REVIEW ARTICLE

COMPARISON OF THE DURATIONS AND COMPLICATIONS OF SPINAL ANAESTHESIA BETWEEN UNILATERAL SPINAL ANAESTHESIA AND BILATERAL SPINAL ANAESTHESIA FOR UNILATERAL LOWER LIMB SURGERY

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ABSTRACT

Background: Despite the advantages of spinal anaesthesia when compared to general anaesthesia, it is associated with complications such as hypotension, bradycardia, shivering and nausea. Our study is set to compare the durations and complications between unilateral and bilateral spinal anaesthesia in patients undergoing unilateral lower limb surgeries. **Method**: Sixty four (64) American Society of Anesthesiology (ASA) 1 and 2 patients that were randomly assigned to two groups. Group U which is the unilateral spinal anaesthesia and group B which is the conventional bilateral spinal anaesthesia group to receive 2ml of 0.5% heavy bupivacaine plus 1ml of distilled water and 3ml of 0.5% heavy bupivacaine only respectively. The group U patients who had the procedure in the lateral decubitus position remained in that position for 20 minutes, while those in group B had the spinal injection in sitting position and immediately took the supine position after the injection. **Results:** The 64 adult patients who were randomly allocated into two groups with 32 patients each successfully had their surgeries done under the chosen technique. The mean duration of spinal anaesthesia was found to be 64±23.29 minutes and 100± 37.08 minutes in the group U and B respectively (p=0.001). There was no statistical differences in the general overall complications when the two groups were compared (p=0.03), however, on individual bases unilateral spinal anaesthesia has less complications compared to bilateral spinal anaesthesia for unilateral lower limb surgeries. **Conclusion**: The study showed that unilateral spinal anaesthesia with 2 ml of 0.5% bupivacaine had shorter duration of spinal anaesthesia with less complications compared to bilateral spinal anaesthesia for unilateral lower limb surgeries.

Keywords: Duration, Complications, Unilateral, Bilateral, Lower Limb Surgery

INTRODUCTION

Spinal anaesthesia has a number of advantages over general anaesthesia which include among others reduced blood loss, lower incidence of deep vein thrombosis, lower cost and better patient's satisfaction.[1] However, spinal anaesthesia may be associated with some complications which may include hypotension, bradycardia, shivering, nausea and vomiting, post dural puncture headache among others.[2]

Moreover, it has been demonstrated by clinical trials that comparing unilateral spinal anaesthesia with bilateral spinal block, haemodynamic values are much more stable during the unilateral spinal anaesthesia compared to the bilateral spinal anaesthesia.[3] There is usually a smaller reduction in arterial blood pressure and heart rate.[4] It is also associated with a much lower incidence of clinically relevant hypotension.[5]

The indications for unilateral spinal anaesthesia includes lower limbs orthopaedic and vascular surgeries, perineal surgeries, inguinal hernias especially in the day case surgery, however, after excluding all the possible contraindications to spinal anaesthesia such as patient's refusal, coagulopathies, prolong surgeries among others.

Due to enormous complications with the bilateral spinal anaesthesia this leads to the postulation that the unilateral spinal technique may be associated with fewer complications, or decreased intensity of such complications when they occur. This is not only due to the smaller doses of local anaesthetic agents deposited compared to the conventional bilateral spinal anaesthesia, but also related to the prolonged period that the patient remained in the lateral decubitus position after the spinal injection.
This study is aimed at comparing the duration and complications of spinal anaesthesia between unilateral spinal anaesthesia and bilateral spinal anaesthesia techniques for unilateral lower limb surgery in our centre.

MATERIALS AND METHOD

This was a prospective interventional randomized double blinded study that involved adult patients of both sexes, aged 18 – 75 years who were scheduled for elective unilateral lower limb surgery in the Federal Teaching Hospital, Gombe. An approval was obtained from the Ethical Committee of the hospital.

The procedure was explained and discussed with the patients and informed consent was obtained from those that accepted to be part of the study. As routinely done, all patients were assessed by history, thorough physical examination and all investigations were checked. Diazepam 10 mg was given orally as a premedication to all the patients and preoperative fasting guidelines were instituted.

The patients were grouped into two by random balloting labeled U and B. Group Band U were those for bilateral and unilateral spinal anaesthesia respectively.

Monitors were attached and baseline vital signs were taken, intravenous access were secured with an 18 gauge cannula and 15 ml/kg of Ringers lactate was given as preload over 10-15 minutes before the procedure and intraoperative fluid management continued, while equipment and drugs for resuscitation were checked and kept ready.

