East Africa Medical Journal Vol. 88 No. 4 April 2011
BRACHIAL PLEXUS BLOCKS FOR UPPER EXTREMITY SURGERIES IN A NIGERIAN HOSPITAL
A. Rukewe, Consultant Anaesthetist, Department of Anaesthesia, A. Fatiregun, Consultant Epidemiologist, Faculty of Public Health, Department of Epidemiology, Medical Statistics and Environmental Health, College of Medicine, O. P. A. Arikawe, Registrar Anaesthetist, Department of Anaesthesia and T. O. Alonge, Consultant Orthopaedic Surgeon, Department of Orthopaedics and Trauma, University College Hospital, Ibadan, Oyo State, Nigeria.

Request for reprints to: Dr. A. Rukewe, Box 30489, Secretariat Post Office, Ibadan, Oyo State, Nigeria

BRACHIAL PLEXUS BLOCKS FOR UPPER EXTREMITY SURGERIES IN A NIGERIAN HOSPITAL

A. RUKEWE, A. FATIREGUN, O. P. A. ARIKAWE and T. O. ALONGE

ABSTRACT

***Background*: Different techniques of brachial plexus blocks are in use to provide surgical anaesthesia from the shoulder to the fingertips. However, they are perceived as time-consuming and unreliable as the sole anaesthetic for surgical procedures. Until recently (July 2008), only general anaesthesia was employed in our centre even for hand surgeries.**

***Objective*: To evaluate the use and outcome of brachial plexus blocks for upper extremity surgeries.**

***Design*: A retrospective review of patients' records and prospective observation of patients with upper extremity surgeries.**

***Setting*: The University College Hospital, Ibadan, situated in Southwestern Nigeria with over 875 beds.**

***Subjects*: Patients who had surgeries of the shoulder, humerus, elbow, forearm, wrist and hand were studied.**

***Results*: In 2006 and 2007, only general anaesthetic accounted for the 220 upper extremity surgeries. However, in 2008, 2009 and 2010, brachial plexus blocks accounted for 6.9, 27.9 and 48.6% respectively. From a success rate of 60.0% in the first year of practicing brachial plexus anaesthesia using 40% paraesthesia technique, the second and third years were 78.9 and 96.5% respectively due to better localisation techniques (nerve stimulation alone or in combination with echo-guidance).**

Conclusion: **Our study shows an increasing successful use of brachial plexus block techniques for upper extremity procedures.**

INTRODUCTION

Brachial plexus blocks (BPB) can provide surgical anaesthesia from the shoulder to the fingertips. Different techniques are in use depending on the area of surgical interest such as interscalene block, supraclavicular block, infraclavicular block, and axillary block (1). The techniques provide site-specific anaesthetic, thereby cause minimal disruption in the cardiorespiratory system of the patient (2). This effect is an advantage in patients with co-morbidities or trauma. Furthermore, opioid requirements are reduced and side effects associated with opioids or general anaesthetics such as nausea, vomiting, sedation and respiratory depression are avoided (3-5). However, they are perceived as time consuming and unreliable as sole anaesthetic for surgical procedures. Until recently only general anaesthesia (GA) was employed at the University College Hospital, Ibadan, Nigeria even for hand surgeries. In this study, we evaluated the use and outcome of BPB for upper extremity surgery in our centre.

MATERIALS AND METHODS

Following approval from the Local Research Ethics Committee and written informed consent, we employed retrospective review of patients' hospital records, anaesthetic and relevant surgical notes as well as prospective observation of patients with upper extremity surgeries between 1st January 2006 and 31st December 2010. An Upper Limb Regional Anaesthesia (ULRA) data extraction form was developed for the collection of more information such as sex, age, weight, American Society of Anesthesiologists' (ASA) physical status, type and technique of anaesthesia, surgical procedures and outcome of anaesthesia. All the procedures considered eligible were surgeries

on the shoulder, humerus, elbow, forearm, wrist and hand.

