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EVALUATION OF AGE-BASED ANESTHETIC DOSING OF BUPIVACAINE HYPERBARIC IN PEDIATRIC SPINAL ANESTHESIA

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ABSTRACT

Background

High success rate of pediatrics spinal Anaesthesia as compare to general Anaesthesia has made it a safer technique in lower limb surgeries. The growth of vertical column depends on the age not on weight, keeping in view lower abdominal in surgeries children. Is to administer bupivacaine and to find the efficacy, adequacy, onset of action, level of sensory, motor blockade of pediatric spinal Anaesthesia. Objectives are to find out the incidence of complications, necessity of addition sedatives and duration of blockade.

Methodology

In this prospective study, pediatric patients (n-30) were selected for lower abdominal surgeries with age between 5 and 15 years. The selected patients were given nalbuphine, midazolam, and atropine as premedicant. Spinal block was administered at a dose of age/5 of the drug. The duration, effect and the attempts were noted along with complications.

Results

standard deviation and the mean of age is 8.70 ± 3.91 years. Intra-thecal anesthesia was successful in 90% of patients. The remaining three were failures needed the second attempt. Intravenous ketamine of 0.20 mg/kg was given for intraoperative sedation. Mean sensory level was T8 (between T6 and T10). Incidence of intra-operative complications was not observed. Surgery was finished within 50 ± 7 min (in between duration of Anaesthesia)

Conclusion

It was recorded that new formula of age/5 (Partha formula) is successful while administrating the drug in lower abdominal surgeries.

Keywords: Pediatric spinal anesthesia, nalbuphine, bupivacaine, midazolam, atropine

1. INTRODUCTION

Spinal anesthesia safest and cheapest in pediatrics patients is in lower abdominal surgery.

Though duration is pediatrics spinal anesthesia is the limiting factor but it provides a cardio respiratory stability to the pediatric patients. In general anesthesia the dose of anesthetic drug is calculated on body weight. Great variation in anesthetic dosage was seen in the pediatric patients of same age group with different body weight. Due to immature peripheral blood pool, preloading in spinal anesthesia is not required. Spinal anesthesia provide balanced anesthesia with minimum cardio respiratory pressure with less stress response, fast recovery, less complications, post-operative nausea and vomiting, and rapid return to normal routine. The children in this prospective study was planned to formulate the spinal dose with age of patient because age of pediatric patient and the growth of spinal cord is found constant.

2. METHODOLOGY

This prospective study was conducted at Pandit Jawaharlal Nehru Government Medical College and Hospital Chamba HP, India from 1st May, 2018 to 30th Oct., 2018. The said work was approved from the ethical committee and informed consent has given to the parents and approval was taken prior to select the pediatrics patients. 30 pediatrics patients were selected between the age 5 to 15. All were selected lower abdominal surgery by continuous sampling method. Exclusion criteria was to not to select the pediatric patients with lack of consent, spinal stenosis, raised ICP, infection at the site and coagulopathy and inclusion criteria was the children with Chronic respiratory disease, potentially difficult airway, and malignant hyperthermia. The children this prospective study was planned to formulate the spinal dose with age of patient because age of pediatric patient and the growth of spinal cord are found constant.

Monitoring the patient's for vitals and mandatory biochemical tests in patients were recorded. Four (04) hour fasting was required before anesthetic procedure. Requirement of supplemental sedation, Vomiting, shivering, and suggestive of neurological injury were also recorded. Premedication in the form of Intravenous nalbuphine (0.3mg/kg), midazolam (0.05 mg/kg), and atropine (0.01mg /kg) were given.

While performing lumber puncture, children were put in lateral position and under strict aseptic precaution, In the L4–L5 inter-space, spinal block was given in lateral position and 0.5% bupivacaine was administered as per dose calculated with 26 gauge Quincke's needle.

The age based dosage was applied as per formula of Partha in children. With this formula we decided the age in months after the completion of a year was noted and considered as next age if it is more than 6 months and the same age if it is <6 months. After giving spinal block, patients were turned supine and level of sensory motor blockade was assessed at every 2 min interval for 10 min. During spinal block, if sedation was insufficient, additional I/V ketamine 0.2mg /kg was given.

The action of blockade was meant either sensory loss at any dermatome or sudden fall of leg. Sensory level was assessed by the lack of response to firm pin-prick to the dermatomal level. Motor blockade was assessed using modified Bromage score as follows.0: Free movement of leg and feet with the ability to increase extended leg, 1: Inability to increase extended leg and knee flexion decreased, 2: Inability to increase or flex knees; flexion of ankle and feet present 3: Inability to increase leg, flex knee or ankle, move toes.

The above score was assessed by the same stimulus (firm pin-prick) given on lower limb (thigh). Superficial abdominal reflexes were tested for identifying motor blockade level above L1. After 10 min of subarachnoid block, the peak sensory level must be at least T10 and a Bromage score of 3 (complete motor block). The surgery was only allowed when there was no response to surgical stimuli; it was considered as successful spinal block. Inadequate level, intraoperative pain or any complaint of the lack of relaxation from surgeons, supplemental anesthesia was given and then the case was considered as partial successful block and recorded.

