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Full Length Research Paper

Choice of anaesthesia for orthopaedic surgeries in a developing country: How appropriate?

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Abstract

Most orthopaedic surgeries involve the extremities and there is a rising trend in the use of regional techniques for them. Skilful and appropriate application of these broadens the anaesthetist's range of options, provides optimal anaesthetic care which includes postoperative analgesia and improves patient satisfaction. This study was to retrospectively review the types of anaesthesia and their appropriateness for extremity surgeries in the orthopaedic unit of a tertiary hospital. This will also provide a reference for future studies. The surgical records of the orthopaedic surgical unit were reviewed over a period of 1year. Paediatric patients (<18years) and those with incomplete data were excluded from the study. Patients' demographic data, extremity and location of where surgery was performed, duration of surgery and type of anaesthesia were recorded. Data was analysed and presented as frequencies and means using the SPSS version 16 software. A total of 145 patients with a mean age of 37.4 ± 15.0 years and male to female ratio of 2:1 were studied. Procedures were 49 (33.8%) upper limb and 96 (66.2%) lower limb surgeries. In the upper limb, 41(83.7%) were conducted under general anaesthesia while 8(16.3%) were done under regional/local anaesthesia. In the lower limb, 79 (82.3%) were done under spinal anaesthesia, 12 (12.5%) under general anaesthesia and 5 (5.2%) were done using other forms of regional/localanaesthesia. Therefore general anaesthesia was used for most upper limb surgeries, while spinal anaesthesia was predominantly used for lower limb surgeries. Peripheral nerve blocks were not offered. Current approaches in regional anaesthetic techniques should be encouraged.

Keywords: Orthopaedic surgery, Developing Country, Anaesthetic techniques, Appropriateness.

INTRODUCTION

Most orthopaedic surgeries involve the upper and lower limbs and there is an increasing trend in the use of regional techniques for most of them (Khanduri, 2008). Skilful application of regional techniques e.g. peripheral neural blockade broadens the anaesthetist's range of options, provides optimal anaesthetic care which includes postoperative analgesia and improved patient satisfaction. Orthopaedic procedures can cause severe perioperative pain (Mahooney et al., 1998) and inadequate analgesia is a cause of delayed discharge and unexpected hospital admission (Clarke, 2003). In a large prospective study, 16% of ambulatory orthopaedic patients had severe postoperative pain (Clarke, 2003). It is important to achieve optimal post-operative pain control since this will facilitate more rapid restoration of function.

Regional anaesthesia (RA) alone or in combination with general anaesthesia (GA) has consistently shown more benefits when compared with sole general anaesthesia for orthopaedic surgery involving the extremities (Clarke, 2003), and in modern anaesthesia practice regional techniques are preferred to GA (Schnittger, 2007). These benefits include superior intraoperative pain control, attenuation of the surgical stress response, minimal systemic impairment, reduced blood loss and transfusion requirements, less postoperative nausea and vomiting, excellent localized postoperative analgesia, increased level of alertness after surgery, decreased hospital discharge time and cost (Anand and Jindal, 2009; Gonano et al., 2006; Maurer at al., 2007; Pavic et al., 2011). The choice of peri-operative

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analgesic techniques has been shown to have significant consequences on the frequency and/or duration of hospitalization (Pavlin et al., 2002).

Overall, the choice of regional or general anaesthesia in orthopaedics depends on some or all of the following factors: patient's preference, state of health of the patient, expertise of the anaesthesiologist, duration of the procedure, surgeon's preference, and practice pattern in the hospital (Khanduri, 2008; Clarke, 2003; Schnittger, 2007; Oldman et al., 2004). The purpose of this study was to retrospectively review the types of anaesthesia and appropriateness for upper and lower limb surgeries in the orthopaedic unit of the University of Port Harcourt Teaching Hospital (UPTH). To the best of the authors' knowledge there has been no previous study of this nature in our environment and this study hopes to provide a reference for future planning and template for further comparative research purposes.

