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REGIONAL ANALGESIA FOR POST-OPERATIVE PAIN MANAGEMENT – INITIAL EXPERIENCE IN A LOW RESOURCE SETTING

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ABSTRACT

Objective: The aim of this study is to demonstrate the use of some regional anaesthetic techniques in effective postoperative pain control in a low resource setting. We also wanted to find out the potential benefits and prospects of regional techniques to achieve effective postoperative analgesia.

Design: This study was a prospective observational study in which 25 patients presenting for various orthopaedic and general surgical procedures were recruited randomly.

Setting: Ahmadu Bello University Teaching Hospital (ABUTH), Zaria, Nigeria from December, 2008 to May, 2009.

Subjects: Eligible patients were males and females aged 21 – 55 years. These included emergency and elective cases.

Results: The age range was 21-55 years with a mean age of 34 years. Of the 25 patient studied, 14 of them were men and 11 women constituting 56% and 44% respectively. Our study shows that Hausa/Fulani ethnic group made up 75% of the study population. Intraoperatively, the anaesthetic techniques used were general anaesthesia (only) in 13 patients (52%), Regional techniques consisting of spinals, epidurals, combined spinals and epidurals and brachial plexus blocks in nine patients (36%) and three (12%) of the patients had a combination of general anaesthesia (GA) and regional anaesthesia (RA). For post-operative pain management, nine patients (36%) had continuous brachial plexus block using intermittent injections, 13 (52%) patients had epidural catheters with intermittent top-up injections and three (12%) patients received combined spinal and epidural with an epidural catheter left *in-situ* for intermittent top-ups. The drugs used for top-ups included 0.125% plain bupivacaine (15 patients), 0.125% plain bupivacaine + 2.5mcgs/ml Fentanyl (10 patients) in 10ml aliquots. The outcome was good in most patients with 19 patients (82.4%) experiencing only mild pain (numeric pain score 0-3). Onset of post-operative pain was 13-18 hours in most (52%) of patients with majority of patients (80%) requiring only a single dose of opioid in 24 hours. There was no incidence of infection at site of catheter insertion one week after the procedure.

Conclusion: Regional techniques if used properly can provide superior pain control in the post-operative period. There is reduction in the requirements of opioids in the immediate post-operative when regional techniques are used for pain management. We need to encourage the use of these techniques especially in our setting where resources are sparse and potent analgesics are not always available.

INTRODUCTION

Regional techniques are superior to systemic opioid agents with regards to analgesia profile and adverse effects in the context of general, thoracic, gynaecological, orthopaedic and laparoscopic surgery. Outcome studies demonstrate that regional analgesic techniques also reduce multisystem morbidity and mortality following major surgery in high risk patients (1).

Pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (2). Post-operative analgesia is recognised as an area where improvement is required (3), since the traditional on-demand administration of opioids analgesic drugs is widely accepted as often being inadequate. The use of local anaesthetic agents provide excellent analgesia but with motor blockade, risk of toxicity of local anaesthetic and variable duration of action, depending on the technique and drug.

The aim of this study was to observe if regional anaesthetic techniques provide improved post operative analgesia and reduce if not eradicate the use of opioids, which sometimes are in short supply and when available, may have some limitations to its use.

Pain is response to impulses from the peripheral nerves in damaged tissue, which pass to nerves in the spinal cord where they are subjected to a gate control. This gate modifies the subsequent passage of the impulses, in accordance with controls from the brain (3). Because attention is a crucial component of pain, distraction can act as a basis of pain therapy (4). On the other hand, anxiety and depression focus the attention and exaggerate the pain. If the nerve pathways are damaged, the brain can increase the amplification in the pathway, maintaining the sensation as a protective mechanism. Severe post operative pain and the stress response to surgery cause increased morbidity and mortality.

MATERIALS AND METHODS

This study was a prospective observational study in which patients are randomly selected based on diagnoses and surgical procedure to be performed. We discussed the study design with respective surgeons (Orthopaedics, general surgeons). The orthopaedic procedures ranged from Girdle Stone excision arthroplasty, femoral intramedullary nailing, femoral plating, patelloplasty, knee joint arthrodesis and amputation. In the upper limb, humeral fracture procedures such as plating, Rusch pin insertion as well as locked intramedullary nail insertion were done under brachial plexus block. Elbow reconstruction as

well as forearm bone fracture plating and kirshener, wire insertion for some fractures of radius and ulnar were also done under brachial plexus (axillary) block. The eligible patients were those age 21 – 55 years who were in ABUTH from December, 2008 to May, 2009. These included emergency and elective cases.

