ORIGINAL ARTICLE

# The practice of spinal anaesthesia in two tertiary hospitals in South-East Nigeria - review of 100 cases

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ABSTRACT

**Background:** Spinal anaesthesia is very important as it avoids the numerous complications that could arise from general anaesthesia including airway problems. It is cost effective and can be used for surgeries of up to two hours duration.

**Objectives:** To evaluate the practice of spinal anaesthesia in South-East Nigeria and document the intraoperative complications as was observed in our centre.

**Methodology:** The study is a prospective multi-centre study carried out at the University of Nigeria Teaching Hospital (UNTH) Enugu and the National Orthopaedic Hospital Enugu (NOHE). Patients who were scheduled for surgery under spinal anaesthesia were recruited into the study. Demographic data, type of operation done, American Society of Anesthesiologists (ASA) physical status classification and intra-operative complications were recorded using a proforma. Also, recorded were the size and type of spinal needle and site of injection of local anaesthetics.

**Results:** A total of 100 patients who met the inclusion criteria were simultaneously recruited into the study. They were between the ages of 18 and 75years with a mean age of 40.2 ± 14.5years. They were 50 males and 50 females. The mean weight was 76.0 ± 13kg and the height was 168 ±11.7cm. The mean duration of surgery was 83.3 ± 26.3minutes. Most of the operations done were orthopaedic surgery 46%. The most common intra-operative complication was hypotension with an incidence of 28%, followed by shivering 21%. Other intra-operative complications included pain 9%, nausea 3%, respiratory difficulty 2%, bradycardia 1% and failed spinal anaesthesia 1%. The hypotension observed during caesarean section was significantly higher than in orthopaedic patients ($X^2=4.060$, $p = 0.044$).

**Conclusion:** In this series no mortality or permanent morbidity was recorded. The practice of spinal anaesthesia is safe.

***Keywords***: *Caesarian section, hypotension, intra-operative complication, orthopaedic surgery, safe anaesthesia*

INTRODUCTION

Spinal anaesthesia (SA), also called sub-arachnoid block (SAB), is a form of regional anaesthesia involving injection of a local anaesthetic into the subarachnoid space, through a fine needle (spinal needle). The injection is administered in a suitable interspinous space below the first lumbar (L1) in order to avoid damage to the spinal cord. It provided a method of blocking afferent and efferent nerves by injecting anaesthetic agents directly in the cerebrospinal fluid (CSF) surrounding the spinal cord.[1]

Spinal anaesthesia is very important as it avoids the numerous complications that could arise from general anaesthesia including airway problems. It is cost effective and can be used for surgeries of up to two hours duration. A block of up to T4 toT6 dermatomes could be safely achieved and it is indicated for surgery below the umbilicus.

Over the years, the use of spinal anaesthesia in our centre has grown tremendously, as there is increasing popularity of regional anesthesia.[2,3] In France, the proportion of regional anesthesia increased from 15 to 25% of all anesthetics administered from 1980 to 1996.[4]

Yet, spinal anesthesia is not without its complications. This study was carried out to evaluate the practice of spinal anaesthesia in South-East Nigeria and evaluate the intra-operative complications as were observed in our centre.

METHODOLOGY

The study is a prospective multi-centre study carried out at the University of Nigeria Teaching Hospital (UNTH) Enugu and National Orthopaedic Hospital Enugu (NOHE). Ethical approval for the study was obtained from the hospitals' Ethics Committee and written informed consents were obtained from all the patients. Patients who were scheduled for surgery under spinal anaesthesia were recruited into the study. The study on orthopaedic patients was carried out at the NOHE.

A proforma was used to collect all the data. Demographic variables and data concerning types of operation done, American Society of Anesthesiologists (ASA) physical status classification and intraoperative complications were recorded. Also, recorded were size and type of spinal needles, and site of injection of local anaesthetics.

