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Research Article

## Anaesthesia for orthopaedic surgeries in two tertiary institutions in north central Nigeria

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### Abstract

**Background:** Orthopedic surgeries involve upper and lower extremities as well as spine surgeries and are performed under various anesthetic techniques. Therefore it is important to review the choice of anesthesia for the various orthopedic surgeries in order to evaluate their appropriateness.

**Method:** A retrospective review of theatre records of all orthopedic surgeries performed over a 2 year period (1<sup>st</sup> July 2016-30<sup>th</sup> June 2018) involving patients of all ages was carried out in two tertiary institutions. Patient's demographic data, site of surgery, the anesthetic technique used and duration of the surgery were recorded. Data were analyzed and presented as frequency and means using statistical package for social sciences (SPSS software version 23).

**Result:** A total of 334 patients had orthopedic surgery done over the period under review. The mean age was  $39 \pm 20.9$  years. More than sixty percent of the patients were males (60.8%). Most of the procedures were done as elective surgeries (61.7%). The sites of orthopedic surgical procedures done were upper limb 73 (21.9%), lower limb 243 (72.8%), upper and lower limb 4 (1.2%) and spine surgeries 14 (4.2%). Of the upper limb surgeries, 55 (75.3%) were performed under general anesthesia (GA) and 18 (24.7%) under regional anesthesia (RA). While for the lower limb, most of the surgeries were done under RA 196 (81%). The RA technique used was predominantly spinal 133 (54.7%) and GA cases were only 46 (19%). All the 14 spine surgeries were performed under GA. The upper and lower limb surgeries were done either as RA 2 (50%) or as GA+RA 2 (50%).

**Conclusion:** Most of the upper limb surgeries that could be performed under regional anesthesia were done under GA, this has to improve. It is however commendable that a large proportion of lower limb surgeries were performed under various regional anesthetic techniques. There is a need to perform more spine surgeries under different anesthetic techniques.

**Keywords:** Orthopaedic surgery, anesthetic techniques, appropriateness

**INTRODUCTION**

Orthopedic surgeries usually involve both the pediatric age group and adults. It also involves upper limb and lower limb surgeries as well as spine surgeries. Therefore, the anesthetic technique of choice is expected to vary for different surgical procedures, age, and available expertise. There is, however, an increasing trend worldwide towards the use of regional anesthetic techniques for upper limb and lower limb orthopedic surgeries [1]. Neuraxial Regional Anesthesia (RA) for lower limb surgeries has gained worldwide popularity because it has lower mortality rates, shorter hospital stay, decreased patient cost and decreased in-hospital complications [1-3]. It also improves post-operative pain control, decreases intraoperative bleeding with no need for endotracheal intubation and artificial ventilation. Thus, neuraxial anesthesia improves the overall surgical outcome [4].

General Anesthesia (GA) and spinal anesthesia have both been shown to be suitable techniques for patients undergoing lumbar spine surgeries [5-7]. However, general anesthesia is the most routinely used technique for spinal surgeries [8].

Regional anesthesia (RA) alone or in combination with General Anesthesia (GA) has been shown to have more benefits when compared with only General Anesthesia (GA) for orthopedic surgeries involving the extremities [9]. In modern anesthetic practice, regional anesthesia is more preferred to general anesthesia (GA) [10].

The choice of anesthesia for orthopedic surgery depends on various factors such as the patient’s preference, the state of health of the patient, expertise of the anesthetist, surgeons preference, estimated duration of the surgery and practice pattern of the hospital [1,9-11].

Therefore the aim of this study is to retrospectively review the various types of anesthesia utilized for orthopedic surgeries and evaluate their appropriateness.

