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Effect of Pre and Post Nursing Intervention on the Occurrence of Tension Headache among Surgical Patients Undergoing Spinal Anesthesia

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Abstract

Spinal anesthesia is a frequently performed procedure in medical emergencies and anesthesia. Tension headache after lumbar puncture is a common occurrence (32%) and carries a considerable morbidity, with symptoms lasting for several days, at times severe enough to immobilize. The aim of this study is to assess the effect of pre and post nursing intervention on the occurrence of tension headache among surgical patients undergoing spinal anesthesia. This quasi-experimental study was conducted in El-Naser Health Insurance Hospital; in Helwan city in Egypt, 60 adult patients admitted for lower abdominal surgery using spinal anesthesia were recruited. The only exclusion criterion was pregnancy in female patients. Participants were alternatively assigned to either the intervention or control groups, ending with 30 patients in each group. The data collection tools consisted of two tools. Tool 1 was concerned with characterization of the pain and patient's personal data. The second tool was a visual analog scale (VAS). The researchers designed a structured pre-spinal anesthetic nursing intervention to be applied to the study group. Control group received the routine nursing intervention only. The results revealed that the incidence of tensions headache became significantly lower in the study group, reaching its lowest rate (3.3%) by the end of the third day, compared to 76.7% in the control group ($p<0.001$) the mean duration of tension headache was shorter in the study (22.1 ± 34.0 hours) than in the control (111.2 ± 55.9 hours) group, $p<0.001$ as well patients in the study and control groups also demonstrated statistically significant differences in the experience of symptoms associated with tension headache ($p < 0.001$). In conclusion, the structured nursing measures before and after the procedure was successful in decreasing the incidence and duration of this tension headache and its associated symptoms. Therefore, it is recommended to generalize these structured nursing measures in hospitals to be included in the routine pre-operative and post-operative nursing care for patients undergoing lower abdominal surgery with spinal anesthesia.

Keywords: Spinal anesthesia; Post spinal anesthesia; Tension headache

Introduction

Lumbar puncture is a frequently performed procedure in medical emergencies and anesthesia. Tension headache after lumbar puncture is a common occurrence (32%) and carries a considerable morbidity, with symptoms lasting for several days, at times severe enough to immobilize the patient. If untreated, it can result in serious complications such as subdural hematoma and seizures, which could be fatal [1].

Multiple complications can occur after dural puncture, including tension headache, cranial neuropathies, direct nerve root irritation, backache, infection, and spinal hematoma. Postural puncture tension headache (PDPH) is the most common of these complications. It develops in 16% to 86% of the cases after attempted spinal block with large bore needles [2]. It is described as frontal or occipital pressure occurring in the upright position and decreasing or resolving when supine [3]. According to the International Tension Headache Society, the criteria for PDPH include a tension headache that develops less than seven days after a spinal puncture, occurs or worsens less than fifteen minutes after assuming the upright position, and improves less than thirty minutes in the recumbent position with at least one of the following symptoms: neck stiffness, tinnitus, hypacusia, photophobia, and nausea. It should disappear within fourteen days after a spinal puncture; if it persists, it is called a CSF fistula tension headache [4].

These tension headaches are thought to result from leakage of the cerebrospinal fluid through the tiny hole created by the spinal tap needle, causing the membranes to rub painfully against the bony skull [2]. Therefore, the needle size and type are among the factors that have been shown to contribute to the risk for PDPH. Small-bore (high-gauge) needles have been shown to reduce the risk although smaller needle sizes increase the failure rate of the lumbar puncture because they are more difficult to use. As a result, needles smaller than 25 gauges are not preferred in spinal anesthesia [5]. A lower incidence was found when 27-gauge Quincke and 25-gauge Whitacre needles were used versus 26-gauge Quincke needles [6].

