Original Research Article

Study of spinal anaesthesia in paediatric age group in rural set-up

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Abstract

Background: The commonly adopted method of anaesthesia in children is general anaesthesia (GA) as per the traditional standards. But, in rural set up, where there is lack of finance, high tech monitoring equipment, man power, trained hospital staff, it is very difficult to perform alone under GA, where there is higher incidence of postoperative apnoea, desaturation under GA.1 2 Infants and children are at an increased risk for GA-related complications. Thus, spinal anaesthesia could also be indicated as an alternative to GA. **Materials and methodology:** The present study was conducted in a rural hospital. All paediatric patients in the age group of 2 years to 15 years, who were given spinal anaesthesia for infraumbilical or lower extremity surgery over a period of 2 years, from January, 2016 to January, 2018, were included in the study. Total sample size was 102 patients. **Result**: Spinal anaesthesia is safe and an alternative to General anaesthesia in rural set-up. **Conclusion:** In rural hospital at Chiplun, Maharashtra, where there is lack of facilities makes it very difficult to perform alone under GA. Infants and children are at an increased risk for GA-related complications. Spinal anaesthesia in paediatric population is safe and effective. However, we conclude that accumulated experience is required in order to apply this technique safely in pediatric patients.
Key Word: Paediatric age group, General anaesthesia, Spinal anaesthesia, Rural set-up.

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INTRODUCTION

The society of paediatric anaesthesia has defined the alleviation of pain as a 'basic human right', irrespective of age, medical condition, treatment, primary service response for the patient care or medical institution. Paediatric patients are a special group in that, their requirements cannot be expressed by themselves. The anaesthesiologist concerned must pay more attention towards their paediatric patients. The commonly adopted method of anaesthesia in children is General Anaesthesia as per the traditional standards. But, in rural set up where there is lack of finance, high tech monitoring equipment, man power, trained hospital staff, it is very difficult to perform alone under GA, where there is higher incidence of postoperative apnoea, desaturation under GA.[1,2] Infants and children are at an increased risk for GA-related complications. Thus, spinal anaesthesia could also be indicated as an alternative to GA. Regional anaesthesia in children was first studied by August Bier in 1899. Since then, spinal anaesthesia was practiced for years, and a number of cases were published in 1909-1910.[3]

AIM

To know the overall safety, feasibility, reliability, success rate, complications and hemodynamic stability related to spinal anaesthesia in paediatric patients aged 2 to 15 years.

OBJECTIVES

- To avoid endotracheal intubation and general anaesthesia and its complications.

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- To allay early bonding with parents after the surgery.
- To give better intra and post-operative hemodynamic stability.
- As a plan of day care surgery.
- To use minimal drugs and avoid poly pharmacy.

MATERIALS AND METHODOLOGY

The present study was conducted in a rural hospital at Chiplun, Maharashtra. All paediatric patients in the age group of 2 years to 15 years, who were given spinal anaesthesia for infraumbilical or lower extremity surgery over a period of 2 years from January, 2016 to January, 2018, were included in the study. This resulted in sample size of 102 patients.

Inclusion criteria:

- Age group of 2-15 years.
- ASA grade I and II.
- Patients coming for infraumbilical surgeries.

Exclusion Criteria

- ASA grade III and IV.
- Infection at the site of injection
- Coagulopathy or anticoagulation.
- Congenital abnormalities of lower spine and meninges.
- Active disease of the CNS.
- History of allergy to local anaesthetics.