Exclusion criteria were patients on anticoagulants, infection at the site of proposed injection and patient's refusal. Some patients had spinal only or epidurals with catheter for the surgery while others had brachial plexus block with catheter left in place for surgery and postoperative pain management. The 13 patients that had GA alone were given regional nerve block immediately after application of plaster to the surgical wound. The times of injection of local anaesthetics were recorded and patients were told to report to the nurses on duty as soon as they started experiencing pain. Ward nurses were also informed to record the time and number of times the patient experienced pain within 24 hours after surgery. The nurses were also told to chart any analgesic given within these periods as well as the dose and frequency.

Numerical pain rating scales was used to classify the degree of pain for those who experienced pain within 24 hours of surgery. The primary outcomes measured were the absence of pain or number of times the patient experienced pain within 24 hours of surgery and severity of pain, and frequency of opioid injections. We did not investigate the safety and tolerability of the procedure. On enrolment, we identified each patient's sex, diagnosis and surgical procedure to be performed. All patients enrolled gave informed consent. To ensure unbiased assessment, the ward nurses were unaware of those patients who had regional nerve block for post operation analgesia. The local anaesthetic agents used were 0.5% plain and heavy bupivacaine and combination of plain bupivacaine and lidocaine.

To obtain the required power (95%, type I error = 0.05, two tailed test) we needed a minimum of 50 participants. This is a report of our initial experience, thus the study was conducted in 25 patients. The data obtained was entered into SPSS version 15.0 and analysed using simple statistical methods and appropriate tables and figures.

RESULTS

The figures show the flow of the patients through the study. A total of 25 patients were eligible for inclusion. One patient had catheter *in-situ* for top-up due to bilateral below the knee amputation. The baseline and the unmediated post operative vital sign of all the patients enrolled were within normal limits. Onset time of pain experienced after surgery was noted. Severity of pain using numeric pain score was documented. Dosage and types of opioids given after the onset of pain were noted. Inspection of the

site of injection of local anaesthetic was noted daily and finally at one week after surgery, to look for signs of infection.