MATERIALS AND METHODS

A retrospective review of the theatre records of the orthopaedic surgical unit of the University of Port Harcourt Teaching Hospital (UPTH) from 1st of June 2011 to 31st of May 2012 was carried out. All patients aged 18years and above were included in the study, while those less than 18years or with incomplete data were excluded. Patients' demographic data, extremity and location of where surgery was performed, duration of surgery and type of anaesthesia were recorded. Data was analysed and presented as frequencies and means using the SPSS version 16.0 software.

RESULTS

A total of 181 procedures were done in the period under review. However, 145 patients met the inclusion criteria and were studied. Their ages ranged from 18-80years, with a mean age of 37.3 ± 15.0 years and male to female ratio of 2:1. The procedures performed were 49(33.8%) upper limb (UL) and 96(66.2%) lower limb (LL) surgeries, while the anaesthesia administered were 53(36.5%) GA and 92(63.5%) RA techniques (Table 1). Table 2 shows the distribution of surgery in the upper and lower limbs. In the UL, 31(63.3%) surgeries were done distal to the elbow and 18(36.7%) on/or above the elbow; while in the LL, 58(60.4%) surgeries were done distal to the knee and 38(39.6%) on/or above the knee. In Table 3, the anaesthetic techniques used for the upper and lower limb surgeries, together with the duration of surgery is shown. More surgeries in the UL were done under GA [41(83.7%)] than regional techniques [8(16.3%)]. In the LL, most surgeries were done under subarachnoid block [79(82.3%)], compared to GA [12(12.5%)] and other regional techniques [5(5.2%)]. Of the 41(83.7%) surgeries done under GA in the UL, 31(75.6%) lasted less than 3 hours, while only 10(24.4%) lasted for more than 3 hours (Table 4). Table 5 shows that of the 79 cases done under SAB in the LL, 64(81.0%) lasted less than 3 hours while 15(19.0%) lasted for more than 3 hours.

DISCUSSION

Our study showed that more surgeries in the UL were done under general anaesthesia than regional techniques, while most LL surgeries were done under regional techniques than general anaesthesia. Also, most procedures were located distal to the elbow or knee joint and lasted less than 3hours. Literature abound that show that most surgeries of the UL can be done under regional techniques (Khanduri, 2008; Anand and Jindal, 2009). However, GA may be more appropriate in some circumstances as it is reported that apart from subarachnoid, epidural and interscalene blocks, regional blocks with local anaesthetic drugs do not relieve tourniquet pain (Lee, 2002). Progress with the surgical procedure may therefore become impossible in the conscious patient after 30 min or so, even though the site of surgery may still be pain-free. Often the only solution in this situation is general anaesthesia. Also, bone grafts to upper limbs already anaesthetized by regional techniques may need to be taken from other parts of the body, e.g. the iliac crest. Consequently, it may be more appropriate to use general anaesthesia when bone grafting is planned.

In the present study, 66.2% of the surgeries were in the LL compared to UL surgeries. This is comparable to the preponderance of LL surgeries (64%) reported by Khanduri (Khanduri, 2008). In the report by Khanduri, 85% were operated under regional techniques and 15% under GA (Khanduri, 2008). The use of regional techniques in the present study was 63.5% while GA was utilised in 36.5%. Although RA is gaining popularity worldwide (Khanduri, 2008), they are still underutilized especially in the developing world (Anand and Jindal, 2009) including Nigeria (Schnittger, 2007; Rukewe and Fatiregun, 2010).

Regional anaesthesia of the upper extremity has several clinical applications and is reported to have several advantages over GA for orthopaedic surgery. These advantages, such as improved postoperative pain relief, decreased postoperative opioid administration, and reduced recovery time (Clarke, 2003; Anand and Jindal, 2009) have led to widespread acceptance of a variety of regional nerve blocks. Regional anaesthesia in the upper extremity can be carried out as a single dose-brachial plexus block or as a continuous infusion to provide a longer duration of postoperative pain relief (Anand and Jindal, 2009). Osaigbovo and colleagues (Osaigbovo et al., 2008) recruited 50 patients to compare the clinical

