ISSN: 2476-8642 (Print)
ISSN: 2536-6149 (Online)
www.annalsofhealthresearch.com
Indexed in: African Index Medicus, Crossref,
Index Copernicus & Google Scholar
Listed on C.O.P.E & Directory of Open Access Journals

Annals of Health Research

VOL. 6 NO. 2
APR. - JUN., 2020

IN THIS ISSUE

PUBLISHED BY THE MEDICAL
AND DENTAL CONSULTANTS ASSOCIATION
OF NIGERIA, OOUTH, SAGAMU, NIGERIA.

Annals of Health Research
Volume 6, Issue No 2: 205-210
June 2020
doi:10.30442/ahr.0602-09-82

ORIGINAL RESEARCH

Efficacy of regional anaesthesia for paediatric surgery: Experience from a surgical expedition

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Abstract

Background: In developing countries where resources are scarce and health care financing is essentially by out-of-pocket payment, a surgical expedition is often a huge economic relief. Children are a category of the vulnerable group that can benefit from such exercises. However, an anaesthesia technique that is economical in both human and material resources should be explored,
Objective: To describe the outcome of regional anaesthesia techniques during a surgical expedition for paediatric patients.
Methods: Children aged 6 months to 16 years, who had been previously screened for free surgery in different surgical specialities, were recruited for the study.
Results: Fifty-six (56) children were screened but only 35 were recruited for the surgical expedition. There were nineteen (19) males and sixteen (16) females with a male to female ratio of 1.5:1. Surgical procedures covered surgical specialities such as orthopaedics, plastic and general paediatric surgery. All the patients had one form of regional technique and/or peripheral nerve blocks. There were no intra-operative or post-operative anaesthetic complications up to a period of 30-days while on follow-up care.
Conclusion: Regional anaesthesia is safe and a cheap choice of anaesthesia in children during surgical expeditions.

Keywords: Children, Outcome, Regional anaesthesia, Surgical expedition,

Introduction

A surgical expedition is a huge economic relief for patients who require surgical procedures. It often involves the volunteer surgeons, anaesthetists, peri-operative care nurses and other allied health workers in carrying out mass surgical procedures in a community. For "Safe surgery and Safe lives", careful patient selection is required for a good outcome at such times. Moreover, it may involve both local and foreign professionals, and it is commonly used in developing countries where resources are scarce and health care financing is largely out-of-pocket. A surgical expedition is often carried out in local hospitals or primary health facilities and most of the professionals are visiting, thus there is inadequate time for the screening of patients, assessments of facilities and familiarization with the environment. [1] More so large numbers of patients are attended to within a

short time and there may be limited facilities posing a challenge to standard surgical care delivery. Therefore, the delivery of safe surgical and anaesthesia services should be of utmost concern in the planning and execution of surgical expeditions

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There is always a concern about the modality of anaesthesia to be employed during a surgical expedition. It will be desired that patients receive less demanding anaesthesia, requiring a minimal hospital stay, and effective with a quick return to normal activity. This is particularly important since there may not be adequate infrastructure and for intra- and post-operative monitoring, as well as in-patient admission after the surgery. [1] Local infiltrations, peripheral nerve blocks and regional anaesthesia techniques [sub-arachnoid or caudal block] readily come to mind when considering the above scenario. Most of the cases often handled during the surgical expedition are ambulatory or short-stay surgical cases. Therefore, local and regional anaesthesia modalities are applicable and safe.

Subarachnoid block (a form of regional anaesthesia) is perhaps one of the oldest and well-tested modalities for pain relief in patients undergoing surgery. [2] It has the added advantage of minimal cardio-respiratory disturbance and it is an economical option for countries with finite resources. [2] Despite its widespread use, the incidence of side effects is low in children, just as the Pediatric Regional Anaesthesia Network (PRAN) has not reported any permanent neurological complication following its use in children. [3, 4]

Safe anaesthesia practice in this age group and under a special condition of mass surgery is important. Regional anaesthesia is increasingly being used in children for intra-operative anaesthesia and supplementary post-operative analgesia. [2, 4-6] Large prospective databases have demonstrated the ability to perform regional anaesthesia safely in paediatric populations. [7] Paediatric regional anaesthesia is especially beneficial for high-risk infants such as preterm neonates who would have otherwise required general anaesthesia. [2] Apart from spinal anaesthesia, several studies have also described the use of other regional anaesthesia techniques in children. [8-11]

In the present study, a prospective evaluation of surgical expedition was carried out at the Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu in July 2017. It was sponsored by Rotary International District 9110DG (Nigeria and India) and the Ogun State government. The objective of this study was to determine the outcome of paediatric regional anaesthesia techniques during the surgical expedition.