Anaesthesia technique: All the patients under study were subjected to detailed pre-anaesthetic evaluation. All the children were kept nil per oral for 2 h for clear fluids, 4 h for milk and 6 h for solid food. No overnight premedication was given. After establishment of intravenous access, all were preloaded with crystalloid solution (Ringer Lactate, Isolyte P) 10 ml/kg according to Holiday and Segar formula. Heart rate, blood pressure and oxygen saturation were measured and noted as baseline values. Injection atropine 0.01 mg/kg was given as premedication. All children, except those who were cooperative and calm were sedated on the operating table before subarachnoid block using Ketamine 1 mg/kg and Midazolam 0.03 mg/kg IV to maintain immobility while performing subarachnoid block. After adequate sedation, the patients were put in lateral position and under strict aseptic precaution before giving spinal anaesthesia local anaesthesia was given with 2 ml of 1% Lignocaine and then lumbar was given with 26 gauge Quincke's needle in the L4–L5 inter-space. After getting free flow of cerebrospinal fluid (CSF) hyperbaric bupivacaine (0.5%) in a dose of 0.5 mg/kg (for child <5 kg), 0.4 mg/kg (for 5-15 kg), 0.3 mg/kg (for >15 kg) was injected in the subarachnoid space. The end of injection was taken as time zero hour for further data recording. After giving spinal anaesthesia patients were turned supine and level of sensory and level of motor blockade were assessed at every 2 min interval for 10 min. The onset of blockade meant, either sensory loss at any dermatome or sudden fall of leg. The hemodynamic parameters were monitored throughout the surgery. 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. It was assessed by the same stimulus (firm skin pinch) given on lower limb (thigh) and modified Bromage score was noted as follows.[4]

1. Free movement of leg and feet with the ability to increase extended le
2. Inability to increase extended leg and knee flexion decreased
3. Inability to increase or flex knees; flexion of ankle and feet present
4. Inability to increase leg, flex knee or ankle, move toes.

After 10 min of subarachnoid block, if the peak sensory level was at least T10 and Bromage score was 3 (complete motor block), surgery was allowed to start. At the end of surgery, all patients received rectal suppository 1.5 mg/kg. Demographic data, indication, type of surgery, duration of surgery and vital parameters were noted. Requirement of supplemental sedation, size of spinal needle, local anaesthetic dose used and number of attempts for lumbar puncture were noted. Sensory block characteristics, motor block characteristics and complication related to anaesthesia such as vomiting, shivering and any manifestation suggestive of neurological injury were also recorded. The patients were monitored until full recovery. The quantitative data was analysed by student 't' test and qualitative data was analysed by chi square test.

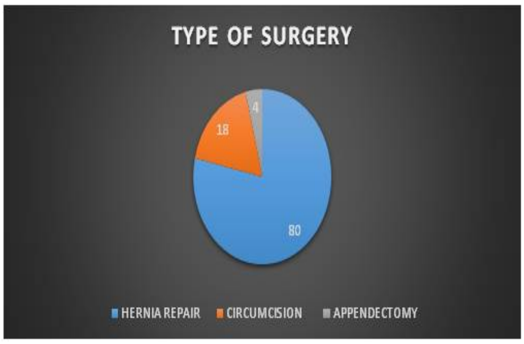
RESULTS:

Table 1: Demographic data

Age group	No of patients	Mean age	Mean weight (kg)	Mean height (cm)	Sex (M:F)
2-5 year	60	3	12	80	50:10
6-10 year	38	6	20	120	20:18
11-15	4	12	25	130	3:1

Table 2: Characteristics of block

Peak sensory block level (Mean)	T 10
Two segment regression time(mins)	50± 4
Total duration of motor block (MINS)	68± 6



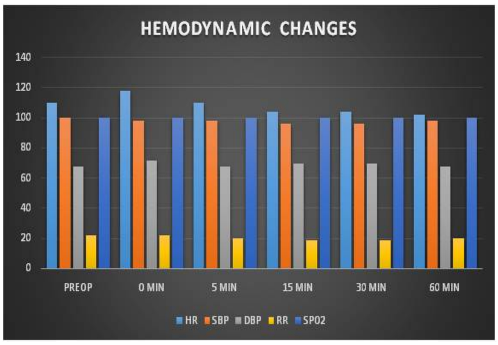


Figure 1: Type of surgery, **Figure 2:** Hemodynamic changes:

