0.2 mg, Inj. Ketamine I/V in the dose of 1 mg/kg. Group B patients were premedicated with Inj. Glycopyrrolate I/V 0.1 mg to 0.2 mg and Inj. Diazepam I/V 2.5 mg to 5.0 mg or Inj. Thiopentone sodium I/V 2-3 mg/kg body weight. After per medicating the child was preloded with isolute P/Ringer lactate (5-7 ml/kg body weight)
Results: The mean duration of analgesia in group A patients was 151.2±10.84 minutes and in group B it was 149.8±5.74 minutes. There was no significant effect of epidural block on cardiovascular system. In this study none of the cases showed any significant change in respiratory rate and oxygen saturation in both groups.
Conclusion: Epidural anesthesia in children is quite safe, economical and effective method for lower abdominal and lower limb surgery. Cardio respiratory Stability is excellent with this technique. Patient wakes pain free after surgery is over child is much easier to manage

Key words

Epidural Anesthesia, Cardiovascular, O_2 saturation, Respiratory rate.

Introduction

In paediatric patients, most regional blocks are performed with the primary goal of providing postoperative analgesia. A child awaking without pain is much easier to manage than one who walks with pain; it is possible that a child who wakes up after a regional block will never develop the same level of pain that a child who wake up in pain will experience [1].

Regional analgesia has been associated with earlier ambulation and discharge, as well as decreased need for both narcotic and non narcotic analgesics. Profound analgesia is produced with minimal physiologic alterations. This pain free period provides ideal psychological conditions for the recovering child and the family, and because the duration of action of most blocks is fairly predictable, administration of a subsequent analgesic drug can be precisely timed so that it becomes effective as the block wears off [2]. Regional anesthesia is also useful when general anesthesia is technically difficult or is associated with an increased morbidity and mortality. Regional anesthesia may offer an alternative to general anesthesia in children with neuromuscular, metabolic, cardiac or chronic lung disease, with patients are at increased risk of pulmonary aspiration of stomach contents. Regional anesthesia provides analgesia without interfering with neurologic monitoring e.g., cases of trauma in which neurological assessment remains incomplete and the vital signs are labile(particularly with accompanying head injury) [3].

In elective surgery, the objectives differ from those in an emergency situation. Regional anesthesia is one of several available anesthetic techniques. It produces quick recovery from anaesthesia while maintaining a potent analgesic effect in the operative period that can extend from 3-24 hours [5, 6, 7]. The present study has been undertaken to know the efficacy safety, advantages & disadvantages of the technique of epidural anaesthesia in paediatric age group.

Materials and methods

In present study was carried out in Department of Anesthesiology, MNR Medical College and Hospital, Sangareddy. Study includes sixty cases admitted in surgical and orthopedic units, to observe safety and cardiorespiratory stability under epidural anesthesia in children undergoing various lower abdominal and lower limb surgeries. The patients selected were of ASA Grade I and Grade II, between the age group of 1 to 12 years, undergoing lower abdominal, parental or lower limb surgery. Preliminary physical examination was done and was noted. All patients were allowed to routine blood investigations, urine examination. All the procedures and possible risks and complications were explained to the patient's attendants and informed consent was obtained. Sensitivity test for lignocaine preceded the procedure.

Exclusion criteria

- Patients with respiratory disorders
- Patient with cardiovascular disorders
- Patients with neurological disorders
- Patients with skin lesion at the site of lumbar puncture.
- Patients with any bleeding disorder.

The total span of work comprised of children aged 1 to 5 years given epidural anesthesia with 21G hypodermic needle as Group A and children aged 6 to 12 years-given epidural anesthesia with 21G spinal needle as Group B. Each patient was examined thoroughly before premedication and induction of anesthesia. pulse rate, blood pressure respiratory rate and oxygen saturation were observed before and after medication and values are noted. Group A patients were premedicated with Inj. Glycopyrrolate I/V 0.1 mg to 0.2 mg, Inj. Ketamine I/V in the dose of 1 mg/kg. Group B patients were premedicated with Inj. Glycopyrrolate I/V 0.1 mg to 0.2 mg and Inj. Diazepam I/V 2.5 mg to 5.0 mg or Inj. Thiopentone sodium I/V 2-3 mg/kg body weight. After per medicating the child was preloaded with isolute P/Ringer lactate (5-7 ml/kg body weight).