Patients who develop PDPH may reveal a wide range of emotional responses from misery and tears to anger and panic. It is important both from a clinical and medical points of view to discuss the possibility of tension headache before a procedure is undertaken that has a risk of this complication. Even though this discussion will not prepare the patient for the sensation, he/she feels the tension headache [7]. It is important to give the patient a thorough explanation of the reason for the tension headache, the expected time course, and the therapeutic options available. Supportive therapy such as rehydration, acetaminophen, non-steroidal anti-inflammatory drugs, opioids, and antiemetic may control the symptoms and so reduce the need for more aggressive therapy [1]. Caffeine, either parenteral or oral, is one of the most common treatments. As PDPH is believed to be caused

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by adenosine-induced cerebral vasodilatation, caffeine may act by antagonizing adenosine, thus leading to cerebral vasoconstriction [4].

The purpose of using hydration in treating PDHD is to ensure that the rate of CSF production is appropriate. Although the degree of CSF leak does not correlate with the severity of the symptoms in a PDPH, it is assumed that improvements in the ratio of CSF production to CSF leak will improve the clinical picture. Dehydration can result in a decrease in CSF production. However, if the patient is appropriately hydrated, and the rate of CSF production is normal, there is no evidence that over hydration will increase the rate of CSF production any further. Therefore, there is no point in administering fluids to a patient who is already appropriately hydrated [8].

If a patient develops a tension headache, he/she should be encouraged to lie in a comfortable position. There is no clinical evidence to support the maintenance of the supine position before or after the onset of the tension headache as a means of treatment. The prone position has been advocated, although it may not be a comfortable position for the patient. This position raises the intra-abdominal pressure, which is transmitted to the spinal space and may alleviate the tension headache [1].

Significance of the study

Reviewing of the admission rate of patients at the El-Nasr Insurance Hospital at Helwan city showed that about 200 cases required lower abdominal surgery under spinal anesthesia during the last year. In addition, around 80% of these patients complained of tension headache after spinal anesthesia that hindered their ability of early mobilization, eating, and/or self-caring. These factors would consequently lead to delay of the healing process of their wounds, and result in longer hospital stay and subsequent financial load on the patients and their families, as well as the healthcare system. Moreover, PDPH might give patients a bad experience with spinal anesthesia that makes them reluctant to use it again.

Aim of the study

The aim of this study is to assess the effect of pre and post nursing intervention on the occurrence of tension head-ache among surgical patients undergoing spinal anesthesia

Subjects and Methods

Research design

A quasi-experimental research design was utilized.

Setting

The study was conducted at the El-Nasr Insurance Hospital at Helwan city and Zagazyge University hospital at Zagazyge City.

Subjects

A consecutive sample of 60 adult patients admitted for lower abdominal surgery using spinal anesthesia was recruited. The only exclusion criterion was pregnancy in female patients. Participants were alternatively assigned to either the intervention or control groups, ending with 30 patients in each group. The study group patients received structured nursing care measures before and after spinal anesthesia, while the control group patients were subjected to routine hospital care. The same anesthesiologist performed the procedure for all patients in both groups using the same needle caliber (needle size 25-gauge Quincke) and the same anesthetic drug.

Data collection tools

Two tools were adopted by the researchers based on related literature. The first tool was concerned with characterization of the pain including its location (occipital, frontal, neck, and shoulder), time of start in relation to operation, duration, and associated symptoms (nausea, vomiting, blurred vision and tinnitus). The tool also included patient's personal data, past and present medical data, past history of spinal anesthesia and related tension headache. It also included recording of vital signs. This tool was filled out for all patients in both groups three times per day during the five days following the operation, and once after one week. The second tool was a Visual analog scale (VAS). It is an instrument used to measure the amount of pain a patient feels, according to Journal of Clinical Nursing. The visual analog scale of pain is usually a 100 mm-long horizontal line, which may contain word descriptors at each end. The patient represents their perception of the amount of pain she feels by marking a horizontal line between two points. The visual analog scale score is measured in millimeters from the left hand end of the line to the point indicated by the patient [9].