Fig 1
Distribution by Gender

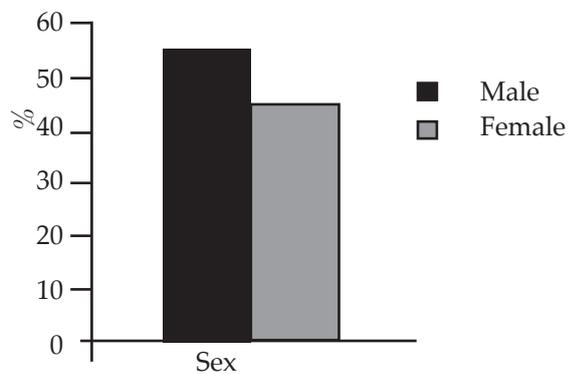


Fig 2
Bar Chart showing ethnicity

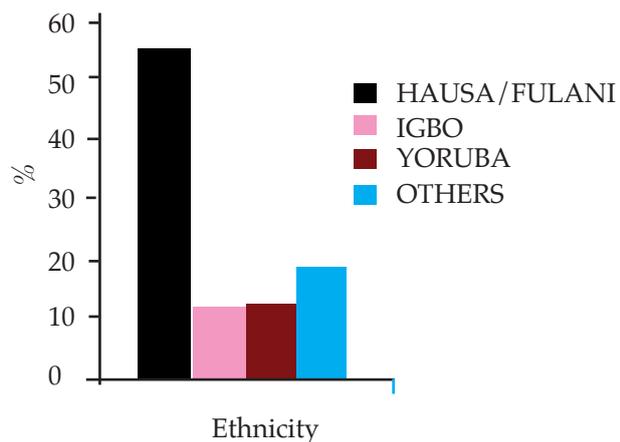


Fig 3
Age distribution of patients

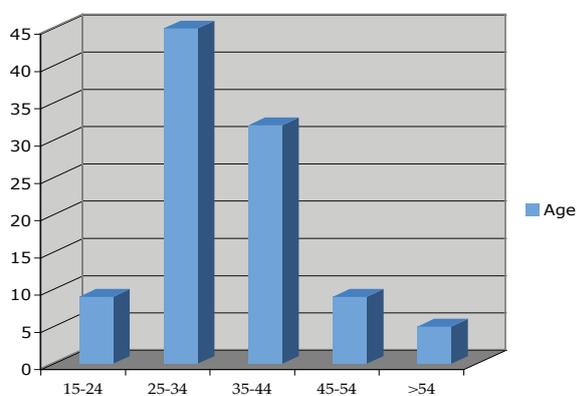


Fig 4
Bar Chart showing type of Anaesthesia

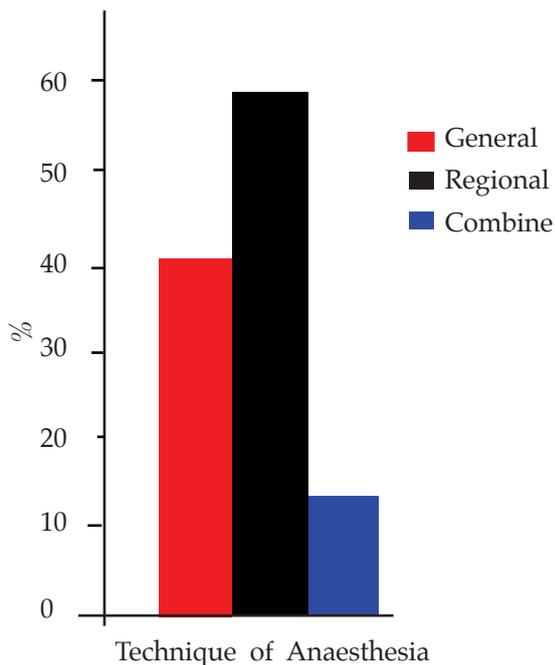


Fig 5
Bar Chart showing types of Surgery

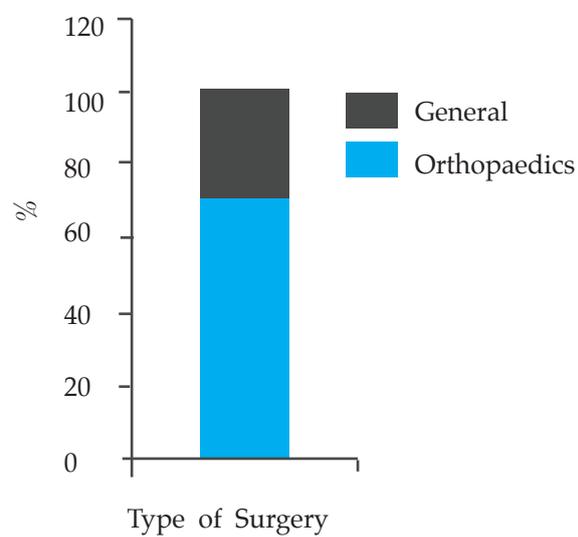


Fig 6
Onset of Post operation pain

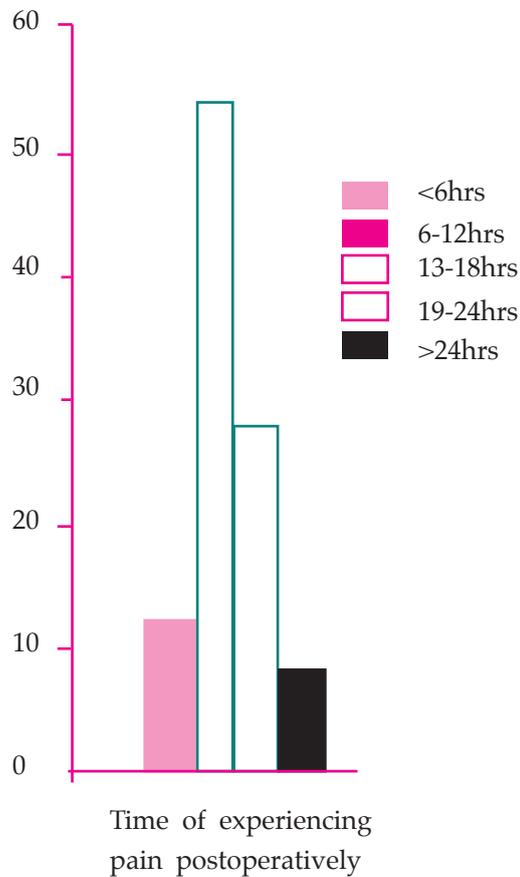


Fig 7
Numeric Pain Scores

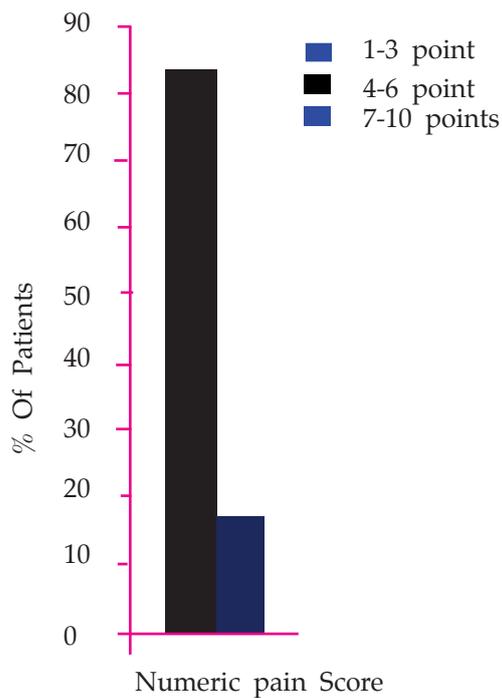


Table 1
Pain Scores

Severity (numeric pain score) of pain	no. of Patients	%
0 - 3	19	82.6
4 - 6	4	17.4
7 - 10	-	0

Table 2
Opioid usage

Opioid used	No. of Patients	%
Single dose in 24hours	20	80
Multiple dose in 24hours	5	20

Table 3
Infection at site of injection/catheter

Infection at the site of injection	No. of patients	%
At 1 week	0	0

DISCUSSION

Despite recent advances in our understanding of the physiology of acute pain, the development of new opioids and non opioid analgesics and novel methods of drug delivery, and more widespread use of pain-reducing minimally invasive surgical techniques, pain after surgical procedures remains a challenge for many practitioners (5). Not surprisingly, recent surveys in the United States and Europe have emphasised the insufficient quality of post-operative pain management and the need for further improvements (6,7). The increasing implementation of standardised pain evaluation and treatment protocols, and the use of multimodal analgesic techniques, are hopeful signs that improvements in pain management are likely to continue in the years ahead.