Patients with history of bleeding diathesis or on anticoagulants, and patients with ASA Classes III and IV, and those below the age of 18year were excluded from the study. Included in the study were patients who do not have any contraindication to spinal anaesthesia.

Standard monitoring was carried out with pulse oximetry, electrocardiography and non-invasive arterial blood pressure (RGB Omnicron multichannel monitor- Spain 2002). After vascular access was secured patients were preloaded with 10-20ml/kg of normal saline.

Subarachnoid block is an aseptic technique. With the help of an assistant the patients were placed in the sitting position with adequate lumbar flexion. The anaesthetist scrubbed in and put on sterile gown and gloves. The puncture site was then cleansed and draped, and L4 interspace identified using the iliac spine as landmarks. A skin wheal was raised with 2ml of 1% lidocaine using a 25G needle to the selected space.

The spinal needle (Whitacre) was inserted through the skin wheal pointing slightly cephalad and into the subarachnoid space (21G introducer was passed through the skin wheal when 25G spinal needles were used). Correct position was ascertained when CSF flow was visualized from the needle when the stylet was removed. A dose of 10-15mg of 0.5% heavy bupivacaine was slowly injected; needles were removed and the patient was positioned.

The patients' blood pressures were measured before induction of SA, and every 5 minutes after the block till the end of surgery.

Hypotension is defined as a decrease in systolic or mean arterial blood pressure of more than 20% from baseline value. Post-anaesthetic shivering is usually defined as readily detectable fasciculation or tremor of the face, jaw, head, trunk or extremities that lasts less than 15seconds.[5]

The results were analysed using Statistical Package for the Social Sciences (SPSS) version 17. The independent-samples 't' test and chi square test were used, *p-values* <*0.05* were taken as significant.

RESULTS

A total of 100 patients who met the inclusion criteria were simultaneously recruited (male versus female) into the study. They were between the ages of 18 and 75years with a mean age of 40.17 ± 14.5 years, *see Table 1.*

**Table 1.** Age and ASA distribution of patients

| | Female No (%) | Male No (%) | Total No (%) |
|---|---|---|---|
| Age range (yr) | | | |
| 18 – 44 | 42 (63.6) | 24 (36.4) | 66 (100) |
| 45 – 64 | 5 (20) | 20 (80) | 25 (100) |
| 65 - 75 | 3 (33.3) | 6 (66.7) | 9 (100) |
| ASA | | | |
| I | 28 (43.7) | 36 (56.3) | 64 (100) |
| II | 22 (61.1) | 14 (38.9) | 36 (100) |
| Elective | 32 (40.5) | 47 (59.5) | 79 (100) |
| Emergency | 18 (85.7) | 3 (14.3) | 21(100) |

There were 50 males and 50 females and the mean weight was 76.0 ± 13kg and height was 168 ±11.7cm (Table 2). The mean duration of surgery was 83.3±26.26minutes.

**Table 2.** Patient characteristics

| | Female Mean + SD | Male Mean + SD | t- value | p-value |
|---|---|---|---|---|
| Weight (kg) | 74.60 ± 13.47 | 75.64 ± 8.32 | -0.464 | 0.644 |
| Height (m) | 1.63 ± 0.09 | 1.70 ± 0.09 | -3.387 | 0.001 |
| Age (yr) | 36.34 ± 13.71 | 45.38 ± 16.06 | -3.026 | 0.003 |
| Duration of Surgery (min) | 71.36 ± 21.47 | 95.24 ± 25.32 | -5.085 | 0.000 |

Most of the operations done were orthopaedic surgery 46%, caesarean section 31%, general surgery 11%, urology 8% and gynaecology 4%. At preoperative assessment 64% of the patients were American Society of Anesthesiologists (ASA) physical status class 1; 36% were ASA class 2, and 21% of the operations carried out were emergencies, *see Table 1.*

The sizes of spinal needles used for the subarachnoid block were 25G (62%) and 23G (38%). The needle was introduced into the subarachnoid space at the L2-3 (2%), L3-4 (46%) or L4-5 (52%) interspace. Heavy bupivacaine 15mg was used for 53 patients, 12.5mg for 25 patients, and 10mg was used for 22 patients. After spinal anaesthesia was established, patients that had adequate anaesthesia (Table 3) were defined as patients who did not require additional analgesia in the intraoperative period. Additional analgesics were required in 9% of cases intra-operatively; intravenous fentanyl 50µg and tramadol 100mg were administered in aliquots. One of the cases was converted to general anaesthesia because of intense

intraoperative pain that was not relieved by supplemental analgesics.