Nursing measures (the study intervention)

The researchers designed a structured pre-spinal anesthetic nursing intervention to be applied to the study group. The nursing intervention consisted of pre and post anesthetic measures. The pre-anesthetic measures included psychological preparation and support to the patient through explaining what spinal anesthesia is, its importance, and correct position during lumbar puncture. They also involved improvement of patient's hydration by encouraging patients to drink more fluids as juice, tap water, and/or soup, in addition to taking two cups of coffee eight hours before the operation. The post-anesthetic measures included bed rest in prone position, improving patient's hydration by encouraging oral intake of fluids, administration of oral analgesic and caffeine, and application of an abdominal binder.

Pilot study

A pilot study was conducted on six patients from the same setting to test the feasibility and applicability of the tools and the intervention, and few modifications were done accordingly. Data obtained from the pilot study were not included in the main study.

Study maneuver

The study protocol was approved and an official permission to carry out the study was obtained from pertinent authorities after explanation of its purpose. An oral informed consent was obtained from every patient to participate in the study. Confidentiality and privacy were assured for each participant. The study maneuvers could not entail any harm to patients. Data collection extended over a period of one year from January 2009 to January 2010. Available patients who fulfilled the inclusion and exclusion criteria were assigned to intervention and control groups in an alternate manner. The structured nursing intervention was implemented to the study group, while patients in the control group received the routine nursing measures. Post-operatively, the post-anesthetic nursing measures were applied to the study group, whereas the control group received the routine post-operative hospital measures.

Statistical analysis

Data entry and statistical analysis were done using SPSS 14.0 statistical software package. Quantitative continuous data were

	Group				X^2 Test	p-value
	Study (n=30)		Control (n=30)			
	No.	%	No.	%		
Age (years):						
<40	17	56.7	23	76.7		
40+	13	43.3	7	23.3	2.70	0.10
Range	22.0-55.0		22.0-50.0			
Mean ± SD	38.1 ± 10.4		33.8 ± 8.8			
Sex:						
Male	14	46.7	17	56.7		
Female	16	53.3	13	43.3	0.60	0.44
Past history of:						
Recurrent tension headache	17	56.7	16	53.3	0.07	0.80
Abdominal surgery	14	46.7	18	60.0	1.07	0.30

Table 1: Demographic characteristics and medical history of patients in the study and control groups.

	Group				Mann-Whitney	p-value
	Study (n=30)		Control (n=30)			
	No.	%	No.	%		
Systolic blood pressure:						
Range	110.0-180.0		110.0-170.0			
Mean±SD	126.3 ± 14.0		124.7 ± 13.3		0.51	0.47
Diastolic blood pressure:						
Range	70.0-120.0		70.0-120.0			
Mean±SD	85.7 ± 10.7		85.7 ± 12.2		0.07	0.80
Pulse:						
Range	70.0-100.0		80.0-110.0			
Mean ± SD	90.0 ± 6.9		92.0 ± 5.5		0.89	0.35
Respiratory rate:						
Range	38.0-39.0		38.0-38.0			
Mean ± SD	38.1 ± 0.3		38.0 ± 0.0		3.11	0.08

Table 2: Pre-intervention vital signs of patients in the study and control groups.

compared using the non-parametric Mann-Whitney test as normal distribution of the data could not be assumed. Qualitative categorical variables were compared using chi-square test. Statistical significance was considered at p-value <0.05.

Results

Patients in the study and control groups had similar demographic characteristics with no statistically significant differences. As (Table 1) shows, about half of the study (46.7%) and control (56.7%) groups were males, with mean ages 38.1 ± 10.4 and 33.8 ± 8.8 respectively. High percentages of them (56.7% and 53.3%, respectively) had a past history of tension headache. Patients in the two groups also had similar pre-operative vital signs, with no statistically significant differences between them (Table 2).

The incidence of post-anesthetic tension headache was similar in the two groups in the first two assessments (0 and 8 hours); with immediate rates of 53.3% in the control group and 46.7% in the study group (Figure 1). From the third assessment, the incidence of tension headache became significantly lower in the study group, reaching its lowest rate (3.3%) by the end of the third day, compared to 76.7% in the control group (p<0.001). One week after operation, during follow-up, 10% of the patients in the study group had tension headache compared to 53.3% in the control group (p<0.001).