**METHODS**

This was a retrospective review of all orthopedic surgeries carried out between 1<sup>st</sup> July 2016 to 30<sup>th</sup> June 2018 from the theatre records of University of Ilorin Teaching Hospital (UIITH) and General Hospital, Ilorin (GHI). Orthopedic patients of all ages were included in the study and patients with incomplete data were excluded. Patient’s demographic data, type of surgery, site of the surgery, type of anesthesia and duration of the surgery were recorded. Data were analyzed and presented as frequencies and means using Statistical Package for Social Sciences [SPSS software version 22].

**RESULTS**

A total of 334 patients were studied over the review period. Their ages ranged from 2-100 years with a mean age of 39 ± 20.9 years. Patients with ages <17 years were 59 (17.7%) while those with ages >18 years were 275 (82.3%). Male patients were 60.8% while the females were 39.2%. Most of the procedures were done as elective 61.7%, while 38.3% were performed as an emergency. Lower limb surgeries, 72.8%, dominated most of the surgical procedure while upper limb, upper limb+lower limb, and back surgical procedures were 21.9%, 1.2%, and 4.2% respectively. The implant surgeries were 218 (65.3%) out of which surgeries in the lower limb 151(69.3%) had the most while surgeries in the upper limb, upper+lower limb and back had 52 (23.9%), 4 (1.8%) and 11 (5.0%) respectively. Most of the surgeries were performed under regional anesthesia (RA) 65% with General Anesthesia (GA) 34.4% and GA+RA (0.6%) making up the rest of the anesthetic technique used (Table 1). Patients between age 1-8 years had their surgeries

performed only under GA 12 (100%), while patients between the ages 9-17 had their surgeries are done under GA 25 (53.2%), RA 21 (44.7%) and GA+RA 1 (2.1%). Patients >18 years had most of their surgeries performed under RA 126 (71.2%).

Table 2 shows the distribution of surgery in the upper limb, lower limb and the back. In the upper limb, 49 (14.6%) of surgeries were done distal to the elbow and 28 (8.4%) on/or above the elbow.

**Table 1.** Demographics, surgical and anaesthetic characteristics

Demographic data	Relevant statistics (n)	Range/percentage (%)
Gender		
Male	203	60.8
Female	131	39.2
Age(years) ± SD	39 ± 20.9	2-100
Type of Surgery		
Elective	206	61.7
Emergency	128	38.3
ASA Status		
I	181	54.2
II	111	33.2
III	37	11.1
IV	5	1.5
Surgical procedures		
Upper limb	73	21.9
Lower limb	243	72.8
Upper and lower limb	4	1.2
Back	14	4.2
Implant Surgery		
Yes	218	65.3
No	116	34.7
Anaesthetic technique		
General anaesthesia (GA)	115	34.4
Regional anaesthesia (RA)	217	65.0
GA+RA	2	0.6

General anaesthesia=GA, Regional anaesthesia=RA, American Society of Anesthesiologist ASA

**Table 2.** Distribution of surgical procedures

Distribution	Number (n)	Percentage %
Upper limb		
Shoulder	6	1.8
Upper arm	19	5.7
Elbow	3	0.9
Forearm	34	10.1
Wrist	11	3.3
Hand	4	1.2
Total	77	23
Lower limb		
Pelvis	3	0.9
Hip	29	8.7
Thigh	80	24.0
Knee	14	4.0
Leg	78	23.0
Ankle	24	7.0
Foot	17	5.1
Thigh+leg	1	0.3
Total	246	73
Back		
Lumbar spine	11	3.1
Thoracic spine	3	0.9
Total	14	4.0

