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Effects of Patient Educational Programs on the Headache Caused by Spinal Anesthesia

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Abstract

Background: Headache is the most common complication caused by spinal anesthesia. Systematic educational programs about conservative treatments could be effective in the reduction of headache after spinal anesthesia.

Aim: This study aimed to evaluate the effects of training programs on the headache of patients after spinal anesthesia.

Method: This empirical study was conducted on 120 patients within the age range of 16-40 years who were candidates for general, orthopedic and urology surgeries in Dr. Shahidzadeh Hospital of Behbahan, Iran in 2015. Patients were randomly divided into two groups of intervention and control. Scheduled training was provided for the intervention group, and the control group received routine training. Intensity of headache was recorded using the visual analogue scale (VAS). Data analysis was performed in SPSS V.14 using Chi-square and independent T-test.

Results: In this study, Chi-square test showed a statistically significant difference between the groups in terms of incidence and time of occurrence of headaches. In total, eight patients (25.8%) in the intervention group and 23 patients (74.2%) in the control group had headaches ($P=0.001$). In the first 48 hours after anesthesia, all patients in the intervention group and 11 patients (47.8%) in the control group had headaches ($P=0.03$). Moreover, independent T-test revealed a significant difference between the mean of pain intensity in patients of the intervention (5.0 ± 1.8) and control groups (7.1 ± 2.1) ($P=0.01$).

Implications for Practice: According to the results of this study, systematic education of patients could effectively reduce the occurrence and intensity of headaches after spinal anesthesia. Therefore, it is recommended that patient training be included in the preoperative preparation program in order to prevent headaches after surgery.

Keywords: Headache, Patient education, Spinal anesthesia

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Introduction

Spinal anesthesia is performed for thoracic surgeries (T₄) in general operations, gynecology, orthopedics and urology (1-3). This method is associated with numerous benefits, such as patient convenience, reduced side effects of general anesthesia, shorter length of hospital stay, and postoperative pain control (4, 5). Despite various merits, spinal anesthesia is associated with complications such as nausea, vomiting, double vision, photophobia, neck pain, and headaches (6-8). Intense pain is one of the most common complications caused by spinal anesthesia (9).

Previous studies have presented variable results regarding the prevalence of headaches after spinal anesthesia. In a study by Singh et al. (2010), the prevalence of headache after spinal anesthesia was reported to be 25%, while Tinca et al. estimated this rate at 42.8% (10, 11). In another study, Deo (2013) reported the prevalence of postoperative headaches to be 0.1-36% (12), and this rate was estimated at 1-40% in a study by Najafi et al. (2014) (13). In 2012, Zeger et al. quoted from Sam that the prevalence of postoperative headaches is approximately 30% (14).

Possibility of postoperative headaches depends on several factors, including the age, gender, diameter of the needle, pregnancy, body mass index (BMI), history of headaches, and experience level of the anesthesiologist. Headaches are known to be more prevalent among young adults and women (especially pregnant women) (15-17). According to the literature, pain intensity is lower with the use of spinal cone-shaped and Sprotte and Whitacre needles, and it increases with the use of sharp-edged Quincke needles.

If the cross section of the needle tip is placed parallel (longitudinal) to the fibres of the dural mater, headache is less likely to occur. On the other hand, increased number of punctures in the dural mater is associated with higher intensity of headache (18, 19). This type of headache is described as an intense, indistinct and pulsating pain mostly affecting the back and front of the head. The headache has a higher intensity in standing and sitting positions and it is slightly relieved while lying on the back. In addition, it might be accompanied with nausea, vomiting and visual disturbances (14, 20).

Dural tear leading to the discharge of the cerebrospinal fluid (CSF) is considered as the main cause of headache. This process reduces the volume of CSF, which stretches pain-sensitive brain structures downwards, giving rise to intense headaches. Another hypothesis regarding the occurrence of headaches proposes that reduced volume of CSF leads to the activation of adenosine receptors and cerebrovascular dilation, eventually stimulating the pain sensors in brain structures (2, 21, and 22).

Use of atraumatic types of needle (slightly sharp edges) with small diameters and adequate experience level of the anesthesiologist could contribute to the reduction of headaches after anesthesia.

Although drugs such as gabapentin, sumatriptan, cosyntropin, theophylline, aminophylline, ondansetron and hydrocortisone cannot decrease the intensity of headache, they are able to shorten the duration of pain (23, 24). Some of these medications have been associated with side effects such as increased blood glucose, increased or decreased heart rate, reduced blood pressure, seizure and distraction, nausea and vomiting (17, 23, and 25).