In Nigeria, sub-arachnoid block still remains a very effective and safe anaesthetic technique for lower abdominal and lower limb surgeries. The technique is cheap and effort should be made to increase patient awareness and its acceptability in the new millennium (8). There are many benefits associated with regional anaesthesia. Regional anaesthesia with epidural bupivacaine can be employed safely when appropriate. Adequate surgical conditions are provided with little or no cardiorespiratory disturbance. Intra-operative blood loss is reduced while the technique can be used to provide prolonged, safe and satisfactory post-operative analgesia (9).

Orthopaedic procedures are generally deep seated in majority of cases and as such are not without problem of pain management post operatively.

Majority of these patients would have been operated upon under general anaesthesia and end up with the attendant problems of recovery from general anaesthesia as most of these procedures are often associated with prolonged duration of surgical procedure.

Under spinal anaesthesia or epidural anaesthesia a number of cases are possible, ranging from Girdle Stone excision arthroplasty, femoral intramedullary nailing, femoral plating, patelloplasty, knee joint arthrodesis (for severe fracture dislocation which is irreparable as well as severe osteoarthritis) where patients cannot afford replacement arthroplasty. Also tibial fracture procedures such as plating locked, intramedullary nailing, corrective osteotomies for angular deformities of the knee and leg are possible under, spinal anaesthesia.