**Table 3.** Anaesthetic technique and duration of surgery

Anaesthetic techniques	Duration in hours			
	<1	1-2	2-3	>3
Upper limb techniques n (%)				
GA 55 (75.3)	8	21	20	6
PNB 17 (23.3)	4	9	3	1
LI 1 (1.4)	0	0	1	0
IVRA 0 (0)	0	0	0	0
Total 73 (100)	12	30	24	7
Lower limb techniques n (%)				
GA 46 (19.0)	12	17	5	12
Spinal 133 (54.7)	37	65	22	9
Epidural 40 (16.5)	1	13	8	18
CSE 21(8.6)	1	11	9	0
PNB 1 (0.4)	1	0	0	0
Ankle bock 1 (0.4)	0	1	0	0
LI 1 (0.4)	1	0	0	0
Total 234 (100)	53	107	44	39
Techniques for back surgery n (%)				
GA 14 (100)	0	1	3	10
Total 14 (100)	0	1	3	10
Upper and lower limb techniques n (%)				
GA 0 (0)	0	0	0	0
RA 2 (50)	0	1	1	0
GA+RA 2 (50)	1	0	1	0
<b>TOTAL 4 (100)</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>0</b>

General Anesthesia=GA, Regional Anesthesia=RA, CSE=Combined Spinal Epidural, PNB=Peripheral Nerve Block, LI=Local Infiltration, IVRA=Intravenous Regional Anesthesia.

In the lower limb 120 (35.4%) surgeries were done distal to the knee and 126 (37.6%) on/or above the knee. While in the back, 11 (3.1%) surgeries were in the lumbar spine and 3 (0.9%) were on the thoracic spine.

Table 3 shows that most of the upper limb (UL) procedures (n=5;75.3%) were performed under general anesthesia, while only 18 (24.7%) were done under regional anesthesia. In the lower limb, most of the surgical procedures were done under regional anesthesia 196 (81%) and this was mostly dominated by spinal anesthesia 133 (54.7%) while other regional techniques accounted for 26.3% (n=64). Only 46 (19%) lower limb surgeries were done under general anesthesia. Back surgeries were all performed under general anesthesia 14 (100%). Upper+lower limb surgeries were either done as regional anesthesia 2 (50%) or GA+RA 2 (50%), with none done as GA alone. Out of the 55 (75.3%) that had upper limb surgery performed under GA, duration of surgery lasted less than 3 hours in 49 (89.0%) while only 6 (11.0%) lasted more than 3 hours. In the lower limb surgeries, out of the 133 (54.7%) that had their procedure done under spinal anesthesia, 124 (93.3%) lasted less than 3 hours and 9 (0.67%) lasted more than 3 hours. All the back surgeries were done under general anesthesia and only 4 (28.6%) lasted less than 3 hours while 10 (71.4%) lasted more than 3 hours. In the upper+lower limb surgeries, none of the procedures lasted more than 3 hours.

**DISCUSSION**

In our study, most of the upper limb surgeries were performed under general anesthesia (75.3%). This was similar to a previous study in Port Harcourt, south-eastern part of Nigeria, in which the rate of GA for upper limb procedures was as high as 83.7% [12]. However, these findings were at variance with that of the study done in Ibadan, south-western part of Nigerian, in which only 27.9% of their upper limb procedures were performed under GA while 69.9% were done under RA [13]. Other studies done have also shown that most upper limb surgeries can be performed under regional anesthesia [1,14]. Our center had low utilization of regional blocks due to

lack of equipment for peripheral nerve blocks such as the nerve stimulators and block needles which are either not available or are too expensive. When bone grafts were to be harvested from another part of the body e.g. the iliac crest the use of general anesthesia is usually the anesthetic technique of choice in our center.

The use of regional anesthesia for upper limb orthopedic surgeries is highly desirable because it has advantages such as improved postoperative pain relief, decreased opioid consumption, reduced recovery time and reduced hospital stay [9,14]. Our study shows that 71.2% of our upper limb orthopedic procedures were implant surgeries and the use of the regional anesthetic technique in upper limb orthopedic surgeries accounted for just 24.7% therefore, increasing the number of regional anesthetic procedures would accord more patients the benefit of better post-operative pain relief.

Bier’s block (intravenous regional anesthesia) could not be used in our centers due to non-availability of the double tourniquet system.