Choice of anaesthesia for each patient was entirely at the discretion of the attending anaesthetist. BPB was instituted in the operating room or a block placement area with multiparameter monitor for blood pressure, arterial oxygen saturation (SaO_2), electrocardiogram as well as drugs for resuscitation and oxygen therapy. To localise the target nerve/plexus, paraesthesia was elicited by mechanical stimulation before injecting the local anaesthetic solution in four out of ten patients in 2008. In 2009, PNS technique was employed in 36 BPB with muscle twitch at 0.2-0.4mA as end-point, while the remaining two cases had PNS combined with ultrasound guidance. However, in 2010, seventy-five BPB had PNS technique and 11 had PNS with ultrasound guidance. In patients who had BPB, a successful block was achieved when no supplementary local anaesthetic was administered intra-operatively nor conversion to a general anaesthetic. Sedation was administered before instituting blocks in children and intra-operatively in all patients unless refusal by the patient to achieve Ramsay sedation score of 2-3. The ULRA we performed comprised Winnie's approach to the interscalene block, subclavian peri-vascular block, coracoid infraclavicular block, triple nerve stimulation axillary block and wrist block, everyone single-shot technique. The results are presented as number of cases, mean, median and range as appropriate. All the data were analysed using a statistical program (SPSS for windows 17.0, SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 677 upper limb operations were considered eligible for brachial plexus anaesthesia during the study period. Table 1 and 2 shows the demographic data of the upper limb surgical patients, type of anaesthesia and BPB success rate. In the first two years (2006, 2007), GA accounted for all the 220 upper extremity surgeries. However, in 2008, 2009 and 2010, BPB accounted for 6.9, 27.9 and 48.6% of the upper extremity surgeries respectively. The first BPB in 2008 was a case of subclavian peri-vascular block for an open reduction and internal fixation of a left midshaft humeral fracture. From a success rate of 60.0% in the first year of practicing brachial plexus anaesthesia, the second and third years were 78.9 and 96.5% respectively.

Out of 134 BPB performed during the study period, axillary block accounted for 57%, subclavian perivascular block 29%, interscalene block 8%, infraclavicular block 4% and wrist block 2%.

Table 1
Demographic data of the Upper Limb Surgical patients during the study period

Characteristic	2006		2007		2008		2009		2010	
Number of patients (n)	91		129		144		136		177	
	GA	BPB	GA	BPB	GA	BPB	GA	BPB	GA	BPB
Anaesthetic Technique	91	-	129	-	134	10	98	38	91	86
Sex:										
Male	61	-	73	-	38	6	65	23	65	71
Female	30		24		17	4	33	15	26	15
Age:										
Median	28	-	28	-	28	36	30	30	25	27
Range	1-72		1-78		1-71	4-60	2-85	3-74	1-80	1-70
Weight (kg) median	41	-	50	-	22	68	32	60	26	68
Range	1-95		7-80		11-50	65-70	6-65	13-85	1-50	7-133
Type of surgery:										
Orthopaedics	66	0	99	0	24	9	64	20	55	66
Plastic	21	0	28	0	29	1	28	17	31	14
Vascular	4	0	2	0	2	0	6	1	5	6

Table 2
Brachial Plexus Block success rate during the study period

YEAR	BPB n	BPB SUCCESS RATE n (%)
2006	-	-
2007	-	-
2008	10	6(60.0)
2009	38	30(78.9)
2010	86	83(96.5)

DISCUSSION

Our results show a growing trend in the utilisation of brachial plexus blocks for upper extremity surgeries in our centre in the years under review. However, in the first two years (2006, 2007), only general anaesthetic was administered even for hand surgeries. Our experience of zero performance of BPB cannot compare with Hadzic *et al*, (6) a decade after they reported under-utilisation of peripheral nerve blocks in the United States. This confirms Harrop-Griffiths and Nathanson's,(7) observation that despite the fact that cocaine was discovered long before ether was synthesised, regional blocks are practiced by fewer anaesthesiologists. The first case of subclavian perivascular block for open reduction and internal fixation of left midshaft humeral fracture was performed by the principal investigator when he returned from training in Ganga Hospital, Coimbatore, India (8).