**Table 3.** Profile of intrathecal Bupivacaine

| Dose of Bupivacaine | <15mg | 15mg | Total |
|---|---|---|---|
| Cases who had adequate anaesthesia (%) | 41(87.2) | 49 (92.5) | 90 (90) |
| Cases who had supplemental analgesics (%) | 5 (10.7) | 4 (7.5) | 9 (9) |
| Cases converted to GA (%) | 1 (2.1) | 0 (0) | 1 (1) |
| Total (%) | 47 (100) | 53 (100) | 100 (100) |

**Table 4.** Comparing outcomes

| Complications | Female No (%) | Male No (%) | Total No (%) | $X^2$ | p-value |
|---|---|---|---|---|---|
| Hypotension | 16 (57.1) | 12 (42.9) | 28 (100) | 0.794 | 0.373 |
| Shivering | 9 (42.9) | 12 (57.1) | 21 (100) | 0.542 | 0.461 |
| Oxygen administered | 20 (74.1) | 7 (25.9) | 27 (100) | 8.574 | 0.003 |

Several intra-operative complications were observed after the SA was instituted. Some patients developed more than one complication. The most common intra-operative complication was hypotension with an incidence of 28%, followed by shivering 21%. Other intraoperative complications included pain 9%, nausea 3%, respiratory difficulty 2%, bradycardia 1% and failed SA 1%. Paraesthesia was observed in 3 patients during the insertion of the spinal needle.

Figure 1. Distribution of intraoperative complication

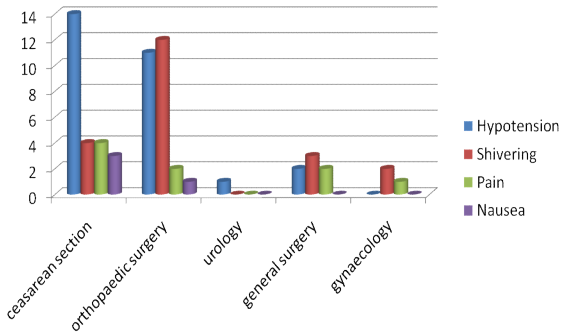
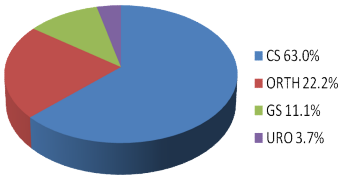



Figure 1 shows the distribution of intraoperative complications according to surgical specialties. A case of bradycardia and 2 cases of respiratory difficulty were observed in patients that had caesarean section. A case of failed SA was noticed in general surgery. The hypotension observed during caesarean section was significantly higher than in orthopaedic patients ($X^2=4.060$, $p = 0.044$).

Figure 2. Oxygen administration




CS- Ceasarean section. ORTH- Orthopeadic surgery
GS- General surgery. URO- Urology

Oxygen by face mask was administered to patients intra-operatively only when it was necessary to ameliorate a complication. A total of 27 patients received oxygen as shown in Figure 2, and females had more oxygen administered than males (*Table 4*).

DISCUSSION

The practice of spinal anaesthesia started over a century ago. It is safe when it is practised by a trained anaesthetist. Safe and effective practice of this regional technique requires a detailed knowledge of the technique, and of the potential complications that may arise.