DISCUSSION

In rural set up, there is lack of facilities for performing GA alone. Also, infants and children are at an increased risk for GA-related complications. Thus, spinal anaesthesia could also be indicated as an alternative to GA.[5 6 7 8] The present study was undertaken to evaluate the efficacy and safety of spinal anaesthesia in the paediatric population. Spinal anaesthesia in children is a safe, cost-effective, single-shot technique and is ideal for day care surgeries. It provides dense and uniformly distributed sensory block with good muscle relaxation. The stress response to surgery is decreased, and recovery is fast, following spinal anaesthesia. For the convenience we divided the patients in 3 groups according to the age, 2-5 yr, 6-10 yr and 11- 15 yrs and according to the demographic data, as shown in Table no 1. Adequate premedication is important for a smooth regional procedure in children. Care should be taken as the child may fall asleep or be inadequately sedated. Analgesia and sedation is important for paediatric spinal anaesthesia. In our study, local anaesthesia of 2ml of 1% Lignocainewas given in all patients, before performing a subarachnoid block, which gives us additional help and blocks are performed smoothly. In our study out of 102 patients, 98 required sedation to perform lumbar puncture with ketamine and only 4 patients out 102 were cooperative and calm whose age was more than 11 years. Ketamine induces dissociative anesthesia, maintain protective airway reflexes during sedation hence choice for sedation in paediatric age group by many authors.[9] In our study subarachnoid block was performed in a single attempt in 100 patients out of 102 and only 2 required second attempt to perform. None of the patients required more than two attempts for lumbar puncture, which shows the ease and feasibility of lumbar puncture technique in the pediatric population. Subarachnoid block has sedative effect in infants as it decreases afferent conduction to reticulo-thalamo-cortical projection pathways which reduces the excitability and the arousal level of brain.[10] In our study, we used the standard hyperbaric Bupivacaine (0.5%) in a dose of 0.5 mg/kg (for child <5 kg), 0.4 mg/kg (for 5-15 kg), 0.3 mg/kg (for >15 kg). These larger doses of local anaesthetics are required for spinal anaesthesia in infants and young children because volume of cerebrospinal fluid CSF is 4 ml/kg, which is double the adult volume.[11] In our study the extent of sensory block was checked by pin prick method and motor block by Bromage scale, In our study we checked for two segment regression time and total duration of motor block as given in Table no 3. In our study two segment regression time was 50 ± 4 mins and the duration of motor block was 68 ± 6 mins.The infant's motor level regression is approximately 5 times faster than in adults because of proportionally greater blood flow to the spinal cord and hence drug uptake is faster in the subarachnoid space.[12]Hence, at the end of surgery additional analgesia was given with Diclofenac rectal suppository with in all cases. In our study, the desired sensory level of T10 was achieved in all the patients, after 10 min of subarachnoid block, and they were considered as a successful spinal block. Thus, none of the patients required supplemental anaesthesia during surgery in our study. In our study the hemodynamic changes were stable throughout the procedure as shown in Table no 4. Cardiovascular changes related to spinal anaesthesia are less common in children than in adults. Children younger than 5-8 years of age have immature sympathetic nervous system and relatively small intravascular volume in the lower extremities and splanchnic system, which limits the venous pooling in this group.[12] In our study talking about the success rate, none of the patient required to convert the procedure into general anaesthesia, giving us the success rate of 100% in our study. Though paediatric age group is more prone for complications like shivering, in our study such complications did not occur.

CONCLUSION

In rural hospital at Chiplun, Maharashtra, where there is lack of facilities, it is difficult to perform GA alone. Infants and children are at an increased risk for GA-related complications. Spinal anaesthesia in paediatric population is safe and effective and also providesgood postoperative analgesia. It reduces requirements of inhalational and intravenous agents with minimum sedation. However, we conclude that accumulated experience is required in order to apply this technique safely in pediatric patients.

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