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Original Article

Anaesthesia Section

Variation in the Duration of Recumbency Post-spinal Anaesthesia in Relation to the Occurrence of Post-dural Puncture Headache

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ABSTRACT

Introduction: Post-Dural Puncture Headache (PDPH) remains one of the most dreaded complications of spinal anaesthesia. Duration of recumbency has been considered as a factor in the occurrence of PDPH.

Aim: This study aimed to look at the incidence of PDPH among two groups of patients that had six and twelve hours of recumbency post-spinal anaesthesia.

Materials and Methods: Patients aged 15 years and above with lower limb pathologies that required surgery under spinal anaesthesia were prospectively recruited into two groups: group A patients had 6 hours of recumbency post spinal anaesthesia while group B had 12 hours. Data on the occurrence of PDPH among the two groups were collected. All patients had dural puncture with either 23G or 25G spinal needles.

Results: One hundred and five patients, with mean age of 45.9 years were studied. The M:F was 1.8:1. Forty eight patients had 6 hours of recumbency while fifty seven patients had 12 hour recumbency. The incidence of PDPH in the patients studied was 9.5% with an average Pain Numerical rating score of 6. There was no significant difference in the incidence of PDPH following either 6 or 12 hours of recumbency (p-value <0.5).

Conclusion: Six hours of recumbency from the time spinal anaesthesia was administered in the theatre is as safe as 12 hours.

Keywords: Spinal anaesthesia, Recumbency, Lower limb injuries

INTRODUCTION

PDPH remains one of the most dreaded complications of spinal anaesthesia [1].

Headache after lumbar puncture carries a considerable morbidity, with symptoms lasting for several days, at times severe enough to immobilise the patient. Certain factors have been reported as contributory to the development of headache after spinal anaesthesia. If these factors are taken into consideration, the incidence of headache could be markedly reduced [2].

Based on the classification of the International Headache Society, post-dural puncture headache can be defined as "bilateral headache that develops within 7 days after lumbar puncture and disappears within 14 days. The headache worsens within 15 minutes of resuming the upright position, disappears or improves within 30 minutes of resuming the recumbent position." This definition helps to distinguish post-dural puncture headache from other forms of headache [3].

The headache occurred within the first 3 days of lumbar puncture and about two-third will occur within the first 48 hours. It rarely occur after 4 days. The characteristic feature is that it worsen with upright posture or head movement and the symptoms are self-limiting. It affects mainly the occipital and frontal region radiating to the neck and shoulders and less commonly the temporal, vertex and nuchal areas [4].

Headache usually resolves within a few days, but the longest reported headache after lumbar puncture lasted 19 months [2].

Factors reported to influence the incidence of PDPH are: age, sex, pregnancy, previous history of PDPH, needle size, needle tip shape, bevel orientation to the dural fibres, number of Lumbar Puncture (LP) attempts, midline versus lateral LP approach, type of local anaesthetic solution, and clinical experience of the operator [2,5-12].

PDPH has been considered to result from CSF leakage through the dural tear into the epidural space. A large hole in the dura leads to a greater CSF volume loss, which increases the odds of developing PDPH. Needle size may be the most important factor in determining the risk of PDPH. Other reported procedure-related risk factors include needle shape, needle orientation, stylet re-insertion and operator experience. Factors like bed rest, hydration, patient positioning during the LP, the volume of CSF removed during the dural puncture, as well as the number of attempts have not been proven to be associated with reduced PDPH incidence. Some studies showed slightly increased frequency of PDPH in recumbent patients as compared with patients immediately mobilized [11,12], while others showed no significant difference in prevalence, pattern and severity of PDPH between 6 hours of recumbence and early ambulation [13,14]. However, there are serious methodologic concerns regarding these previous studies. Therefore, the strict bed rest after LP for variable time period is still advised by many physicians.

Kim S et al., suggested that the duration of supine recumbence after LP may not play a key role in the development of PDPH. In their study, four hours of recumbency was compared to one hour and there was no difference in the incidence of PDPH. Therefore, the prolonged supine recumbence after LP may not be necessary to prevent PDPH [11].