Epidural and spinal analgesia have been shown to improve surgical outcomes by decreasing intra-operative blood loss, post-operative catabolism, and the incidence of thromboembolic events, and by improving vascular graft blood flow and post-operative pulmonary function (10). Epidural and spinal opioids provide better analgesia than systemic opioids, but the side effects are still present and therefore monitoring protocols are necessary. The neuroaxial narcotics may cause insidious delayed respiratory depression, and pruritus may occur in a significant number of patients. Local anaesthetics may cause hypotension and muscle weakness that may slow down mobilisation. To reduce the narcotic side effects, low concentrations of local anaesthetic, such as ropivacaine 0.2%, may be added to the infusion. This concentration is weak enough to avoid motor weakness. In our series, we did not experience these side effects. Also, none of the patients had infection at the site of injection of local anaesthetic agent, even one week after the procedure. Thus the safety and tolerability of the procedure is assured

In the upper limb, humeral fracture procedures such as plating, Rusch pin insertion as well as locked intramedullary nail insertion have been done under brachial plexus block or Biers block. Elbow reconstruction as well as forearm bone fracture plating as well as kirshener, wire insertion for some fractures of radius and ulnar are all possible under regional brachial plexus (axillary) block. This was the experience in our series where brachial plexus blocks were used for the procedures on the upper limb. We used an improvised canula (22 G IV canula with infusion set attached to give intermittent injections of local anaesthetic agents for postoperative pain control.

Regional analgesia makes it much easier for intra-operative monitoring of the patient as he/she is awake and alert and by so doing the anaesthetist buys the patient's confidence and trust. Regional anaesthesia also minimises the risk of massive intraoperative

blood loss to a great extent (11). This is not to say that regional anaesthetic is without some side effects. The recovery following regional analgesia is usually smoother. In some case the residual analgesic effects of the regional anaesthetic agents overlap long into the post-operative period of the patient and therefore the need for post-operative analgesia does not come up early and hence the quantity or amount of analgesic required post-operatively is reduced markedly. Also, the overall systemic effects of general anaesthesia in these patients especially the elderly ones is markedly reduced.

Of the 25 patient studied, 14 of them were men and 11 women constituting 56 and 44% respectively. Our study shows that Hausa/Fulani tribe consist of 75% of the study population. This is because majority of the patients in the state where our hospital is located are Hausa/Fulani. About 80% of study population are within ages of 25 – 44 years, which means that patients of younger ages benefited from the study.

More than 50% of the population had regional block as the main techniques of anaesthesia majority of the studied population were patients who underwent orthopaedic procedures constituting 72%. Six patients constituting 24% did not experience significant pain until 18 hours after surgery. In this study, the use of opioids within the first 18 hours after surgery was not necessary, thus preventing the problems associated with the use of opioids. Most of our patients had minimal or no pain when severity of pain was assessed after surgery. More than 80% had numeric pain score of zero to three. None of our patients had severe pain (7 – 10) when assessed. About 80% of those who experienced pain had a single dose of opioids within the first 24 hours after surgery. Twenty percent of patients had multiple doses of opioids within 24 hours.

A Cochrane review by Bamigboye (12) showed that women undergoing regional analgesia who had local anaesthetic infiltration or abdominal nerve block had reduction in the use of post-operative opioids. Addition of non-steroidal anti-inflammatory drugs to the local anaesthetic for Caesarean section wound infiltration conferred additional advantage. This may be explained because of the addition of another type of analgesic with a different mode of action. Opioid consumption may not be the optimal method of pain assessment because of being influenced by the patients' fear of dependency, but this effect is balanced by the randomisation process. In general, local anaesthesia was found to be of benefit in women having a Caesarean section by reduction in opioid consumption (12). This is similar to what we found in our study in which there was reduction in opioids consumption in our patients. Regional anaesthetic techniques can be recommended, with consideration to affordability, as part of the multimodal approach to pain relief in the post-operative period.

Effective post-operative pain management has a humanitarian role, but there are additional medical and economic benefits for rapid recovery and discharge from hospital. A number of factors contribute to effective post-operative pain management including a structured acute pain management team, patient education, regular staff training, use of balanced analgesia, regular pain assessment using specific assessment tools and adjustment of strategies to meet the needs of special patient groups, such as children and the elderly

LIMITATIONS OF THE STUDY

This is an initial experience with a limited number of patients. Although the study did not set out to elicit the incidence of side effects there is a need to study more patients in order to find out the safety and side effects profile of these techniques. Our study did not include the level of satisfaction of our patients with the various techniques that were used.

In conclusion, the benefits of regional analgesia cannot be over emphasised especially as several studies have shown various beneficial effects. The use of regional anaesthetic techniques also prevent complications of general anaesthesia and lead to reduction of the use of opioids. The opioid-sparing effect of regional techniques using local anaesthetic agents should be utilised as much as possible especially in our practice where potent opioids are not always available and resources are limited.

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