ORIGINAL ARTICLE

SPINAL ANAESTHESIA IN PAEDIATRIC PATIENTS UNDERGOING SURGERY OF SUB UMBILICAL REGION OF THE BODY

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Background: The use of spinal anaesthesia in infants and children requiring surgeries of sub umbilical region is gaining considerable popularity worldwide. But in our setups in South Asia, this technique has not gained popularity yet. The objective of this prospective study was to evaluate the haemodynamic and respiratory safety of spinal anaesthesia in infants and children. **Methods:** In our study, 66 paediatric patients of age ranging from 6 months to 10 years of either sex, ASA I and II, undergoing surgeries of sub umbilical regions were included. Spinal anaesthesia was administered with Quincke 25 gauge needles at L3–L4 and L4–L5 space in the lateral decubitus position after pre-medication. Mean Arterial Blood Pressure (MAP), Heart rate, Spo_2, duration of surgery and attempts of spinal block were the data recorded. **Results:** Out of the 66 patients, intra-operative Mean Arterial Blood Pressure (MAP) was normal in 65 (98.5%) of the patients. Heart rate was increased in 57 (86.4%) patients, intra operatively. Pulse oximetery was normal during surgery in all the children. Duration of surgery was less than one hour in 48 (72.7%) patients and it was between 1–2 hours in 18 (27.3%) of the patients. Feasibility in the form of attempts was first in 37 patients and second in 29 patients. **Conclusion:** The ease of performance and the safety regarding cardio- respiratory functions makes spinal anaesthesia as an alternative to general anaesthesia in infants and children undergoing surgeries of sub umbilical regions.

Keywords: spinal anaesthesia, infants, sub umbilical, surgery, haemodynamics

INTRODUCTION

The use of spinal anaesthesia in paediatric surgery particularly in the extremely premature infants requiring surgery has gained considerable popularity.[1] It inspired me for the practice of spinal anaesthesia in infants and children and to accept the task of evaluation of its safety. It was in the beginning of 20th century that Lord H Tyrrell Gray supported the use of spinal anaesthesia for surgery in the infants and declared it to occupy an important place in the future for paediatric surgery.[2]

In 1933 spinal anaesthesia was proposed for paediatric thoracic surgical procedures such as lobotomy and pneumectomy,[3] Later on due to development and safety of GA the use of spinal anaesthesia was abandoned.

After the study by Abajian *et al* in 1984, spinal anaesthesia in infants was successfully reintroduced into the modern anaesthesia practice.[4] Since then infant spinal anaesthesia has been used either alone or in combination with epidural anaesthesia for different types of surgical procedures of the lower parts of the body.[5–18] and even as an adjunct to general anaesthesia in infants undergoing repair of complex congenital heart diseases[6] with cardiopulmonary bypass.

Infants and children are at an increased risk of complications associated with general anaesthesia as compared to adults.[19–22] Spinal anaesthesia in infants and children exhibit a high degree of cardiovascular and respiratory stability.[23,24] In several small comparative trials spinal anaesthesia in infants has been associated with decreased incidence of hypotension, hypoxia, bradycardia and postoperative apnoea as compared with general anesthesia.[25–29] The limitation of spinal anaesthesia for longer surgical procedures can be overcome by the addition of clonidine in the spinal anesthesia.[30] However spinal anaesthesia remains under utilized in children relative to general. Although a study of large patient population is needed to confirm the clinical feasibility and safety of spinal anaesthesia in infants and children in the modern era of anaesthesia and surgery. This is a prospective study of spinal anaesthesia in paediatric patients, 6 months to 10 years of age undergoing surgery of lower abdomen, pelvis, perineum, lower limbs and lumbo-sacral meningocoele repair and evaluated its haemodynamic and respiratory stability and safety.