Determining the effect of recumbency time on PDPH will help to determine the safety of a shorter recumbency time than it is presently being practised and whether a 6 hour postoperative recumbency period is adequate and safe for our patients.

There has been paucity of research papers on this topic in our environment, hence the need for this study. This study will help to determine the effect of the duration of recumbency on the occurrence of PDPH with a view to reduce this complication among patients. It will also guide the Orthopaedic surgeons and Anaesthesiologists on proper counselling of the patients on the duration of recumbency required to minimize this complication.

MATERIALS AND METHODS

Study Design

This was a prospective observational study involving orthopaedic patients undergoing lower limb surgeries in Obafemi Awolowo University Teaching Hospitals' Complex, Ile-Ife from February 2016 to June 2017 that qualify for spinal anaesthesia. The inclusion criteria were patients above 15 years of age with lower limb pathology requiring surgery under spinal anaesthesia. Exclusion criteria were patients less than 15 years, patients that had headache prior to giving of spinal anaesthesia and patients that did not give consent. The patients who met the inclusion criteria were placed with simple randomization into two groups labelled A and B. Group A were kept supine for six hours after administration of spinal anaesthesia, while group B were kept supine for twelve hours after administration of spinal anaesthesia for lower limb surgeries.

Procedure

The spinal anaesthesia was performed by an Anaesthesiologist under the standardized institutional guideline for spinal anaesthesia using heavy marcain (Bupivacaine-AstraZeneca) with dose 0.25-0.30 mg/kg but most patients used 3-4 mL of the drug. The patients had spinal anaesthesia with bevel tip (Quincke, pencil-tip, atraumatic) spinal needles of 23G and 25G. All patients that developed headache after spinal anaesthesia were identified and screened for qualification for the criteria in diagnosing post-dural puncture headache. Those who met the criteria had the severity assessed using the Numeric Rating Scale (NRS). The incidence of PDPH was determined and compared among patients who had 6 and 12 hours post-spinal anaesthesia recumbency periods.

A 0 to 10-point NRS was chosen, with an endpoint of 10 for extreme pain and a zero point for no pain.

We collected demographic and clinical characteristics of the patients, including disease diagnosis, number of spinal anaesthesia attempts, and presence of headache in the patients, previous exposure to spinal anaesthesia, past experience of PDPH, and the treatment given in the affected patients. Information was gathered on the size of needle used, the number of CSF drops before injection of spinal anaesthetic agent, whether patient had combined epidural and spinal anaesthesia. Approval for this study was obtained from the Ethics and Research Committee of the Obafemi Awolowo University Teaching Hospitals Complex, Ile-Ife, Nigeria. Consent was also obtained from patient before inclusion in the study.

STATISTICAL ANALYSIS

The data collected were entered into a spreadsheet and analysed. The differences between the two groups were compared using the students' t-test or chi-square test and Fisher's-exact test when the variables are small or ANOVA as appropriate. Analysis was done using SPSS version 22 (SPSS Inc., Chicago, IL). Statistical significance between the two groups will be inferred at p-value of <0.05.

RESULT

One hundred and five patients were studied with mean age of 45.9±19.4 and age range of 16 to 95 years. Male to female ratio was 1.8:1. Forty eight patients were recruited into group A comprising of patients that had 6 hours of recumbency after spinal anaesthesia while fifty seven patients were recruited into group B with recumbency of 12 hours.

The diagnosis and surgery done for the patients were as depicted in [Table/Fig-1,2].

Variables were compared between the two groups as seen in [Table/Fig-3] and found not to have any statistical significance except the needle size and the vertebral level used for the spinal anaesthesia. There were two cases of PDPH in group A with 6 hours of recumbency and eight cases in group B with 12 hours of recumbency but this was not significant statistically (p=0.086). This showed that the duration of recumbency did not have significance in the incidence of post-dural puncture headache.

Diagnosis	Frequency	Percentage (%)
Femoral fracture	50	47.6
Bilateral Tibio-fibular fracture	2	1.9
Unilateral Tibio-fibular fracture	18	17.1
Ankle fracture	5	4.8
Lower limb gangrene	3	2.9
Chronic Osteomyelitis	1	1.0
Tumours of the lower limb	1	1.0
Others	25	23.8

[Table/Fig-1]: Showing the diagnosis of patients recruited into this study.