One of the invasive approaches for the treatment of postoperative headache is the use of epidural blood patch (EBP) (injection of 20-30 cc of the patient's blood into the epidural space). This method has been shown to cure headaches in more than 90% of the cases (3, 7, 26). However, EBP is associated with complications such as infection, random dural tear, refusal of the patient, and hematoma (2, 27, 28).

Random dural tear may increase the intensity of headache. In this regard, non-medicinal approaches are preferred since they are cost-efficient, non-invasive and associated with few side effects (29). The headache caused by spinal anesthesia could be diminished by sufficient bed rest, use of oral or intravenous fluids and other common conservative treatments (3, 12, 30). Some studies have focused on the pivotal role of bed stay and extra fluid intake in the treatment of headaches after spinal anesthesia (31).

In 2006, Ahmed quoted from Trenbal that in order to cure headaches after spinal anesthesia, patients should lie down in the supine position and drink lots of fluids during recovery. This could effectively control the symptoms of headache in mild cases (31). In 2013, Deo determined four main steps for the treatment of headache after spinal anesthesia, and the first stage involved the use of conservative approaches (e.g., bed rest and fluid intake) (12).

In one research, Lavi (2010) claimed that to reduce and cure headaches after spinal anesthesia, conservative approaches, including bed rest and fluid intake, should be used. In case the headache is

severe and disabling and does not respond to supportive treatments, EBP should be considered at least 24-48 hours after spinal anesthesia (32). Previous studies have confirmed the higher efficacy of conservative methods compared to invasive approaches in the treatment of headaches. If the patient adheres to the conservative approach, the intensity of headache is likely to decrease significantly (3, 12, and 27).

On the other hand, some studies have indicated that conservative methods have no specific effect on the severity of headaches after spinal anesthesia (9, 21, 32). For instance, in a review article by Shah and Thomas (2007), use of needles with small diameters through parallel insertion into the dura mater fibers was recommended to reduce the risk of headaches after spinal anesthesia. According to the other findings, supportive and conservative treatment methods could only be effective in cases with mild headache (33).

In another review study in 2013, Nguyen and Walter stated that despite the lack of evidence, most traditional treatments, such as bed rest and high fluid intake, are commonly used for curing headaches (9). In another review by Sudlow and Warlow (2013), no reliable evidence was found in randomized clinical trials to confirm the efficacy of common bed rest after dural tear. Moreover, the exact role of fluid intake therapy in the prevention of headaches after dural tear remains unclear (34).

In another review article in 2012, Ghaleb et al. claimed that although bed rest could prevent the escalation of headache, it cannot prevent the occurrence. Furthermore, they reported that fluid therapy exerted no protective effects against headaches; nevertheless, dehydration was noted as a significant issue to be prevented in patients (20). While some studies have confirmed the positive impact of conservative approaches (e.g., bed rest, fluid therapy) on curing headaches, the mechanism of these effects remains unclear in the viewpoint of some medical researchers.

Conservative treatment methods could be executed through educating of the patients. Education is a non-invasive approach with the least amount of complications. Patients could receive training on all the aspects of conservative treatment methods. Previous studies have indicated that patient education could be considered as a medical procedure for the reduction and control of migraine and tension-type headaches (35, 36).

In 2009, Sadoughi et al. reported that progressive relaxation training decreased chronic tension-type headaches. They concluded that in general, management of headache with regular home practice could reduce the length and severity of pain (35).

In another research, Omatreza et al. (2014) suggested that education programs based on Orem's self-care framework for patients diagnosed with migraine increased the average health care performance in mental and physical aspects, leading to an overall improvement in the quality of life of the patients (36). Patient education consists of an active interaction between the instructor and patient, and if the educational content is useful, it is accepted by the patient to accelerate the treatment procedure (35-37).

Patient education is an easy, inexpensive approach with no complications, and at the moment, no scheduled training is provided for patients affected by headache after spinal anesthesia. This study aimed to evaluate the effects of patient educational programs on the occurrence, time and intensity of headaches after spinal anesthesia.

Methods

This empirical study was conducted on patients referred to the surgery department of Dr. Shahidzadeh Hospital in Behbahan, Iran in 2015. Patients selectively underwent orthopaedic, urology and general surgeries with spinal anesthesia. In total, 120 patients were enrolled in the study, and the minimum sample size of each group was determined at 60 patients based on the confidence interval of 95%, test power of 80%, and prevalence rate of headaches induced by spinal anesthesia as reported by previous studies (38).

