Orthopaedic anaesthesia for upper extremity procedures in a Nigerian hospital

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Abstract

Background

General anaesthesia and regional anaesthesia have been used successfully for upper extremity orthopaedic procedures. Despite the advantages of regional anaesthesia, there is low utilisation in Nigeria. In this study, we assessed the types of anaesthesia employed for upper extremity surgeries in our centre.

Methods

After obtaining approval from the institutional ethics committee, all the patients who had upper extremity surgeries from 1 January 2011 to 31 December 2012 were included in this review. Both prospective and retrospective data were gathered. The choice of anaesthesia was at the discretion of the attending anaesthetist.

Results

A total of 226 patients with a male-to-female ratio of 1.6:1 and median age of 35.0 (range 2 – 89) years, had orthopaedic upper extremity procedures during the study period. Sixty-three cases (27.9%) had general anaesthesia, 5 (2.2%) combined regional and general anaesthesia while 158 (69.9%) had regional blocks. The regional blocks comprised 145 (89%) different approaches to the brachial plexus and 18 (11%) local anaesthetic infiltrations. The arm was the site mostly operated upon; while supraclavicular and axillary brachial plexus blocks were performed in equal amounts. In 14 (6.2%) patients, brachial plexus blocks were performed with spinal anaesthesia because of concomitant iliac crest bone grafts. While the duration of surgery did not differ significantly, regional anaesthesia provided a significantly longer duration of anaesthesia than general anaesthesia (251 ± 70.8 min versus 141.3 ± 65.5 min; p = 0.0000001).

Conclusion

There is a high use of regional anaesthesia for upper extremity orthopaedic surgeries in our centre, which is a positive development in a resource limited setting.

Introduction

General anaesthesia (GA) and regional anaesthesia (RA) have been used successfully for upper extremity orthopaedic procedures[1,2]. Nerve block anaesthesia being cheaper than GA has many advantages such as anaesthesia targeted at the operative site, excellent postoperative pain relief, decreased opioid use and reduced recovery time[3,4]. One would have thought resource limited centres across Nigeria would have embraced regional techniques. A recent local study reported a predominant use of general anaesthesia (84%) for upper extremity surgeries[5]. Earlier Imarengiaye et al,[6] had proposed the transarterial approach for axillary block for hospitals that cannot provide the peripheral nerve stimulator. In this study, we assessed the current orthopaedic anaesthesia for upper extremity surgeries in our centre.

Materials and Method

After obtaining approval from the institutional ethics committee, all the patients who had upper extremity surgeries from 1 January 2011 to 31 December 2012 were included in this review. Both prospective and retrospective data were gathered. On the day of surgery, patient's demographics, block technique including local anaesthetic solution and dose administered, success/ failure , need for supplementation and identity of the performing physician were prospectively entered in the questionnaire designed for the study. The need for planned or unplanned general anaesthesia was obtained retrospectively from the anaesthesia register.

The choice of anaesthesia was at the discretion of the attending anaesthetist. Informed consent was obtained from the adult patients or the guardian/parents of children. Preceding the blocks, all patients had an infusion of 0.9% normal saline started on the non-operated arm and were positioned supine with the head turned to the contralateral side. Only children were pre-medicated before separation from their guardian/parent with intramuscular ketamine 2mgkg-1 and glycopyrrolate 2 mcgkg-1 or atropine 0.01 mgkg-1. Routine electrocardiogram, noninvasive blood pressure and pulse oximetry monitors were applied. The nerve block anaesthesia was performed using 22-G x 2" stimuplex D block needles and Stimuplex HNS12 nerve stimulator (B. Braun Melsungen, Germany) with or without echo-guidance using Ultrascan 3, HCE (Surrey, UK). Before block placement in children, intravenous midazolam or diazepam was administered for sedation. In adults, sedation was administered only intra-operatively unless refusal by the patient to achieve Ramsay sedation score of 2-3. The local anaesthetic solution injected upon localisation of the target nerve/plexus was based on the expected duration of the surgery, often 50:50 mixture of 2% lidocaine with 1:200,000 epinephrine (20 ml) and 0.5% isobaric bupivacaine (20 ml) plus 10 ml water for injection (constituting 50 ml solution). A total of 40-50 ml was injected after obtaining the desired motor response with a current of 0.2-0.5 mA for the different approaches to the brachial plexus. In a few patients, 32 ml of 1.5% lidocaine with 1:200,000 epinephrine plus 8 mg dexamethasone was administered for axillary brachial plexus block for forearm and hand surgery. The local anaesthetic infiltration by the surgeons comprised 5-10 ml of 1% plain lidocaine. We define successful block as one requiring no supplemental local anaesthetic administration intraoperatively or conversion to GA. Patients with inadequate surgical anaesthesia upon incision received supplemental LA administration, or conversion to endotracheal GA.

Data were summarised using SPSS for windows 17.0 (SPSS Inc., Chicago, IL, USA) and reported as mean ± SD, rates, and percentages, as appropriate.

Results

A total of 226 patients with a male-to-female ratio of 1.6:1 and median age of 35.0 (range 2 – 89) years, who had orthopaedic upper extremity procedures between January 2011 and December 2012 were studied. The patients' demographic characteristics are shown in Table 1. The duration of surgery ranged from 5 – 405 minutes. Osteo-articular procedures constituted 208 (92%) cases, while soft tissue procedures were 18 (8%). The arm (30.5%) was the surgical site with the most surgeries and the shoulder was the least, 7 (3.1%). Table 2 showed the duration of surgery, anaesthesia and surgical site.