Results

The present study was conducted to identify the efficacy, Safety and cardiorespiratory stability under anesthesia in children undergoing various lower abdominal and lower limb surgeries. This study has been made on a series of 60 cases admitted in MNR Medical College and Hospital, Fasalwadi, Sangareddy during 2013 to 2015. The maximum number of cases studied, were in the age group of 6-12 years with the male female ratio of 3.3:1, males predominated, being about 77%. There was significant difference in number of cases in both groups ($p<0.05$)

Mean weight in group A was 10.88 kg with range of approximately 7 to 14 kg and group B the mean weight was 20.28 kg with the range of approximately 13 to 27 kg. The mean dose on the basis of weight was 8.0 ± 0.66 mg/kg in group A and 9.0 ± 0.49 mg/kg in group B. the mean volume of local anesthesia solution (1.5%) came out to be 6.58 ± 2.13 ml for group A and group B it was 13.50 ± 4.85 ml.

In lower abdominal surgeries the maximum number of cases was of Herniotomy. In orthopedic surgeries, the maximum number of cases was of CTEV correction. The mean duration of operation was 50.0 ± 12.82 minutes in group A (1.5 years of age) and 57.77 ± 30.41 minutes in group B (6-12 years of age). The duration of operation was more in group B as some long procedure e.g. Pyelolithotomy, K-nailing femur etc. were exclusively preformed in group- B patients.

In the Group A, majority of patients had onset of analgesia within 5 to 10 minutes. The mean was 9.720 ± 0.87 minutes. In the Group B also, majority of patients had onset of analgesia within 5 to 10 minutes. The mean was 9.98 ± 0.67 minutes. The maximum time which had been taken for the onset of analgesia was 20 minutes in one case belonging to group B (**Table - 1**). The uppermost level of sensory block achieves in most of the cases was T_{9-8}. (**Table - 2**)

Table – 1: Onset of analgesia in each group.

Time of onset of sensory block	No. of patients in group A	Mean onset time ± S.E in group A	No. of patients in group B	Mean onset time ± S.E in group B
0-5 min.	3		6	
5-10 min.	11	9.720 ± .87	27	9.98 ± .67
10-15 min.	4		6	
15-20 min.	0		1	

Table – 2: Uppermost level of sensory block achieved in both groups.

Upper most level of sensory block	No. of patients in Group A	No. of patients in Group B
T_{10}	1	3
T_9	5	15
T_8	12	24

Slight increase in the pulse rate after premedication was observed in group A. There was no change in pulse rate immediately after the block and intra-operatively also. In group B patients, a slight fall or no change at all was observed after premedication. Pulse rate was well maintained immediately after the block and intra-operatively also. There was no clinically significant change in pulse rate. ($P>.05$) (**Table - 3**)

Only slight increase in systolic blood pressure in group A patients was observed. Immediately after the block and intra-operatively blood pressure was well maintained to that of basal values. In group B only slight fall in blood pressure was seen after premedication. Immediately after the block there was no change in blood pressure. Intra-operatively also the blood pressure was well maintained throughout the procedure (**Table - 4**).

There was no change in diastolic blood pressure after premedication immediately after the block and intra-operatively also. Diastolic blood pressure was well maintained. In both groups no significant changes in either systolic or diastolic blood pressure were observed. The values were not clinically and statistically significant (P >.05). (**Table - 4**)

In both groups no significant change could be observed as compared to preoperative values. The values were not clinically as well as statistically significant (p>0.05). (**Table – 5, 6**)

Not a single complication was observed in Group A. In Group B also no significant complication was noted. Nausea and vomiting in only two cases was seen in Group B which is clinically insignificant.

Table – 3: Changes in pulse rate in patients.

Group	Before pre medication	After pre medication	Immediately after the block	Intra operative
A	112.33 ± 21.58	118.24 ± 22.62	118.24 ± 22.62	116.28 ± 21.82
B	94.09 ± 9.72	90.88 ± 8.42	90.88 ± 8.42	90.06 ± 8.22

Table - 4: Changes in systolic and diastolic blood pressure (mm Hg).

Group	Before pre medication	After pre medication	Immediately after block	Intra-operative
Systolic blood pressure				
A	119.4 ± 16.04	122.21 ± 15.41	122.21 ± 15.41	119.21 ± 15.99
B	114.76 ± 9.8	110.26 ± 8.99	110.26 ± 8.99	109.19 ± 8.89
Diastolic blood pressure				
A	80.20 ± 2.24	81.41 ± 1.91	81.41 ± 1.91	80.81 ± 1.82
B	82.91 ± 1.86	81.96 ± 1.90	81.96 ± 1.90	82.11 ± 1.72

Table – 5: Changes of respiratory rate (per minute) (Mean ± S.D).