Inclusion criteria of the study were as follows: 1) age of 16-40 years; 2) elective surgery; 3) absence of distinct mental disorders; 4) no addiction; 5) no history of migraine or other types of headache; 6) lack of conditions forbidding spinal anesthesia; 7) consent for receiving spinal anesthesia; 8) having the first or second classification of the American Society of Anesthesiologists (ASA) and 9) having indications to receive spinal anesthesia. Patients with early discharge were excluded from the study.

Initially, patients were selected via available sampling based on the inclusion criteria of the study. Afterwards, they were randomly divided into two groups of intervention and control by coin flip; if

one patient was placed in the intervention group, the next patient would be allocated to the control group. In total, 60 patients were allocated to each of the study groups.

To evaluate headaches, the visual analogue scale (VAS) was used. VAS is one of the most accepted scales for pain measurement and has been frequently used in various domestic and foreign studies. In this scale, the intensity of pain is rated by the patient within a score range of 0-10. Based on this scale, pain intensity has several levels, the most common of which are mild (scores 1-4), moderate (scores 5-6) and severe pain (scores 7-10) (39).

Patients in the intervention group received training with the educational content emphasizing on two aspects of bed rest and sufficient fluid intake. With respect to bed rest, patients were instructed to rest after regaining the sensory function in their legs within the first 24 hours after the surgery. For resting, the patients would lie on their back with the bed head lowered, and following that, they were asked to keep their head down, stay in the bed, and avoid using pillows. In case the patients needed to urinate or defecate, they were asked to use special bedpans.

As for fluid intake, the patients were required to drink 3-4 litres of water daily (one glass per hour, 200 cc) (23). Patients in the control group received no training, and if the patient or family members had a question about the headache, the nursing staff would provide them with clear, brief replies.

In the intervention group, theoretical and practical education was provided at the surgery department by experienced nurses in a face-to-face manner in three main stages, as follows: 1) at the surgery department (immediately after the preparation of patient files or one hour before patient transfer to the operation room); 2) in the waiting room of the surgery department (immediately before patient transfer to the operation room) and 3) at the surgery department (immediately after the surgery). Educational programs before surgery were carried out in the morning shift, while the training after surgery was implemented in the morning, evening or night shifts in the presence of one of the family members of the patient.

Depending on the level of consciousness in the patient, each stage of the training program lasted for 20-30 minutes on average. After the training, the patient was asked to repeat the educational content. Moreover, the educational content was provided for the patients in the intervention group in the form of pamphlets. Before inducing spinal anesthesia, patients were fully instructed on the self-report mechanism of VAS to report the intensity of headache.

To induce spinal anesthesia, all the patients were seated on the surgery bed, with their head and back bent over, and their hands placed on the knees. At this stage, the patients were supported by an anesthesiologist assistant. Spinal anesthesia was performed on all the patients by an anesthesiologist with more than 10 years of clinical experience. For all the patients, Quincke needle (No. 25, sharp-edged) was used.

After touching the lumbar spine of the patients and using the line landmark between two iliac spines, the needle was inserted with the median approach between the 3rd and 4th cords or the 4th and 5th cords in the form of cephalad at the angle of 10-15 degrees, so that the cross section of the needle was perpendicular to the longitudinal fibres of the dura mater. After placing the needle in the subarachnoid space and stabilization by aspiration of CSF, all patients were injected with 7.5-15 milligrams of 0.5% bupivacaine (Marcaine) depending on the required level of anesthesia. Also, based on the type of surgery, patients were put into different sleep positions, including supine, prone and lithotomy (lying on the back with open legs).

In addition to cardiac monitoring during the surgery, other parameters such as pulse rate, respiratory rate and blood pressure were monitored using a pulse oximeter device and a sphygmomanometer. Also, 1-3 milligrams of midazolam was intravenously injected to the patients as the tranquilizer.

Occurrence of headaches was followed-up from 12 hours to one week after the spinal anesthesia, and pain intensity was measured using VAS. The first evaluation of headache intensity was performed 12 hours after the spinal anesthesia, and pain intensity was re-examined by VAS every 12 hours during hospitalization. After the discharge of patients, pain intensity was followed-up every day for one week via phone calls with references to the training programs.

Data analysis was performed in SPSS V.18. In order to meet the study objectives and determine the intensity of pain in patients of the intervention and control groups, we used descriptive statistics (mean and standard deviation), and independent T-test was used for the comparison of study groups. In this study, P value of less than 0.05 was considered significant.

Results

In this study, 47 patients in the intervention group (78.3%) and 48 patients (80%) in the control group were male, which encompassed the majority of the participants. Regarding the education status, 32 patients in the intervention group (52.5%) and 29 patients in the control group (47.5%) had high school education, which encompassed the majority of the participants.