Most of the orthopedic surgical procedures in our study were done in the lower limbs (72.8%). This was comparable to that of Obasuyi et al [12] and Khanduril who reported 66.7% and 68% respectively. Furthermore, most of these lower limb procedures were mostly performed under regional anesthesia (81%). Khanduril also reported an 85% use of regional anesthesia for their lower limb orthopedic procedures. Our use of the regional anesthetic technique for lower limb procedures was much higher than that reported by Obasuyi et al [12] in Port Harcourt south-eastern part of Nigeria (63.5%). Our study shows that our choice for regional anesthesia for lower limb surgeries is in line with current best practices. Out of the 81% of the regional anesthesia performed for the lower limb surgeries, 54.7% were done under spinal anesthesia. This finding was similar to that of Obasuyi et al [12]; Rukewe and Fatiregun [15], Schnittger [10] and Rosenberg [16]. In our study, we used other methods of central neuraxial blocks such as epidural anesthesia (16.5%) and combined spinal-epidural (8.6%). Rukewe and Fatiregun [15] in their survey of Nigerian Anaesthetist reported that the regular use of epidural was 15%.

The use of central neuraxial block in our Centre is usually with adjuvants such as opioids which provide excellent postoperative analgesia without much effect on motor function. This ensures early patient mobilization and thus good prophylaxis against Deep Vein Thrombosis (DVT).

The use of Peripheral Nerve Block (PNB) for lower limb surgeries in our study was very low at 0.4%. A survey carried out by Rukewe and Fatiregun reported that the use of PNB among Nigerian anesthetists was 2.5% [15]. Mafe and Ajetumobi [17] achieved adequate analgesia using a three-in-one block combined with sciatic nerve block for below-knee amputation in critically ill patients in order to avoid the risk of general anesthesia. A nationwide survey carried out in the United States of America showed that among the regional anesthetic technique for lower limb surgeries PNB remains under-utilized because the spinal anesthetic technique is the current trend for lower limb extremity surgeries [16,18].

Several studies have compared the outcome between the use of GA or RA for lower limb orthopedic surgeries with conflicting reports. Some report that there is no difference as regards outcome [4,19] while some others report a reduction in postoperative morbidity and mortality [10,20]

All our back surgeries both in the thoracic and lumbar spine were performed under general anesthesia. The best anesthetic technique for thoracic and lumbar spinal surgery is still controversial. However, Erbas et al [21] concluded in their study that spinal anesthesia is safe and effective for lumbar spinal stabilization, especially in high-risk patients. Attari et al [8] in their study also showed that spinal anesthesia was superior to general anesthesia in

providing analgesia and decreasing blood loss while maintaining better perioperative hemodynamic stability without increasing adverse effects. In contrast, Sadrolsadat et al [22] concluded in their study that spinal anesthesia for lower thoracic and lumbar spine surgeries had no advantage over general anesthesia and that spinal anesthesia was accompanied with more adverse effect when compared to general anesthesia. Our centers need to perform more thoracic and lumbar spine surgeries under regional and general anesthesia in order to compare the outcome.

## CONCLUSION

Most of our upper limb surgeries performed under general anesthesia could be performed under various regional anesthetic techniques. Therefore, we need to improve on regional anesthetic techniques for upper limb orthopedic procedures so that patients can benefit from the numerous advantages. A large proportion of our lower limb surgeries were performed predominantly under spinal anesthesia, it is, however, commendable that other forms of the neuraxial technique of anesthesia were also used, such as epidural and combined spinal epidural. The use of epidural anesthesia provided better postoperative analgesia for our patients than the single shot spinal anesthesia. We need to perform more thoracic and lumbar spine surgeries under different techniques of anesthesia in order to arrive at a conclusion on which anesthetic techniques will benefit our patients best.

Finally, our institutions need to do more in the provision of equipment and manpower training so as to improve on the quality of anesthesia delivered to orthopedic patients in accordance with current best practices.

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