In 14 (6.2%) patients, brachial plexus blocks were performed with spinal anaesthesia because of concomitant iliac crest bone grafts. Sixty-three cases (27.9%) had GA, while 158 (69.9%) had regional blocks and lastly, 5 patients, had upper limb RA combined with planned GA because of the preferences of the surgeons who anticipated prolonged operating times for shoulder and elbow reconstructive surgeries. The mean duration of surgery for GA and RA was 106 ± 56.7 and 118.9 ± 67.5 respectively, p = 0.18. The mean duration of anaesthesia for GA and RA was 141.3 ± 65.5 and 251 ± 70.8 respectively, p = 0.0000001. The regional blocks comprised 145 (89%) different approaches to the brachial plexus. Table 3 showed the different upper extremity RA performed.

On gender and age, there was statistical difference as more male patients (p = 0.009) that were a decade older (p = 0.0001), had regional techniques for their procedures. There was no difference between both groups with respect to weight (p = 0.246) but physical status showed that ASA I patients had RA rather than GA, p = 0.023.

Three blocks were considered failures because of conversion to endotracheal GA for 2 cases and local anaesthesia infiltration intraoperatively for the third. In another 6 cases, block anaesthesia was inadequate as the surgical procedures were longer than the block duration necessitating the administration of ketamine to complete the surgery. Overall, 154 (94.5%) RA was adequate but successful block anaesthesia was achieved in 160 (98.2%) cases.

Table 1. Patient Demographic Characteristics

	General Anaesthesia n = 63	Regional Anaesthesia n = 163	P Value
Gender, n (%)			
Male	47 (74.6)	91 (55.8)	
Female	16 (25.4)	72 (44.2)	0.009
Age, mean ± SD, yr	28 ± 19	39 ± 19	0.0001
Range, yr	(2 – 89)	(4 – 84)	
Weight, mean ± SD, kg	38.1 ± 30.2	43.9 ± 34.8	0.246
range, yr	(11 – 101)	(14 – 107)	
ASA physical status			
I	33 (52.4)	117 (71.8)	
II	26 (41.3)	41 (25.2)	
III	3 (4.8)	5 (3.0)	0.023
IV	1 (1.5)	-	

Table 2. Duration of Surgery, Anaesthesia and Surgical site

	General Anaesthesia n = 63	Regional Anaesthesia n = 163	P Value
Duration of surgery,			
Mean ± SD, (min)	106 ± 56.7	118.9 ± 67.5	0.180
range (min)	(15 – 250)	(5 – 405)	
Duration of anaesthesia,			
Mean ± SD, (min)	141.3 ± 65.5	251 ± 70.8	0.0000001
Range, (min)	(25 – 275)	(110 – 480)	
Surgical site, n (%)			
Shoulder	3 (4.8)	4 (2.5)	
Arm	23 (36.5)	46 (28.3)	
Elbow	19 (30.2)	29 (17.8)	
Forearm	14 (22.2)	50 (30.7)	
Wrist	- (0)	13 (8.0)	
Hand	4 (6.4)	21 (12.9)	0.023

Table 3. Upper limb regional techniques used

Technique	n (%)
Interscalene block	9 (5.5)
Supraclavicular block	68 (41.7)
Axillary block	68 (41.7)
Local anaesthetic infiltration	18 (11.0)
Total	163 (100)

Discussion

Our study showed that both GA and RA provided effective surgical anaesthesia for upper extremity orthopaedic procedures, irrespective of the location or complexity of surgery for the 226 patients studied. Block anaesthesia when used as a sole technique or in conjunction with GA proved adequate for surgery in our study population. However, there was a predominant use of RA; only 27.9% cases were performed under GA. This finding is at variance with the Port Harcourt data, where 84% had GA for upper limb surgeries[5]. In this present study, brachial plexus blocks made up 89% RA. This percentage represents a positive development in a resource limited setting where low utilisation of regional blocks has been blamed on deficiencies of training, equipment and drugs[7,8]. Imarengiaye and colleagues had recommended transarterial axillary approach for centres that cannot provide nerve stimulators for neurolocation[6].

Another local study had compared transarterial with midhumeral axillary techniques and found both effective for forearm and hand surgeries[9]. Our data showed that surgical anaesthesia was significantly longer under RA than GA (p = 0.0000001). However, we are cautious with this interpretation since there was no randomisation. Researchers who compared GA and infraclavicular nerve block did not find any significant difference in the total operating time between both techniques[1]. There are instances when one might employ RA as an adjunct to a planned GA like we did in 5 (2.2%) patients, where the surgeons anticipated prolonged operating time for elbow/shoulder reconstructive surgeries. In another 14 (6.2%) patients, upper limb brachial plexus blocks were used with concomitant spinal anaesthesia for planned iliac crest bone grafts. It is difficult to draw conclusions on our findings of statistical difference on age, gender, ASA physical status and location of surgery, as the choice of anaesthetic technique in this study depended firstly on the anaesthetist, then the surgical preference.

Our result of 98.2% successful block anaesthesia represents a good outcome, especially following single-shot techniques. This should be put down to the neurolocation techniques, which were largely neurostimulation and the few combined with echoguidance.

We admit as limitation that some data on planned or unplanned GA were retrospectively gathered, which introduced inherent bias. Secondly, our methodology constrains us not to make comparison between GA and RA, being disparate techniques. The heterogeneity in RA is such that the blocks were performed at different levels of the brachial plexus; from the most proximal to the terminal branches.

In conclusion, upper limb orthopaedic procedures are performed under GA and RA, with a high use of plexus/ nerve blocks in our centre. This is a positive development in a resource limited setting.

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