Table 1. Demographic and surgical characteristics

Characteristics	Value
Number of patients	145
Mean age (years) ± SD	37.3 ± 15.0
Male to female ratio	2:1
Surgical procedures n (%)	
UL	49 (33.8)
LL	96 (66.2)
Type of anaesthesia n (%)	
GA	53 (36.5)
RA	92 (63.5)

UL-upper limb, LL-lower limb, GA-general anaesthesia, RA-regional anaesthesia

Table 2. Distribution of surgery

	UPPER LIMB						
	Shoulder	**Upper arm**	**Elbow**	**Forearm**	**Wrist**	**Hand**	**Total**
Number	2	11	5	16	4	11	49
Percentage	4.1	22.4	10.2	32.7	8.2	22.4	100
	LOWER LIMB						
	Hip	**Thigh**	**Knee**	**Leg**	**Ankle**	**Foot**	**Total**
Number	12	22	5	34	9	15	96
Percentage	11.4	23.0	5.2	35.4	9.4	15.6	100

Table 3. Anaesthetic technique and Duration of Surgery

UL techniques n(%)		**Duration (Hrs)**			
		< 1	**1-2**	**2-3**	**>3**
GA	41(83.7)	11	8	12	10
IVRA	3(6.1)	3	0	0	0
PNB	0(0)	0	0	0	0
LI	5(10.2)	5	0	0	0
TOTAL	**49(100)**	**19(39.0)**	**8(16.0)**	**12(25.0)**	**10(20.0)**
LL techniques n(%)		**Duration (Hrs)**			
		< 1	**1-2**	**2-3**	**>3**
GA	12(12.5)	4	4	1	3
SAB	79(82.3)	19	24	21	15
PNB	0(0)	0	0	0	0
AB	1(1.0)	1	0	0	0
LI	4(4.2)	3	1	0	0
TOTAL	**96(100)**	**27(28.0)**	**29(30.0)**	**22(23.0)**	**18(19.0)**

GA-general anaesthesia, IVRA-intravenous regional anaesthesia, PNB-peripheral nerve blocks, LI-local infilteration, SAB-subarachnoid block, AB-ankle block.

Table 4. Site and duration of surgery GA (Upper limb)

Site	Duration (Hrs)				
	<1	**1-2**	**2-3**	**>3**	**TOTAL**
Shoulder	0	0	0	2	2
Upper arm	1	3	5	2	11
Elbow	2	0	1	2	5
Forearm	5	4	4	3	16
Wrist	1	1	1	0	3
Digits	2	0	1	1	4
TOTAL	**11**	**8**	**12**	**10**	**41**

Table 5. Site and duration of surgery SAB (Lower limb)

Site	Duration (Hrs)				
	<1	**1-2**	**2-3**	**>3**	**TOTAL**
Hip	1	0	3	6	10
Thigh	1	6	6	4	17
Knee	2	0	2	1	5
Leg	11	12	8	3	34
Ankle	1	4	1	1	7
Foot	3	2	1	0	6
TOTAL	**19**	**24**	**21**	**15**	**79**

benefits of transarterial axillary (24 patients) block and mid-humeral (26 patients) block, and recorded 70.8% and 96.15% success rates respectively. Of the brachial plexus blocks, the interscalene approach is the most appropriate block for procedures involving the shoulder because it blocks the suprascapular nerve that also innervates the upper part of the shoulder, which is left out by other approaches (Clarke, 2003; Osaigbovo et al., 2008).

Brachial plexus blocks are increasingly being carried out with a nerve stimulator and the trend has been to use large volumes of local anaesthetic solutions to fill the plexus-containing compartment, achieving rapid onset of the block. Recent developments also include its use as patient-controlled continuous infusions of low doses of local anaesthetics via perineural, intra-articular, subacromial, and axillary approaches (Rawal N et al., 2002). Brachial plexus anatomy has been studied and block needles have been successfully placed with ultrasound imaging guidance (Peterson et al., 2002).