Surgery Performed	Group		Total
	6 hours recumbency	12 hours recumbency	
ORIF Femoral fracture	10	17	27
ORIF Tibia fracture	5	4	9
Hemi-arthroplasty	6	6	12
Implant Removal	6	5	11
Sequestrectomy	0	1	1
Biopsy	1	0	1
Amputation	1	2	3
Multiple surgeries	0	1	1
Others	19	21	40
Total	48	57	105

[Table/Fig-2]: Showing the surgeries done for the patients in the two groups.

Ten subjects reported headache: two in group A and eight in group B. All of them satisfied the criteria for post-dural puncture headache (according to the Classification Committee of the International Headache Society) and they were influenced by posture as seen in [Table/Fig-4] below.

Seven of the subjects reported headache in the frontal area, two in the occipital region while the last patient had generalised headache [Table/Fig-5].

The severity of the headache as rated using NRS was 5 in four patients, 6 in two and 7 in the remaining four patients with a mean NRS of 6 and the duration of the headache was between 10 to 120 hours. They all resolved with fluid hydration, analgesics and Caffeine drinks.

DISCUSSION

Post-dural puncture headache is believed to result from the leakage of Cerebrospinal fluid following lumbar puncture. When there is continuous loss of CSF, the risks of having PDPH is high [15].

In this study, the incidence of PDPH in the 105 patients studied was 9.5% and this was comparable to 7.3% of PDPH seen in 1021 spinal anaesthesia given in the study of Lybecker H et al., [16]. However, Delpizzo K et al., in New York had a lower overall incidence of 2.0% in their study [17]. In that study, size 27G pencil-point needle and younger subjects aged 15 years to 45 years undergoing ambulatory surgeries were studied but this study was done among older patients (16-95 years) with bevel tip 23G or 25G needles.

This study showed male preponderance with M:F (1.8:1). Majority of the patients were operated following fractures and such presentation is common to males. Wu CL et al., had similar male preponderance compared to this study though the ratio was 1.1:1 [18] whereas Monserrate AE et al., had female preponderance in their study of factors associated with onset and persistence of post-lumbar puncture headache [15].

	Six hours	Twelve hours	p-value
Age (n=105)			
15-44	25	31	0.456*
45-64	16	12	
≥65	7	14	
Sex (n=105)			
Male	31	37	0.972*
Female	17	20	
Duration of surgery (n=87)			
60-120 mins	27	16	0.273*
121-180 mins	13	22	
>180 mins	2	7	
Needle size (n=105)			
23G	29	20	0.008™
25G	19	37	
Vol. of Mercain (n=103)			
3.0-3.5 mls	33	35	0.508*
3.6-4.0 mls	15	20	
No of attempt (n=105)			
1-2	40	46	0.219*
3-4	8	11	
No of CSF drops (n=104)			
≤3	38	45	0.606*
>3	10	11	
Vertebral level used (n=101)			
L3/L4	41	38	0.034™
L4/L5	6	16	
Height of block (n=88)			
T6	19	16	0.603®
T8	21	19	
T10	5	8	
Previous exposure to spinal anaesthesia (n=101)			
Yes	13	16	0.682*
No	34	38	
Previous History of headache (n=91)			
Yes	2	4	0.105*
No	43	42	
Assess for PDPH (n=105)			
Yes	2	8	0.086*
No	46	49	

[Table/Fig-3]: Demography and other indices compared in the two groups.
Pearson Chi-Square* Fisher's-Exact Test™ Likelihood Ratio®

Group			Effect of posture		Total
			No	Yes	
6 hrs	Assess Headache	No	46		48
		Yes	2	2	
		Total	48	2	
12 hrs	Assess headache	No	49		57
		Yes	8	8	
		Total	57	8	

[Table/Fig-4]: Showing effect of posture on the headache.

Group		Characteristic of headache				Total
		No	Frontal	Occipital	Generalised	
6 hrs	Assess Headache	46	2	0	0	48
12 hrs	Assess headache	49	5	2	1	57

[Table/Fig-5]: Showing the characteristic of the headache.