According to the results of Chi-square test, there was no significant difference between the participants in terms of gender and education level. Mean age of the patients in the intervention and control groups was 26.13 ± 7.63 and 26.4 ± 5.1 years, respectively. Mean of BMI in the intervention and control groups was 24.4 ± 3.6 and 25.4 ± 3.6 kg/m², respectively. Moreover, duration of surgery was 61.5 ± 13.7 minutes in the intervention group and 62.3 ± 13.0 minutes in the control group.

The results of independent T-test were indicative of no significant difference between the patients in terms of age, BMI and duration of surgery (Table 1). In addition, no significant difference was observed between the study groups in terms of age, gender, education level, BMI, and duration and type of surgery ($P < 0.05$).

Table 1: Comparison of Demographic Characteristics in Intervention and Control Groups

Variables		Intervention Group	Control Group	Test Results
Education Level	High School	32 (52.5%)	29 (47.5%)	*0.46
	Diploma	16 (42.1%)	22 (57.9%)	
	Academic	12 (57.1%)	9 (42.9%)	
Gender	Female	13 (21.7%)	12 (20%)	*0.82
	Male	47 (78.3%)	48 (80%)	
Age (year)		26.1 ± 7.6	26.4 ± 5.1	**0.8
Body Mass Index		24.4 ± 3.6	25.4 ± 3.6	**0.12
Duration of Surgery (minute)		61.5 ± 13.7	62.3 ± 13.0	**0.76

*Chi-square test; **Independent T-test

With respect to the prevalence of headache caused by spinal anesthesia, our findings indicated that eight patients (25.8%) in the intervention group and 23 patients (74.2%) in the control group had headaches after spinal anesthesia. In this regard, the results of Chi-square test showed a significant difference in terms of the occurrence of headaches between the study groups ($P = 0.001$).

All the patients in the intervention group had headaches during the first 48 hours after anesthesia, whereas no headache was reported after 48 hours. In the control group, 11 patients (47.8%) had headaches 48 hours after the surgery ($P = 0.03$). In this regard, a significant difference was observed between the study groups in terms of the time of headache after spinal anesthesia (Table 2).

Table 2: Time of Headache Occurrence after Spinal Anesthesia in Intervention and Control Groups

Group Time Of Headache Occurrence	Intervention Group N (%)	Control Group N (%)	Total N (%)	Chi-square Test Results
24 Hours after Surgery	4 (50)	4 (17.4)	8 (25.8)	P=0.03 X ² =6.62 Df=2
48 Hours after Surgery	4 (50)	8 (34.8)	12 (38.7)	
More than 48 Hours after Surgery	0 (0)	11 (47.8)	11 (35.5)	
Total	8 (100)	23 (100)	31 (100)	

According to the results of this study, the intensity of pain was different in patients of the intervention and control groups. As such, mean of pain intensity was 5 ± 1.85 in the intervention group and 7.13 ± 2.13 in the control group. In this regard, the results of independent T-test were indicative of a significant difference between the study groups ($t = -2.5$, $P = 0.01$) (Table 3).

Table 3: Mean of Pain Intensity in Intervention and Control Groups

	Group		Independent T-test Results
	Intervention	Control	
Pain Intensity (Mean \pm SD)	5.0 ± 1.8	7.1 ± 2.1	P=0.01 t=-2.5

Discussion

According to the findings of the present study, incidence rate of headaches due to spinal anesthesia was lower in the intervention group compared to the control group, and a significant difference was observed between the study groups in this regard. Moreover, pain intensity was lower in the

intervention group compared to the control group, which confirms the positive effect of scheduled education program on the reduction of headache after spinal anesthesia.

In most of the cases, headaches occurred during the first 48 hours after spinal anesthesia. This could be due to the fact that during the first 24 hours after spinal anesthesia, the patient is mostly resting, and meanwhile, CSF is gradually discharged from the dural punctures. With increased amount of CSF, headache is likely to occur within 48 hours after the surgery.

In the studies by Shah & Thomas (2007) and Nguyen & Walter (2014), the interval for the occurrence of headache after spinal anesthesia was reported to be 48 hours, which is in line with the results of the present study (9, 33). Review of the literature in Cochrane database (Sudlow & Warlow (2013), Dodge et al. (2013) quoting from Dejernes & Vankvt (2005) confirmed this time interval for the incidence of headaches after spinal anesthesia (19, 34).