Our study also showed that most LL surgeries were done under subarachnoid block compared to general anaesthesia and other regional techniques. This agrees with the findings of other workers (Schnittger, 2007; Rukewe and Fatiregun, 2010; Hadzic et al., 1998; Rosenberg PH, 2005). A nation-wide survey conducted in the United States of America revealed that among the RA techniques, peripheral nerve blocks (PNBs) especially of the lower extremity remain under-utilized (Hadzic et al., 1998). Spinal anaesthesia is therefore the current trend of anaesthetic technique for lower extremity surgeries (LES) (Rosenberg PH, 2005), although better longer lasting approaches may be offered. While no outcome differences regarding major morbidity parameters were shown between the use of spinal anaesthesia compared with GA for LES in orthopaedics by some workers (Gonano et al., 2006; Parker et al., 2004), others have reported a reduction in postoperative morbidity and mortality with the use of RA (Schnittger, 2007; Maurer et al., 2007).

It is possible to use peripheral nerve blocks alone and achieve adequate pain relief without any form of neuraxial analgesia. Adequate analgesia was achieved by a three-in-one block combined with a sciatic nerve block for below knee amputation in a critically ill patient, thereby avoiding the risks of GA in the very ill (Mafe and Ajetumobi, 2006). Haemodynamic stability is also better especially in the aged who constitutes a large proportion of orthopaedic surgical patients. It has been shown that continuous femoral nerve block (CFNB) with a sciatic nerve block caused less nausea and resulted in more pain-free patients when compared with patients who received epidural analgesia after total knee arthroplasty (Chelly JE et al., 2001). However, analgesia after CFNB without a sciatic nerve block was equivalent (Singelyn et al., 1998) or inferior (Capdevila et al., 1999) to epidural analgesia. A high efficacy with a low rate [3% (15/507)] of conversion to GA for the popliteal sciatic block placed with nerve stimulator guidance (Singelyn et al., 1991), and a significant reduction in post-operative opioid

requirements in patients with a successful popliteal fossa block compared with no block (Provenzano et al., 2002) have been reported. Continuous sciatic nerve catheters have no doubt led to excellent analgesic outcomes when compared with single-injection blocks or placebo catheters (White et al., 2003; Chelly et al., 2002).

Despite overwhelming evidence supporting the beneficial and safe use of various regional techniques including catheter placements in all types of orthopaedic extremity surgeries, our study showed that most UL surgeries were done under GA and within 3hours. Although spinal anaesthesia, as the anaesthetic technique of choice for LES was employed, there was no use of neuraxial blocks with catheters or PNB with or without catheters. Catheters were therefore not utilised to prolong intraoperative analgesia if necessary or facilitate postoperative analgesia. Rukewe and Fatiregun in their survey of Nigerian Anaesthesiologists reported that regular use of spinal, epidural and PNBs was reported by 92.9%, 15% and 2.9% respectively of the 140 respondents (Rukewe and Fatiregun, 2010). This shows the low utilisation of PNBs in Nigeria. The limited use of PNBs in orthopaedic extremity surgeries in our centre may be attributed to various factors such as lack of equipments and lack of training. Deficiencies in equipment, training and drugs in Africa have been reported earlier (Schnittger, 2007).

There is no doubt that there is a clear understanding of the benefits of regional approaches in extremity surgeries to both patient and health service provider, but there is the need for improved training of manpower in the use of regional techniques and encouragement of subspecialisation. Provision of necessary equipment such as ultrasound scan, nerve stimulators, block needles etc will also stimulate interest and motivation of staff, and improved skills and success rate will enhance appropriate practice of orthopaedic anaesthesia.

Limitations of the study

The limitations of the study include the fact that it was a retrospective study. Some incomplete data were excluded and a study for a longer duration would have improved the inference drawn.

CONCLUSION

We therefore conclude that general anaesthesia was inappropriately used for most UL surgeries which could otherwise be performed using different types of RA in current practice and of greater benefits (Schnittger, 2007; Clarke 2003). Regional blocks in form of spinal anaesthesia were predominantly and appropriately used for LL procedures, but there is need to broaden the horizon of options available i.e., improved approaches and techniques to orthopaedic anaesthesia practice in line with current and best practices. These will contribute to better patient satisfaction and improved results. Manpower training, provision of necessary equipments and self motivation of staff are vital to this outcome and should be encouraged.

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