The age range of 105 patients in this study was 16 to 95 years with mean age of 45.9±19.4. The incidence is said to be higher in females especially in pregnancy [18]. Age is also a factor in the development of this complication with greater risks in younger patients [19]. Amorim JA et al., had 640 patients in their study; with age range of 8 to 65 years, the patients' population in their study were younger as compared to this study [20].

This study considered patients undergoing orthopaedic procedures for lower limb pathologies who had spinal anaesthesia for their procedures whereas the study of post-dural puncture headache by Lybecker H et al., considered patients undergoing surgeries below the diaphragm though orthopaedic pathologies accounted for majority in their series [16] and Fyneface-Ogan S et al., in Port-Harcourt, considered obstetric patients undergoing caesarean section for post-dural puncture headache [10].

The age, sex, duration of surgery, volume of bupivacaine used, number of attempts, number of CSF drops, height of block, previous exposure to spinal anaesthesia and previous history of headache were compared in the two groups with no significant difference. The size of the spinal needle and the vertebral interspace used for injection of anaesthesia were the two variables which were not comparable in the two groups and showed significant difference. More subjects in the 12 hour group had spinal procedures done with the smaller size 25 G needle than the 6 hour group. It was expected that this group where the smaller 25G needle was used should have less incidence of PDPH but surprisingly, the 6 hour group with more subjects using bigger size 23G spinal needle had less incidence of PDPH.

This implies that prolonged recumbency does not confer any advantage in the prevention of PDPH. Needle size though reported to be a major factor in the occurrence of PDPH may not show any difference in the occurrence of PDPH with increasing use of finer needles because multiple punctures with finer needles and a single puncture with a little bigger needle may have the same effect on CSF leakage. The actual cause of PDPH in patients who had spinal anaesthesia may be multifactorial and beyond just the consideration of needle sizes and duration of recumbency.

Ahmed SV et al., in their article on PDPH agree with the fact that the amount of CSF fluid removed during lumbar puncture does not influence the incidence of PDPH, but the needle sizes do. The number of attempts was reported to influence the incidence of PDPH in their study but this is contrary to the finding in this study [2].

Hafer J et al., found out that age and number of attempts influenced incidence of PDPH as against the findings in this study [12].

Rodriques AM et al., in their studies to unravel the cause of postpartum headache among patients who had elective caesarean section under spinal anaesthesia showed that the most important cause of headache is the needle type used; with smaller atraumatic pencil tip needles found to have lower incidence of post dural puncture headache [5], in this study, similar type of needles were used with small difference in caliber. It is instructive to note that whereas in most study, the larger needle sizes were associated with increase incidences of PDPH but in this study, the group that had higher number of patients having PDPH (eight of the ten cases recorded) had more smaller needle size used [16,19,21,22].

Kuntz K et al., also noted that the amount of CSF fluid removed during lumbar puncture did not influence the incidence of PDPH among the 501 patients they studied [23].

The incidence of PDPH in the Six hours recumbency group was 4.2% while it was 14% among the 12 hours group. Though, there was no statistically significant difference in the incidence of PDPH (p-value=0.086) it will appear that early ambulation is associated

with a lower incidence of PDPH. Anderson A et al., in their meta-analysis reported similar findings [24].

This agrees with studies among researchers that recumbency time does not have effect on the occurrence of PDPH [5,12,23]. Moreover, Kim S et al., compared one hour of recumbency to 6 hours of recumbency and found no statistically significant difference in the incidence of PDPH which also agree with the findings of this study. This implied that keeping patients on the bed after spinal anaesthesia is not necessary to prevent PDPH.

Seven of the ten cases of PDPH affected the frontal region; two affected the occipital region while the last one was generalized and throbbing in nature. Wu C et al., reported of the affectation of the frontal, occipital and diffuse headache which was in agreement with the report of this study [25].

LIMITATION

The study limitation is the small sample size as compared to some studies on PDPH in the literature. This has to do with the volume of patients available to us over the period given for the study.

CONCLUSION

Duration of recumbency after spinal anaesthesia does not influence the incidence of PDPH, hence keeping patient supine for prolonged period after spinal anaesthesia may not be necessary.

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