Methods

Approval was obtained from the Rotary international district 9110DG, the Ministry of Health, Ogun State, and the Health Research Ethics Committee of the OOUTH, Sagamu to carry out the study. Written consent was obtained from the parent or guardian of each child for participation in the study. Children aged six months to 16 years [ASA 1or 2] were recruited. The procedures were carried out at the Olabisi Onabanjo University Teaching Hospital [OOUTH] Modular Theatres between 11th and 15th July 2017. The surgical procedures carried out included herniotomies, umbilical herniorrhaphies, hypospadias repair, cleft lip repair, and orthopaedic procedures (corrective osteotomy). Baseline investigations carried out for all patients included Packed Cell Volume, urinalysis and viral screening [HIV, HBC and HBV]. Instruction The parents were instructed not to give breakfast on the morning of operation during pre-operative review exercise. Those who ate mistakenly had their surgeries rescheduled to 6 to 8 hours after the last meal.

The data collected included age, sex, clinical presentation and diagnosis. Type of regional anaesthesia administered, complications of surgery or anaesthesia, surgical specialities involved and the types of operation performed during the surgical expedition and period of follow-up were also recorded.

The children had intravenous access with the appropriate size of intravenous cannula and they were given pre-medicants [IV Dexamethasone 0.08mg/kg, Atropine 0.4mg/kg and Diazepam 0.5mg/kg] in the theatre waiting room in batches of four. Baseline vital signs were obtained on the operating table, oxygen was administered by face mask and sedatives [IV Ketamine 1mg/kg, Diazepam 0.25mg/kg] were given in preparation for sub-arachnoid block [SAB]. Under aseptic technique, SAB was done in moderately sedated and flexed patient in the lateral position with size 25G/26G pencil-point spinal needle. Heavy Marcaine was instilled based on calculated weight of child [<5kg - 0.5mg/kg; 5-15kg - 0.4mg/kg; and >15kg - 0.3mg/kg]. Patients were positioned supine after the block was instituted and a Bromage score of 3 was regarded as appropriate for surgical anaesthesia.

Caudal block [CB] is a safe form of epidural anaesthesia and can be the sole anaesthetic in older children or can be combined with general anaesthesia. CB was also performed under aseptic conditions. The patients were also moderately sedated after baseline vitals were taken with IV Diazepam 0.25mg/kg and IV Ketamine 0.5mg/kg body weight. Subsequently, the patient was positioned in the left lateral posture with 100% Oxygen given by self-retaining face mask. After identifying the sacral hiatus, a size 20G/22G short bevelled IV cannula was inserted through the sacral hiatus cephalad at angle 45^{0}. The needle was inserted until a click is felt as the sacrococcygeal ligament was pierced. After confirming negative aspiration for blood and cerebrospinal fluid identified, preservative-free plain Marcaine [0.25%] at 2mg/kg was injected into the sacral epidural space slowly, watching out for signs of systemic toxicity.

All the patients were monitored intra-operatively with the handheld pulse oximeters for oxygen saturation [SPO_2] and pulse rate. The patients were monitored in the recovery room till the features of motor blockade were reversed and then, they were subsequently taken to the wards for continued routine monitoring. All paediatric patients that received a form of regional technique or another were monitored until 30 days post-operative day via telephone conversation.

Results

A total of 35 children were recruited for the surgical expedition. There were nineteen (19) males and sixteen (16) females giving a male-to-female ratio of 1.5:1. The surgical procedures spanned specialities such as orthopaedics, plastic surgery and general paediatric surgery. All the recruited patients were screened for HIV, HBV and HBC, and were negative using the rapid kit. Furthermore, the instant urinalysis strip test showed normal results for all the patients. The Packed Cell Volume (PCV) results are displayed in Table I.

All the patients had one form of regional technique and/or a peripheral nerve block. There was no intra-operative or post-operative anaesthetic complication within the period of 30-days follow- up care.