Hypotension was the most common intra-operative complication. Hypotension following neuraxial blockade is due to sympathetic inhibition, which causes a significant decrease in the venous return due to dilatation of the resistance and capacitance vessels.[6] In patients scheduled for ceasarean section, hypotension may lead to maternal nausea and vomiting and decreased utero-placental blood flow with possible foetal acidaemia.[7] It is, therefore, pertinent to institute measures to prevent it. Pre-operative pre-loading of patients with normal saline was done in this series.

The hypotension observed in obstetric patients in this study was significantly higher than those of orthopaedic cases. This may be attributed to the compression of the inferior vena cava by the gravid uterus, reducing the venous return and right atrial pressure.[8] This, perhaps, translates to more females receiving oxygen therapy than males (*Figure 2*). Decreased pre-load after spinal anaesthesia initiates reflexes that may also cause severe bradycardia. Bradycardia was observed in one of the patients who developed intra-operative hypotension.

Colloids, ephedrine, phenylephrine and lower leg compression have each been shown to reduce the incidence hypotension during spinal anaesthesia.[9] Desalu, *et al*, found that prophylactic ephedrine infusion administered after spinal block and titrated to maternal systolic pressure was more effective than crystalloid pre-hydration in the prevention of hypotension during spinal anaesthesia for elective caesarean section.[7]

Post-anaesthetic shivering is associated with a number of deleterious effects. These include increased oxygen consumption and carbon dioxide production, cathecholamine release and increased cardiac output; but, tachycardia and hypertension may also occur.[10] Post-anaesthetic shivering is often preceded by core hypothermia and vasoconstriction, but not necessarily so.[10,11] In this series post-anaesthetic shivering was treated with 100% oxygen by face mask and intravenous tramadol. Studies have shown that clonidine is equally effective and with a better thermodynamics and fewer side effects than tramadol.[12]

The main respiratory effect of spinal anaesthesia occurs during high spinal blockade when active exhalation is affected due to paralysis of abdominal and intercostal muscles. Spinal block, well above the level required for surgical anaesthesia, and producing unwanted clinical manifestation is regarded as high spinal block. Respiratory difficulty or insufficiency observed in this series is attributable to high spinal block. Patients were managed using 100% oxygen delivered by face masked and reassured. Nausea, anxiety, hypotention and bradycardia are classical symptoms of a high spinal block which were observed in this series. Good clinical practice demands that every effort should be made and measures put in place to prevent these complications. High spinal block could rapidly progress to a 'total spinal block' where loss of consciousness, apnoea and cardiac arrest may develop.

Intra-operatively, pain is the most common reason for technique failure. The incidence of failure of SA ranges from 1.7 to 2.9%, compared to 1% observed in this series.[13,14] The inability to extend the block if the original block height is inadequate or if the surgery takes longer than predicted is a disadvantage and a cause of severe pain and patients' discomfort resulting in failed SA. It is, therefore, paramount to ensure adequate block before commencing surgery.

Others causes of failed SA include paresthesia on injection, communication problems and panic attacks due to claustrophobia.[15] In an

environment such as ours poorly preserved drugs could also be a reason.

Neurological complications were not observed in this series even though three patients complained of paraesthesia when the spinal needle touched the nerve roots. Neurological sequelae can occur due to damage to the nerve root by the spinal needle or as a result of neurotoxity of the local anaesthetic agent. The incidence of neurologic complications after spinal anesthesia is higher with lidocaine than with bupivacaine.[16,17] Bupivacaine is the drug of choice in our centres for SA. With the development and availability of safer local anaesthetics, such as ropivacaine and levo-bupivacaine, in our hospitals, the practice of SA will continue to improve.

In this series no mortality or permanent morbidity was recorded corroborating the reports that the practice of spinal anaesthesia is safe. Skill, knowledge and experience are very important in the conduct of safe and effective spinal anaesthesia.

## CONCLUSION

Spinal anaesthesia still remains a very effective, safe, and cheap anaesthetic technique for lower abdominal and lower limb surgeries.[18] In the hands of skilled and experience anaesthetists the practice of SA is safe.

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