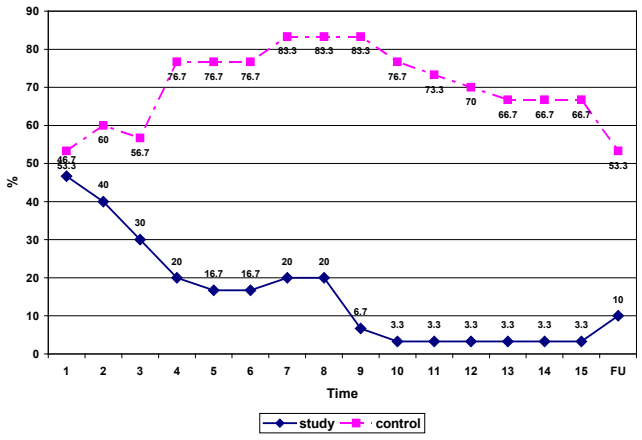

Figure 1: Incidence of headache among patients in the study and control groups throughout follow-up (Statistically significant at p<0.05 except time 1-2).

	Group				X^2 Test	p-value
	Study (n=30)		Control (n=30)			
	No.	%	No.	%		
Start:						
None	9	30.0	2	6.7		
Day 1	14	46.7	16	53.3	5.90	0.052
Day 2+	7	23.3	12	40.0		
Mean ± SD	38.1 ± 10.4		33.8 ± 8.8			
End:						
None	9	30.0	2	6.7		
Day 1	12	40.0	1	3.3	26.81	<0.001*
Day 2-5	7	23.3	9	30.0		
Follow-up	2	6.7	18	60.0		
Duration (hours):						
Range	0.0 - 168.0		0.0-168.0			
Mean ± SD	22.1 ± 34.0		111.2 ± 55.9		U=27.75	<0.001*

(*) Statistically significant at p<0.05 (U) Mann-Whitney test

Table 3: Time of start, end, and duration of tension headache among patients in the study and control groups.

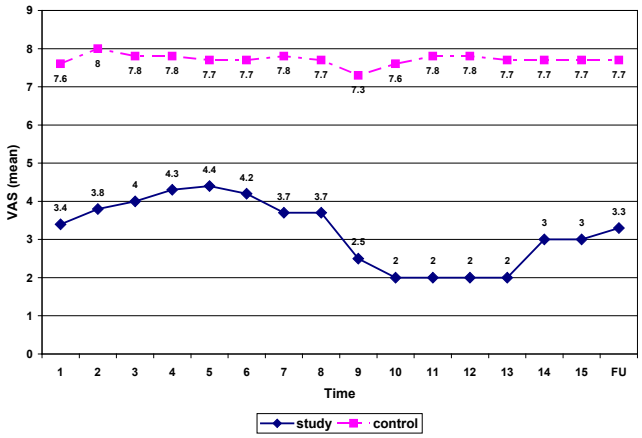

Figure 2: Intensity of headache (mean of visual analog scale – VAS) among patients in the study and control groups throughout follow-up (Statistically significant at p<0.05 except time 10-15).

As regards the time of start of tension headache, there is no statistically significant difference between study and control group patients (Table 3). However, the time of end of tension headache demonstrated a statistically significant difference between the two groups, with 40.0% of the study group ending in the first day, and 60% of the control group extending to follow-up (p<0.001). Also, the mean duration of tension headache was shorter in the study (22.1 ± 34.0 hours) than in the control (111.2 ± 55.9 hours) group, p<0.001.

The comparison of the intensity of tension headache assessed by visual analog scale indicated statistically significant differences between the two groups in the first three days and follow up measurements (Figure 2). The mean scores ranged between 2.0 to 4.4 in the study group, and 7.6 to 8.0 in the control group. Patients in the study and control groups also demonstrated statistically significant differences in the experience of symptoms associated with tension headache (p< 0.001). As (Table 4) illustrates, none of the patients in the study group who had tension headache had any of these symptoms. On the other hand, all of the patients with tension headache in the control group had either one or multiple symptoms throughout the follow-up time.