MATERIAL AND METHODS

This study was carried out at Ayub Teaching Hospital Abbottabad, Pakistan, a tertiary care hospital, pertaining to the period January–December 2009. The hospital's ethical committee approved the study. Sixty Six paediatric patients, aged from 6 months to 10 years of both sex and ASA I or ASA II scheduled for surgery of lower abdomen, pelvis, perineum, lower limbs and lumbo-sacral regions were enrolled. They were admitted via their respective surgical units. A day before all the patients was assessed for anaesthesia and surgery. Written, fully informed consent was taken from their parents a day before the surgery and they were also advised to keep them all fasted for 6 hours preoperatively. The patients were pre-medicated with atropine 0.01 mg/Kg body weight, and Ketamine 1–2 mg/kg body weight in the operation theatre, were put in the lateral decubitus position. Oxygen was started via face mask and monitor applied to the patient. Baseline data of pulse oximetry, heart rate, ECG, mean arterial blood pressure (MAP) recorded. The lumbo-sacral region was scrubbed with antiseptic solution of Pyodine and then draped with sterile towels, L3–L4 or L4–L5 lumber inter-vertebral space was identified. Lumber puncture was performed with 25 gauge Quincke needle. After free reflux of CSF bupivacaine 0.3 mg/Kg body weight 0.75% (hyperbaric) was injected slowly over 20 seconds into the subarachnoid space. The spinal needle was then slowly withdrawn. Punctured area was covered with sterile gauze and then patient was put in the supine position. The feasibility of procedure was assessed as attempt I, II or abandoned. The efficacy of the block was assessed with response to pin prick and profound motor block in the lower extremities (unable to move hip, knees and foot).

After establishment of the block the required surgery was allowed to perform. The patients were observed for any discomfort in addition to other monitors like Spo_2 NIBP, ECG. Ketamine/inhalational anaesthesia was standby in any case of discomfort. The safety of the technique in paediatrics cases was assessed by monitoring the respiratory and cardiovascular functions of the patients by Spo_2, ECG, pulse and NIBP (MAP) of the patient.

Ringer lactate with 5% dextrose was administered I/V as maintenance and replacement fluid. Arrangement of blood for transfusion was done in case of need. The patients were monitored in the postoperative care unit till full recovery and then transferred to the respective surgical units and followed up for 24 hours. The data was recorded on the patient's assessment Performa and analysed using SPSS.

RESULTS

Total 66 children were included in the study. Male children were 55 (83.3%), while 11 (16.7%) were female. The mean age and weight of the children was 61.02±35.22 months and 14.72±5.42 Kg respectively. Table-1 shows the age, sex and weight distribution of the patients. Maximum children (56%) were in the age group 1–6 years.

All patients were pre-medicated with Atropine 0.01 mg/Kg body weight and Ketamine 1–2 mg/Kg body weight. Spinal anaesthesia was given with Bupivacaine 0.3 mg/Kg body weight (0.75% hyperbaric) using spinal needle of 25 gauge Quincke at the level of L4–L5. Maximum numbers of children (75.8%) were from orthopaedic ward (Table-2). As per American Society of Anaesthesiologists (ASA) physical status, 61 (92.4%) children were in Class-II, and 5 (7.6%) were in Class-I (Table-3). Successful procedure could be done on 1st attempt in 37 patients and on 2nd attempt in 29 patients (Table-4).

History of previous anaesthesia/surgery was found in 11 (16.7%) children and pre-medication was done in 64 (97%) patients. Crystalloids were given to 65 (98.5%) patients. Heart rate during surgery was increased in 57 (86.4%) patients and it was increased more in male children (47) compared to female (10). Intra-operative Mean Arterial Blood Pressure (MAP) was normal in 65 (98.5%) of the patients. Pulse oximetery was normal during surgery in all the children. Mean duration of surgery was 1.27±0.45 hours. Duration of surgery was <1 hour in 48 (72.7%) patients and it was between 1–2 hours in 18 (27.3%) of the patients. Blood loss was less than 10% in 63 (95.5%) and more than 10% was found in 3 (4.5%) of the patients. With regard to postoperative haemodynamic status was found normal in 11 (16.7%) children, and it was increased in 55 (83.3%) patients. NIBP (MAP) was normal in all patients. With regard to the postoperative side effects, only 2 (3%) patients had retching/vomiting and 1 (1.5%) suffered from shivering. Rescue medication was needed to be given to 3 (4.5%) of the patients.