On the other hand, other studies have reported different time intervals for the incidence of postoperative headache. For instance, headaches occurred within the first 72 hours after surgery in the studies by Zeger (2012) and Turnbull (2003) (14, 40), while Barbosa (2011) and Ghaleb (2012) reported the incidence of headaches during the first seven days after surgery (20, 30). In another research by Najafi et al. (2014), this time interval was reported to be five days after dural puncture (13).

In the current study, the prevalence of headaches caused by spinal anesthesia was 25.8% in both groups, while this rate has been reported differently in previous studies. In the earliest studies in this regard, Shepherd and Turnbull (2003) quoted from Wyer (1898) that the prevalence of headache was as much as 66% (40), and the significant difference of this finding with the results of our study could be due to the use of needles with larger diameters for spinal anesthesia in the study by Shepherd and Turnbull. In the current study, we used a Quincke needle (No. 25).

In another research by Baig (2014), the prevalence of postoperative headache was estimated at 21.7% (1), while Mahajan & Sharma (2002) reported this rate to be 24% (41). Also, the results obtained by Dodge et al. (2013) reported the prevalence of postoperative headache to be 25.5% (19), while this rate was estimated at 25% in the study by Geurts et al. (1990) (42).

Similarities between the findings of the aforementioned studies and the present research could be due to the use of needles with equal diameters (Quincke, No. 25) for spinal anesthesia. Furthermore, the patients in the aforementioned studies and our research were almost within the same age range.

According to our findings, incidence of headache during the first 24-48 hours after spinal anesthesia had a significant difference between the study groups. After 48 hours, no headaches were reported in patients of the intervention group, which denotes the effectiveness of the education program in the reduction of the headache caused by spinal anesthesia.

Adequate fluid intake (e.g., water) increases the production of the CSF, and sufficient bed rest could prevent the discharge of this fluid from the punctured dura. As a result, it compensates for the diminished pressure of the CSF caused by spinal anesthesia, leading to the reduced intensity of the headache.

According to the results of the present study, conservative treatments, such as adequate bed rest and fluid intake, could effectively reduce the occurrence and intensity of headache after spinal anesthesia. This finding is consistent with the results obtained by different studies in this regard (3, 10, 12).

On the other hand, some researchers have reported conservative approaches to have no significant effect on the occurrence and intensity of headache after spinal anesthesia (38, 43, 44). Recent experiments in this regard mostly consist of clinical trials, empirical studies with pretest-posttest designs, and review articles.

Insignificant effect of conservative approaches on the incidence and intensity of headache as reported by previous studies could be due to the fact that the patients were not recommended for sufficient bed rest and simultaneous fluid intake. In the current study, the patients were asked to stay in bed for at least 24 hours after surgery, in addition to adequate intake of water and other fluids.

It is also noteworthy that the diameter of the needle used for spinal anesthesia significantly affects the occurrence and intensity of postoperative headaches. In the aforementioned studies, the needles used for spinal anesthesia were larger compared to our research.

In the review of literature, no domestic or foreign studies were found regarding the effect of patient education programs on the reduction or control of headaches after spinal anesthesia. Therefore, we

evaluated a number of studies focusing on the effects of patient education on the reduction of migraine and tension-type headaches.

In one research, Abdi et al. (2014) reported that high-intensity aerobic exercise for eight consecutive weeks could reduce different indices of migraine headaches (e.g., frequency of attacks, intensity and duration of headaches). Therefore, this type of training was recommended as a non-medicinal approach for the treatment of patients with migraine (45).

In this regard, Sadoughi et al. (2005) reported that progressive relaxation training could effectively decrease chronic tension-type headaches. In general, it was claimed that management of headache could effectively diminish the duration and intensity of pain (35). Moreover, the findings of Saedi et al. (2010) indicated that guided imagery visualization and progressive relaxation training were effective in the reduction of migraine headaches and the associated disabilities (46).

In the current study, attendants of the patients were also reminded that if implemented correctly, the education program could in fact decrease the occurrence and intensity of headaches after spinal anesthesia. Participation and support of family members probably played a pivotal role in the successful outcome of the education program in our study.

Implications for Practice

According to the results of this study, systematic educational programs focusing on conservative methods of treatment (bed rest and sufficient fluid intake during 24 hours postoperatively) could effectively reduce the occurrence and intensity of headaches induced by spinal anesthesia. Therefore, it is recommended that scheduled patient training be included in preoperative preparation programs in order to prevent headaches. In conclusion, it is suggested that the effect of systematic educational programs on the reduction of the occurrence and intensity of headaches be evaluated in patients within other age groups.

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Conflict of interest

The authors declare that there is no conflict of interest.

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