Group B patients were positioned sitting at the edge of the operating table with the legs resting on a stool by the side of the operating table. The back of each patient was cleaned and prepared with iodine solution to disinfect the skin around the site of puncture, and the patient draped. A skin wheal was raised with 1 ml of 2% lidocaine at the place of needle puncture at L3/L4intervertebral space. A lumbar puncture was performed at the same level with a 25 gauge disposable Quincke spinal needle. After free flow of clear cerebrospinal fluid was seen, an injection of 0.5% hyperbaric bupivacaine (Marcaine by AstraZeneca) 3 ml was administered intrathecally over 30 s using a 5 ml syringe with the bevel of the spinal needle downwards. The needle was removed at once and the puncture site covered with sterile gauze and secured in place with adhesive plaster. The patient was positioned supine immediately. Sensory and motor testing was started from 5 minutes until sensation was lost in the appropriate dermatomes before the surgery was commenced.

Group U patients were placed in the lateral decubitus position with the surgical side down (dependent) on the edge of the operating table, ensuring that the vertebral column was kept as horizontal as possible by placing a pillow under the shoulder. The back of the patient was prepared with iodine solution to disinfect the skin around the proposed site of puncture and the patient was draped. A skin wheal was raised with 1 ml of 2% lidocaine at the site of needle puncture at L_3/L_4intervertebral space. A lumbar puncture was performed at the same level with a 25 gauge disposable Quincke spinal needle. After free flow of clear cerebrospinal fluid was seen, 2 ml of 0.5% hyperbaric bupivacaine (Marcaine by AstraZeneca) and 1 ml of distilled water added was injected intrathecally slowly over 60 s using a 5 ml syringe without further aspiration maneuvers with the

spinal needle bevel facing the dependent side. The needle was withdrawn at once and the puncture site covered with sterile gauze and secured in place with adhesive plaster. The patient was kept in this position for 20 minutes, and then patient was turned supine for the procedure and monitored continuously.

This frequent monitoring of vital signs was to allow for early detection of complications like hypotension and bradycardia which must be treated promptly.

In all patients, 3-5 minutes after institution of the block, the level of sensory block was assessed by a pin prick starting from foot upwards. This was done at various time intervals of 5, 10, 15, and 20 minutes and was documented.

Motor block was assessed using the modified Bromage scale at various time intervals of 5, 10, 15, and 20 minutes and was documented.

In both groups the assessment of the sensory block, motor block and haemodynamic parameters were done by a blinded assistant, different from the Anaesthetist that performed the block. The contra-lateral side was assessed for block before the start of surgical procedure in those who received the unilateral block. This was done at 5 and 10 minutes after the block. Surgeries were allowed to commence only when the level of block reached above T10. Complications were anticipated and they were treated when they occurred.

The spinal anaesthesia was considered effective by sensory and motor assessment. Either of the techniques was termed failed if patients felt pain on the blocked limb on surgical stimulation. If this happened despite good technique, another form of appropriate anaesthesia like general anaesthesia was given to the patient and such a patient was withdrawn from the study.

After observing the patients in the recovery room for 60 minutes, and if there were no complications or complaints, patients were transferred to the ward with clear instructions to the nurses for continuous close monitoring of vital signs and for documentation of any complaints. Data were analyzed using EPI- info™ 7 (2007). They were expressed as absolute numbers of mean ±SD and as percentages. The chi-square analysis was used to compare the discrete variables, while student t- test was used to analyze continuous variables. A level of significance was set at $P \leq 0.05$.

RESULTS

Sixty four adult patients in both groups were recruited for this study, with age range between 18 - 75 years with the mean age of 39.28±15.30 and 43.84±16.91 in group U and B respectively. The male to female ratio was 2:1in each group (p=0.26). The socio-demographic characteristics were evenly distributed within the study groups except for height which showed that patients in group B were taller p=0.03 as shown in Table 1.

The mean duration of analgesia in this study was 64±24 minutes and 100±37 minutes in group U and B (p=0.01) respectively.

Hypotension occurred in 2(6.3%) patients in group U compared to 8 (25.0%) patients in group B. This was statically significant (p=0.04), however, nausea and shivering were not significant between the groups as shown in table 2.