Our nerve/plexus localisation techniques demonstrate a growing trend as well. In 2008, 40% of the BPB were done via eliciting paraesthesia as the endpoint to determine the site of local anaesthetic injection as per Moore's dictum "no paraesthesia, no anaesthesia"(9). This is high when one considers that we are well past both the paraesthesia and nerve stimulator era (10). It is noteworthy that two and eleven cases in 2009 and 2010 respectively had nerve stimulator plus ultrasound-guided approaches. This growth in our clinical practice is against the background that the ultrasound has been proposed as the 'gold standard' for regional anaesthesia (11). The BPB success rate in our first year was 60% where paraesthesia technique accounted for 40%, in the second year it rose to 78.9% with PNS technique accounting for 95% and in the third year during which we had more PNS combined with echo-guidance, the success rate was 96.5%. The increasing success rate underlines better nerve/plexus localisation techniques during the study period. Our experience supports the fact that there is potential that ultrasonography may facilitate visualising the nerves, the needle, local anaesthetic spread during injection and reduce vascular puncture or intraneural needle placement (1,12,13). While echoguidance account for 95% of BPB in Oslo University Hospital (13), we combined ultrasound with nerve stimulator in 10% of BPB in just two and a half years of peripheral regional anaesthesia.

One limitation of this study was not being able to assess the time to achieve successful BPB partly because we employed a retrospective review of patients' hospital records and prospective observation of cases. A prospective study in future will address this concern.

In conclusion, our study shows an increasing successful use of BPB techniques for upper extremity procedures. The effect of the learning curve is discernable from improving BPB success rate.

REFERENCE

1. Neal, J. M., Hebl, J. R., Gerancher, J. C. and Hogan, Q. H. Brachial plexus anesthesia: essentials of our current understanding. *Reg. Anesth. Pain. Med*. 2002; **27**: 402-428.
2. Elliot, J. M. Regional anaesthesia in trauma. *Trauma* 2001; **3**: 161-174.
3. Cross, G. D. and Porter, J. M. Blood flow in the upper limb during brachial plexus anaesthesia. *Anaesthesia* 1988; **43**: 323-326.
4. Chung, F. and Mezei, G. Factors contributing to prolonged stay after ambulatory surgery. Anesth Analg 1999; **89**: 1352-1359.
5. Klein, S., Evans, H., Nielsen, K. C., *et al*. Peripheral nerve block techniques for ambulatory surgery. *Anesth. Analg*. 2005; **101**: 1663-1676.
6. Hadzic, A., Vloka, J. D., Kuroda, M. M., *et al*. The use of peripheral nerve blocks in anesthesia practice. A national survey. *Reg. Anesth. Pain. Med*. 1998; **23**: 241-246.
7. Harrop-Griffiths, W. and Nathanson, M. H. Regional anaesthesia – the bride at last? *Anaesthesia* 2010; **65** (Suppl. 1): ii-iv.
8. Rukewe, A., Ogunlade, S. O., Idowu, O. A. and Aderinto, D. A. Subclavian perivascular block for open reduction and internal fixation of left midshaft humeral fracture – a case report. *Afr. J. Med. Sci.* 2010; **39**: 69-71.
9. Moore, D. C. Regional anesthesia. Springfield, IL: Charles C. Thomas, 1953; 241.
10. Russon, K., Pickworth, T. and Harrop-Griffiths, W. Upper limb blocks. *Anaesthesia* 2010; **65** (Suppl. 1): 48-56.
11. Hopkins, P. M. Ultrasound guidance as a gold standard in regional anaesthesia. *Br. J. Anaesth*. 2007; **98**: 299-301.
12. Bedforth, N. M. New technologies in nerve localization. Anaesthesia 2010; **65** (Suppl. 1): 13-21.
13. Klaastad, Ø., Sauter, A. R. and Dodgson, M. S. Brachial plexus block with or without ultrasound guidance. *Curr. Opin. Anaesthesiol*. **22**: 655-660.