	Group (with tension headache)				X^2 Test	p-value
	Study		Control			
	No.	%	No.	%		
Day 1:						
None	12	100.0	0	0.0		
One	0	0.0	7	38.9	30.00	<0.001*
Multiple	0	0.0	11	61.1		
Day 2:						
None	5	100.0				
One	0	0.0	2	6.7		
Multiple	0	0.0	1	3.3	26.81	<0.001*
Day 3:						
None	6	100.0	0	0.0		
One	0	0.0	7	28.0	31.00	<0.001*
Multiple	0	0.0	18	72.0		
Day 4:						
None	1	100.0	0	0.0		
One	0	0.0	6	27.3	23.00	<0.001*
Multiple	0	0.0	16	72.7		
Day 5:						
None	1	100.0	0	0.0		
One	0	0.0	6	30.0	21.00	<0.001*
Multiple	0	0.0	14	70.0		
Follow-up:						
None	3	100.0	0	0.0		
One	0	0.0	3	18.8	19.00	<0.001*
Multiple	0	0.0	13	81.3		

(*) Statistically significant at p<0.05

Table 4: Symptoms associated with tension headache among patients in the study and control groups throughout follow-up.

	Group (with tension headache)				X^2 Test	p-value
	Study		Control			
	Mean ± SD	Median	Mean ± SD	Median		
Age (years):						
<40	11.3 ±12.7	8.00	111.7 ± 59.6	120.00	20.28	<0.001*
40+	36.3 ± 46.8	16.00	109.7 ± 45.7	120.00	7.98	0.005*
Sex:						
Male	26.3 ± 44.0	16.0	105.9 ± 62.1	120.00	10.08	0.002*
Female	18.5 ± 22.9	12.00	118.2 ± 48.2	144.00	18.49	<0.001*
History of recurrent tension headache:						
No	12.3 ± 14.1	8.00	92.6 ± 62.7	104.00	10.82	0.001*
Yes	29.6 ± 42.5	16.00	127.5 ± 45.1	144.0	18.56	<0.001*
History of abdominal surgery:						
No	20.0 ± 21.1	16.00	95.3 ± 68.7	104.00	7.66	0.006*
Yes	24.6 ± 45.3	12.00	121.8 ± 44.5	132.00	16.76	<0.001*

(*) Statistically significant at p<0.05

Table 5: Duration of tension headache among patients in the study and control groups adjusted for age, sex, and medical history.

The differences in the duration of tension headache between the study and control groups were still statistically significant when stratified according to their demographic characteristics and medical history. As displayed in (Table 5), the duration was longer in the control group patients compared to the study group irrespective of age, gender, past history of tension headache, and medical history of abdominal surgery.

Discussion

Tension headache following a lumbar puncture is a common and often debilitating syndrome. In this current research, the majority of patients (more than 50%) developed tension headache immediately after the operations. However, this high percentage persisted and even increased in the control group patients throughout follow-up. The findings are in agreement with [10] and [11] who reported rates of PDPH reaching as much as 70%. Moreover, [12] mentioned that PDPH occurs in up to 90% of patients within two days following diagnostic lumbar puncture, which is close to the rate in the present study control group patients (83.3%). Meanwhile, much lower percentages of patients in the study group experienced tension headache, which points to success of the nursing intervention measures.

The needle size or bore can be a confounding factor in the study of PDPH. Studies have demonstrated a significant association between the needle gauge and the incidence of PDHD. The incidence is 40% with a 22G needle; 25% with a 25G needle; 2%-12% with a 26G Quincke needle; and <2% with a 29G needle [4]. However, technical difficulties leading to failure of the spinal anaesthetic are common with needles of 29G or smaller [8]. In the present study, a needle size 25-gauge Quincke was used for all patients in the study and control groups to avoid the effect of this confounding factor.