Table1: Demographic Parameters and ASA Status in the two study groups

Characteristics	Group U	Group B	t-test	P-value
Number (M:F)	32(22:10)	32(21:11)	0.071	0.790
Mean Age±SD (yr)	39.28±15.30	43.84±16.91	1.132	0.262
Mean Height±SD (M)	1.60±0.05	1.63±0.052.173	0.034	
Mean Weight±SD (Kg)	69.44±7.85	69.16±7.98	0.142	0.888
ASA I	17(53.1)	19(59.4)		
II	9(28.1)	11(34.3)		0.424
III	6(18.8)	2(6.3)		

Table 2: Frequency of Intraoperative Complications

Complications	Group U n(%)	Group B n(%)	p value
Total	6(18.8)	14(43.8)	0.03
Specific complications			
Hypotension	2(6.3)	8(25.0)	0.04
Nausea	3(9.4)	6(18.8)	0.29
Shivering	5(15.6)	9(28.1)	0.23
Breathing difficulty	0(0.0)	1(3.1)	0.50

DISCUSSION

The factor that affects the optimum duration of lateral blocks includes the baricity and the dose of local anaesthetics used. High doses (12 to 20 mg) lead to local anaesthetic migration to the other limb even when the patient remains in the lateral decubitus position for 30 minutes to one hour.[6] On the other hand if low doses of local anaesthetic solution (5 to 8 mg) are used, 10 to 15 minutes in the lateral position is enough to prevent migration of the local anaesthetic solution when patients are returned to the supine position.[7]

The 2 ml (10 mg) of 0.5% hyperbaric bupivacaine used in our study was able to provide adequate sensory block that lasted 64 minutes in the unilateral group which was significantly different from the bilateral group that lasted for100 minutes(p=0.01). Reported duration of anaesthesia varies with the dose of local anaesthetics injected. The lower duration in the unilateral group may be because of the smaller dose of 0.5% hyperbaric bupivacaine used (10 mg) compared to the dose of 15 mg used in the bilateral group. Depending on the expected duration of surgeries, different doses of 0.5% hyperbaric bupivacaine can be used. But one must bear in mind that higher doses may be associated with a higher incidence of complications.

The duration of analgesia (64 minutes) observed in our study was however different from findings observed by Fanelli et al, [8] where the duration of analgesia was 81 minutes when they used 8mg of 0.5% bupivacaine. Although our study used a higher dose of 10 mg compared to 8 mg in the Fanelli et al, [8] study, the longer duration of analgesia in their study could be related to technique of injection and difference in time the patients remained in lateral decubitus position (20 versus 15 minutes).

In this study there was significant difference regarding the frequency of hypotension in the groups. This significant finding may be as a result of the lower dose of 0.5% hyperbaric bupivacaine used, 2 ml (10 mg) in the unilateral group compared to 3 ml (15 mg) used in the bilateral group. Also, maintaining and remaining in the lateral decubitus position reduces the number of nerves that the local anaesthetic drugs will have contact with and hence less effect on haemodynamic parameters. The third reason may be because of the effect of gravity in relation to the baricity of the bupivacaine used. This finding is similar to other studies that used the same dose of 0.5% hyperbaric solution with little modification in technique .[9,10,11,12,13,14,]

Osinaike et al, [9] in their study found a reduced incidence of hypotension in the unilateral spinal group even though not significant (p=0.14). They studied 74 ASA I and II adult patients scheduled for elective unilateral lower limb surgery. Patients were divided into 2 equal groups randomly. The unilateral group with the operative limb on the dependent side received 10 mg of 0.5% hyperbaric bupivacaine using a 25 gauge spinal needle (Whitacre). Patients in the unilateral group remained in the lateral position for 15 minutes. They concluded that compared to the conventional group, the unilateral group was associated with fewer cardiovascular perturbations. This is similar to what was found in this study. This study used the same dose of 10 mg of 0.5% hyperbaric bupivacaine, but the patients stayed longer in the lateral position (20 minutes) and a cutting (Quincke) spinal needle was used in this study while Osinaike et al, [9] used

pencil point (Whitacre) spinal needle. Also they used only ASA I and II patients, while in this study stable ASA III were included in the study. The fact that they excluded stable ASA III patients could explain the lower incidence of hypotension recorded in their study. Even though patients were clinically assessed preoperatively, some may still have undetected cardiovascular conditions that could predispose them to intraoperative hypotension.

The higher incidence of shivering in group B compared to the group U in this study may also be as a result of the higher dose (3mls) in the group B compared to the lower dose (2mls) of bupivacaine in the group U. The shivering was easily treated using warm intravenous fluids, covering the patients with blankets and by increasing the temperature of the theatre air conditioners.

CONCLUSION

The study showed that unilateral spinal anaesthesia with 2 ml of 0.5% bupivacaine had shorter duration of spinal anaesthesia with less complications compared to bilateral spinal anaesthesia for unilateral lower limb surgeries. Unilateral spinal block could be considered for patients who would require a unilateral lower limb surgery where haemodynamic stability is greatly desired.

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