General anesthetic was administered to the patients whose level was below T10 and Bromage score <3, failed spinal block. Size of spinal needle, local anesthetic dose used, and number of attempts for lumbar puncture were also noted. Sensory and motor block characteristics were recorded. The requirements of supplemental anesthesia in failed spinal block were also noted. The onset of

pain or the movement of the leg was approximately considered as termination of action of drug and the duration was calculated from the onset. Monitoring was done. The patients with no complications were discharged.

Statistical Analysis: Statistical analysis was done by using SPSS version 23.0 software.

3. RESULTS

Demographic Data

The mean and standard deviation of age is 8.70 ± 3.91 years. Out of the 30 cases, 22 (73.33%) were males whereas the remaining eight were females. Mean weight of the patients was 24.45± 15.23 (10-51)) kg [Table 1]. Mean duration of anesthesia was 77.12 ± 14. 53(40-95) min. Injection atropine 0.01 mg/kg was given as premedication. At the time of entering the operation theatre, 18 (60%) (90.2%) patients were conscious and crying. Only 12(40%) patients were conscious and calm, who were older in age (>10 years). Most of the patients were given ketamine either alone (n = 15, 50%) or with midazolam (n=33.3%).Ringer lactate was given to 30(100%) patients in the operation theater (Data not shown in table).

Table 1: Demographic profile of the patients

	Demographic data	**N=30**
1	Meanage(years)	8.70 ± 3.91 (5-15)
2	Meanweight(kg)	24.45± 15.23 (10-51)
3	Sex (Male %/ Female%)	22(73) / 8(27)
4	During of Operation (Min.)	48.22 ±7.35
5	Duration of Anesthesia (Min)	77.12 ± 14. 53 (40-95)
6	PNOV (Incidence)	One
7	Urea (mg/dL) Before surgery/after surgery	15.6± 5.3/16.2±6.5
8	Creatinine (mg/ dL) Before surgery/after surgery	0.64±0.12/ 0.55±0.18

Table 2: Differing sensory level and the number of patients

	Sensory level	**Number of patients**
1	T6	3
2	T8	22
3	T10	5

Vital Parameters

There was no significant change in the mean value of systolic blood pressure, diastolic blood pressure, respiratory rate, and oxygen saturation after subarachnoid block at all time periods. Pulse rate showed a significant increase(11.3%) after 5min of subarachnoid block. Biochemical parameters like urea, creatinine etc were analyzed before and after the surgery and no significate change in the levels were found (table 1).

The onset of blockade was within 1 min. and satisfactory sensory levels were found in all the selected pedeatric patients under observation as shown in table 2. The mean duration of anesthesia was 77.12 ± 14. 53 The motor blockade coincided with the sensory level in all cases. All the cases were completed within the anesthetic duration i.e. 77.12 ± 14. 53 (40-95) as shown in table 1.

Discussion

This study was undertaken to find efficacy, safety and adequacy of block provided by local anesthetic drug bupivacaine heavy at a dose of age/5 in terms of onset of action, level of sensory and motor blockade spinal anesthesia in children. Spinal block in children is an ideal for daycare surgeries with less stress response, and with uniformly distributed sensory block with good muscle relaxation and fast recovery. Drug dosage in pediatrics is routinely based on weight, but method and formula for the dosage given by Parthasarathy et al 2017 was taken as standard .

Age based dosing so far 0.25–0.8 mg/kg bupivacaine drug have been used for pediatric spinal block. In our study, the desired sensory level of T8 was achieved in 22 (73.33%) patients and they were considered as successful spinal block. Whereas in 8(26.66%) patients, T10 level was not achieved. The median sensory level was T8. These results are similar to the study by Ahmedetal al 2010. Where 78 children aged between 2 and 6 years undergoing different type of surgery in the lower part of the body and reported that sensory block showed wide variation of height from T1to T7, and the median was T4. Frumiento et al. achieved successful spinal anesthesia in 97.3% in the first attempt, whereas we did in 88%. This difference could not be due to more advanced age and possible non cooperation from the patient side.

Further, we observed that and as per the requirement 10% of selected pediatrics patients (n=3) had given additional anesthesia i.e. 0.20 mg/kg of intravenous ketamine for perioperative sedation. Sensory anesthesia was achieved in all the case with a mean spinal level of T8. Actually a spinal level of 8 is a simple arithmetic mean of the levels achieved in all the cases.

This observation is further supported by the fact that high levels of block (T2-T4) reduce motion of ribcage and leads to paradoxical repiratory movement in children. We observed that the mean duration of anesthesia was 77.12 ± 14. 53 it was further supported that in children endoneurium is loose which has a little barrier to drug diffusion with faster onset and offset of block and it has to be noted that high cardiac output which lead to rapid reabsorption of drugs and shorter duration of block in children.

We observed that post operative nausea and vomiting were seen only in one patient i.e.0.33% and this finding similar to the results where infra umbilical surgeries in children with varied dose of 0.4-0.5 mg/kg with a success rate of 96% was found and occurrence of post operative nausea and vomiting was in 4% of pediatric cases (Verma et al 2014).

We have not observed any complications like bradycardia, nausea, vomiting, PDPH, and urinary retention. These results were found similar to the study conducted on 78 children aged between 2 and 6 years and reported that shivering occurred in five patients and vomiting occurred in one patient.

4. CONCLUSION

Administration of age-based local anesthetic dosing of hyperbaric bupivacaine by utilizing the different new formula of age/5 is successful in our study for lower abdominal surgeries in pediatrics patients.

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