Group	Before pre medication	After pre medication	Immediately after block	Intra operatively
A	16.88 ± 2.08	16.99 ± 2.11	16.99 ± 2.11	16.22 ± 2.04
B	15.88 ± 2.44	15.11 ± 2.12	15.10 ± 2.12	15.61 ± 2.11

Table – 6: Changes in O_2 saturation (%) (Mean ± S.D).

Group	Before pre medication	After pre medication	Immediately after block	Intra operatively
A	98.0 ± 1.08	98.0 ± 1.02	98.0 ± 1.02	98.0 ± 1.01
B	98.0 ± 1.01	98.0 ± 1.11	98.0 ± 1.11	98.0 ± 1.06

Discussion

Regional anesthesia is becoming a growing interest in paediatric patients. Epidural anesthesia can be used for lower abdominal and lower limb surgeries. Regional anesthesia provides and advantages of reduced requirements for other anesthetic agents and excellent post-operative analgesia [4].

The introduction of neuromuscular blocking agents to paediatric anaesthetic practice [5] followed by halothane, coincided with a growing controversy over the use of techniques such as spinal anaesthesia in children. Some authors stated spinal anesthesia is an excellent method for children [8], while others contended that spinal anesthesia in children has been and still is frowned upon by majority of anaesthetists and surgeons [9]. In paediatric patients, most regional blocks are performed with the primary goal of providing postoperative analgesia [10].

The present study has been undertaken encouraged by above studies to see the efficacy, safety and cardiorespiratory stability under epidural block in children undergoing various lower abdominal and lower limb surgical interventions. The mean dose of 2% lignocaine hydrochloride with adrenaline on the basis of weight was 8.0±0.66 mg/kg in group A and 9.0±0.49 mg/kg in group B. the mean volume of 1.5% solution in group A was 6.58±2.13 ml and in group B. it was 13.50±4.85 ml. With these doses, the uppermost level of sensory block in back the groups was T_{9-8} in most of the patients, when epidural block was given in L_{3-4} or L_{4-5} inter space. The maximum safe dose for lignocaine hydrochloride with adrenaline is 10 mg/kg for epidural anaesthesia [11].

In present study, the range of onset of analgesia after epidural block was 2 to 15 minutes with the maximum number of patients falling in the range of 5 to 10 minutes. In the patients aged 1 to 5 years, the mean onset time of analgesia was 9.72±0.87 minutes and in patients aged 6 to 12 years of age it was 9.98±0.67 minutes (Mean ± S.E.) ($P > .05$). Onset of analgesia is usually within 5 to 10 minutes with lignocaine hydrochloride with adrenaline [12].

Assessment of duration of analgesia in present study after single shot lumber epidural block with lignocaine hydrochloride with adrenaline shows that the mean duration of analgesia in group A patients was 151.2±10.84 minutes and in group B it was 149.8±5.74 minutes. The approximate range of analgesia in both groups was from 100 to 200 minutes. Our finding is consistent with the duration of epidural block with lignocaine hydrochloride with adrenaline is usually 2 to 3 hours [13].

In the present study there was no significant effect of epidural block on cardiovascular system. In group A, there was a slight increase in the pulse rate and BP due to the effect of Ketamine while in group B slight decrease in the pulse rate and BP (systolic) due to diazepam anxiolytic effect. Epidural anesthesia in children provides for hemodynamic stability during surgery. [15].

In this study none of the cases showed any significant change in respiratory rate and oxygen saturation in both groups. There is no evidence of intra-operative or postoperative apnoea in present series of patients observed by Welborn, et al. in 1990 [16]. In Normal child respiratory depression does not occur unless the block extends up to the cervical dermatomes and paralyzes the diaphragm [17].

Conclusion

Epidural anesthesia in children is quite safe, economical and effective method for lower abdominal and lower limb surgery. Cardio respiratory Stability is excellent with this technique. Patient wakes pain free after surgery is over child is much easier to manage and at the same time the anxiety of attendants becomes much less as the patient lies comfortably post operatively. As most of the patients is this age group are uncooperative, they can be

supplemented with light general anaesthesia prior to the procedure. The mean dose of 1.5% lignocaine hydrochloride with adrenaline in children aged 1 to 5 years in 4.45 to 8.71 ml while in 6 to 12 years age group, it is 8.65 to 18.35 ml. with these doses, the upper most level of sensory block in most of the patient is T_{9-8} when the block is given in L_{3-4} or L_{4-5} inter space.

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