Table-1: Age, sex and weight distribution of children

Sex of the child	Age groups (Year)			Weight groups (Kg)			Total
	<1	1–6	>6	<10	10–20	>20	
Male	2	30	23	17	28	10	55
Female	0	7	4	1	10	0	11
Total	**2**	**37**	**27**	**18**	**38**	**10**	**66**

Table-2: Ward of admission

Ward of admission	Frequency	Percent
Orthopaedics	50	75.8
General Surgery	15	22.7
Urology	1	1.5
Total	66	100.0

Table-3: ASA physical status of the patients

ASA Physical Status Class	Frequency	Percent
Class-I	5	7.6
Class-II	61	92.4
Total	66	100.0

Table-4: Attempts on anaesthesia

Attempt	Number	Percent
1st	37	56.1
2nd	29	43.9
Total	**66**	**100.0**

DISCUSSION

This study was designed to evaluate feasibility and safety of spinal anaesthesia in healthy children of ASA physical status-I and II undergoing surgical procedures below umbilical region. The study demonstrated the feasibility of the technique of spinal anaesthesia in children as simple and easy.

Blaise and Roy[14] studied ASA-I paediatric patients aged from 7 weeks to 13 years, 4 of 34 patients required GA due to failure of lumbar puncture after two attempts. Better result of our performance of the technique may be due to the fact that we used Ketamine for sedation because slight movement of the children during lumbar puncture can cause difficulty and failure. Our patients were quite comfortable during the procedure of lumbar puncture after sedation with Ketamine.

Kachko *et al*[31] studied 505 new born and infants undergoing surgery under spinal anaesthesia. They achieved spinal anaesthesia at first attempt in 69.9% of their patients. Our results are comparable to their results in achieving spinal anaesthesia. William *et al*[32] studied spinal anaesthesia in 1,554 infants and have successful spinal anaesthesia in 97.4% of their patients. We achieved spinal anaesthesia in first attempt in 56%, and in second attempt in 44% patients. This shows similar ease of performance of technique.

The patients remained stable haemodynamically during surgery and in the postoperative period. The heart rate increased in 57 (86.4%) patients which may be due to the effect of atropine and Ketamine pre-medication. There was no episode of bradycardia. The mean arterial pressure remained normal in 65 (98.5%) of patients during the peri-operative period as the patients were receiving crystalloid fluid for maintenance. One patient sustained a brief episode of hypotension due to blood loss which was controlled with instant blood transfusion and then the mean arterial pressure remained normal throughout the postoperative period.

The breathing was normal in all of the patients as the pulse oximetry (Sp_{O2}) remained normal (>95%). Blaise and Roy[14] also noted no episode of hypotension/ arrhythmia or vomiting intra operatively in their patients. Kachko *et al*[31] noted bradycardia (heart rate <100 per min) without de-saturation (Sp_{O2} <90%) in 1.8% of their patients as the main side effect. They have also noted no episode of hypoxemia in their patients.

William *et al*[32] have noted oxygen haemoglobin de-saturation (Sp_{O2} <90%) in 10 patients (0.64%), bradycardia (heart rate <100 per min) in 24 patients (1.6%). These rare episodes of oxygen de-saturation and bradycardia in their study may be attributed to the wide variety of their patients including a number of premature infants undergoing major abdominal/thoracic surgical procedures.

CONCLUSION

Our experience of this small study highlights the ease of performance and the safety regarding cardio-respiratory functions. So that anaesthesiologists who care for infants and children during their practice should have option of spinal anaesthesia as an alternative to general anaesthesia for surgical procedures below umbilicus. Further study of large number of cases is required for more evaluation.

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