The time of start of the PDPH was not significantly different between the study and control group patients in the current study. In both groups, about half of the patients experienced tension headache by the first day, and this increased to about 70% and 90%, respectively in the second day. These rates are slightly higher than those reported by [11] who found that 66% of the patients' tension headache starts within the first 48 hours. This difference between the two studies might be related to needle size differences or the experience of the person doing the procedure.

The present study intervention was also successful in decreasing the duration of tension headache among patients in the study group, compared to the control group patients. The mean duration in the study group was reduced to about one day, compared to about five days in the control group. This duration in the control group is close to that reported by Shah and Thomas [5] who found a median of five days. Moreover, Apfel et al. [4], reported that 72% of tension headaches lasted for seven days. Therefore, there was a true reduction in the duration of tension headache in the intervention group of the current study, which could be attributed to the implementation of the nursing measures. These

included oral hydration, which has been recommended by Ghaleb [2], as well as caffeine in a single oral dose, which was demonstrated to be safe, effective and recommended in the early treatment of PDPH [13,11]. These results of the present study are in congruence with Ahmed et al. [14], who highlighted that the syndrome of postdural puncture tension headache may be resolved spontaneously in a few days to a week or lasts months to a year according to the provided conservative measures.

With regard to the intensity of tension headache, the present study findings point to significantly lower intensity scores among patients in the study group as compared to those in the control group. This can also be attributed to the effect of providing pre-and post-anesthetic nursing measures for patients in the study group, which might have a positive effect on reducing the intensity of tension headache. This explanation is in line with the results of David [15], who reported the importance of conservative approaches in preventing PDPH. The higher intensity in the control group patients could also be due to the earlier start of their tension headache, which is usually associated with more severe and longer lasting tension headache as indicated by Benyamin et al. [16].

There are certain demographic factors that seem to be associated with the risk of PDPH for reasons that are not well understood. Patient age is a risk factor, with ages between 18 and 40 years the highest risk range [17]. The risk of PDPH at age 25 years is 3-4 times that at age 65 years. There is also significantly decreased frequency after age 60 years, which also may be related to reduce CSF pressure [18]. It has been speculated that the dura mater of the elderly is less stretchable [2]. Therefore, age could be a confounding factor in the current research. However, with stratified analysis according to age, there were still statistical significant differences between patients in the two studied groups. This means that conservative intervention measures were successful in reducing the duration of PDPH regardless of patient's age.

Female sex is a debatable risk factor for PDPH [19] with some studies reporting a twofold risk among women and others denying any gender difference. Nonetheless, in the present research, the difference between patients in the study and control groups regarding the duration of PDPH remained in stratified analysis according to sex, which obviates any confounding effect of sex in the intervention study results. This adds a further confirmation of the effectiveness of the conservative nursing measures in reducing the duration of PDPH.

Another possible confounding factor taken into account in the present study is the history of chronic or recurrent tension headache, which has been claimed to be a risk factor for development of future tension headaches [16,19]. According to the current study, the duration of PDPH was longer among patients with a past history of recurrent tension headache, and past history of abdominal surgery. Meanwhile, with stratified analysis according to history of tension headache, there were still statistically significant differences between patients in the study and control groups. This point to success of the intervention measures irrespective of past history of tension headache.

Conclusion and Recommendations

In conclusion, a large percentage of the patients undergoing lower abdominal surgery under spinal anesthesia had post-dural puncture tension headache. The structured nursing measures before and after the procedure was successful in decreasing the incidence and duration of this tension headache and its associated symptoms. Therefore, it is recommended to generalize these structured nursing measures in hospitals to be included in the routine pre-operative and post-operative nursing care for patients undergoing lower abdominal surgery with spinal anesthesia. It is also important to be included in the curriculum of the faculty of nursing. This would decrease the incidence of complications, and reduce hospital length of stay. More research is needed to investigate the effectiveness of these measures in other types of surgery using spinal anesthesia.

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