Discussion

Paediatric regional anaesthesia is becoming more popular worldwide. It is often a key component of ambulatory surgeries. Regional anaesthesia techniques are cheaper and safer anaesthesia alternatives (compared to general anaesthesia) in countries with limited resources. They are particularly useful for lower limb, groin, perineum and lower

abdominal surgeries. Just like in this study, Kokki *et al*. reported satisfactory anaesthesia in ninety-two out of ninety-three children aged 1-17year olds who had a subarachnoid block for lower limb procedures with ropivacaine. [12]

Table I: Distribution of patients according to the Packed Cell Volume

PVC (%)	*Frequency*	*Percentage*
25-29	2	5.7
30-35	5	114.3
35-40	25	71.4
≥40	3	8.6
Total	35	100.0

Table II: Distribution of participants according to the regions of the body operated upon

Surgical speciality	*Region of the body*	*Frequency*	*Percentage*
Orthopaedics	Upper limb	1	2.9
	Lower limb	1	2.9
Plastic surgery	Upper limb (Fingers)	2	5.8
	Lower limb	1	2.9
Paediatric surgery	Umbilical	2	5.7
	Inguino-scrotal	22	62.9
	Penile	6	17.1
Total		35	100.0

Table III: Distribution of patients according to surgical specialities and anaesthesia techniques

Surgical Speciality	SAB	Caudal block	PNB	GA & PNB	SAB & LA	Total
Orthopaedics	2	0	0	0	0	2
Plastic surgery	0	0	2	2	1	3
Paediatric Surgery	24	6	0	0	0	30
Total	26	6	2	2	1	35

SAB - Subarachnoid block; PNB - Peripheral nerve block; GA - General anaesthesia; LA - Local anaesthesia

Generally, there has been encouraging reports as regards the safety and efficacy of subarachnoid block in children. [2-6] Subarachnoid block has been successfully used for a variety of surgical procedures in children such as herniotomy, general urologic and orthopaedic procedures. [13]

Regional techniques have also been demonstrated to have advantages of rapid and smoother emergence from anaesthesia and thus, earlier discharge from the operating room, faster recovery times and earlier discharge from the hospital or surgery centre. Greater personal and patient/parent satisfaction is an additional benefit of regional blocks. These benefits make regional techniques more desirable during the surgical expedition where there are usually inadequate equipment, personnel, time and space for intra and post-operative monitoring or critical care.

All the patients recruited were aged between six months and sixteen years of age with ASA I or 2. During the surgical expedition, there is usually a large turnout of patients to cope with. This often implies more pressure on the surgical team to accommodate as many patients as possible; however, careful selection of stable patients is very important. [1] Also,

there is usually limited time for a thorough investigation, even though basic/ routine investigations [such as PCV, HIV, HBV, HBC, and urinalysis] cannot be compromised in all the patients. Therefore, patients at risks of problems such as malignant hyperthermia and Glucose-6-Phosphate Dehydrogenase deficiency can be spared of the use of general anaesthesia drugs and the associated problems with the use of regional techniques. In this study, haematocrit, urinalysis and viral screening were the only baseline investigations carried out before surgery.

The majority of the patients in this study had spinal anaesthesia as the main anaesthetic modality. The block lasted the duration of surgery or beyond in most cases. No child complained of headache (as size 26 / 27G pencil-point spinal needle were used with one single attempt performed only by the Consultant Anaesthetists). This outcome is similar to that reported by Paton RH. However, none of our patients experienced nausea and or vomiting, probably because they were adequately pre-medicated and no adjunct was added to bupivacaine before administration. Also, no child required catheterization for urinary retention. It is acknowledged that the total number of patients included in this study is small.

Conclusion

Paediatric regional anaesthesia is a cost-effective and safe technique of anaesthesia for mass surgeries as in surgical expedition, provided meticulous pre-operative screening and patient selection is done without compromise. Moreover, technical skills and vigilance of skilled anaesthesia provider are indispensable to achieve good outcome with the use of regional techniques in the paediatric age group.

Acknowledgement: Dr CY Kalyan and Dr CR Siriparapu of the Trust Hospitals, Gaigolupadu, India for their patience at skill impartation in the field of paediatric regional anaesthesia.

Authors' Contributions: FOM conceived and designed the study. NCC participated in study design and literature review. EEA, ASO, SRO and ALO participated in literature review and drafting of the manuscript. All the authors approved the version of the manuscript.
Conflict of Interest: None.
Funding: Self-funded.
Publication History: Submitted 22 September 2019; **Accepted** 01 February 2020.

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