Effect of Benson Relaxation on the Intensity of Spinal Anesthesia–Induced Pain After Elective General and Urologic Surgery

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Purpose: *The present study aimed to evaluate the effect of Benson's muscle relaxation on postoperative spinal anesthesia–induced pain.*
Design: *Randomized clinical trial.*
Methods: *Sixty-four patients were randomly assigned to intervention and control groups. Benson's muscle relaxation was performed on the intervention group for 10 to 20 minutes based on the patients' tolerance. Before and after the intervention, the two groups were assessed using the visual analog scale and compared. SPSS version 23 was used to analyze data.*
Findings: *The mean pain score in the control group before and after the intervention was 5.34 and 5.62, respectively (P < .003), and in the intervention group, 5.28 and 4.03, respectively (P < .001).*
Conclusion: *Benson's relaxation technique effectively influenced the intensity of postoperative spinal anesthesia–induced pain. Therefore, it can be used by nurses as a safe, simple, and inexpensive nonmedicinal treatment method to relieve spinal anesthesia–induced pain.*

Keywords: *pain, spinal anesthesia, Benson's relaxation.*
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SPINAL AND EPIDURAL ANESTHESIA, as a branch of regional or conductive anesthesia, are collectively referred to as the neuraxial block. In addition to their widespread use in the operating room as an anesthetic method and a complement for general anesthesia, neuraxial anesthesia is also used for the management of obstetric diseases and control of postoperative pain.[1-3] Spinal anesthesia blocks the sympathetic, sensory, and motor nerve conduction. Injection of the spinal anesthesia solution into the subarachnoid space blocks nerve conduction in small unmyelinated fibers (sympathetic) before conduction of large myelinated fibers (sensory and motor).[4] This method, though good, is not free of adverse effects. Side effects associated with spinal anesthesia can usually be predicted from the physiological effects of the block. Side effects associated with

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spinal anesthesia include numbness, hypotension, bradycardia, asystole, headache after dura rupture, and low back pain.[5]

Pain is a common phenomenon after all surgical procedures. Because of the stretching of the ligaments and the use of multiple needles to determine the correct location, spinal anesthesia is one of the main causes of acute pain after surgery; thus, one of the complaints of patients undergoing surgery by spinal anesthesia is pain in the anesthetized area. This pain starts in the lumbar region 1.5-2 hours after surgery. According to some studies, pain in the anesthetized area is the worst pain that patients experience in disease and surgery.[6] Unrelieved acute pain can lead to more adverse effects such as cardiac, respiratory (loss of lung functional capacity, no effective cough), digestive system (constipation, frequent nausea and vomiting), and urinary (retention) complications; deep vein thrombosis due to immobility; psychological complications such as anger, anxiety, and fear; skin complications (bed sores); and prolonged hospitalization. Most importantly, the inability of nurses to relive pain leads to the loss of patients' confidence in nurses.[7]

Pain can be relieved through medical and nonmedical approaches. Administration of analgesics is a nursing practice that can significantly improve patient care through the use of opiates, nonopiates, and nonsteroidal anti-inflammatory drugs.[8,9] Although drug therapy is the most powerful tool available, studies show that 9% to 15% of medications are associated with medication reactions, and 2.5% of hospital admissions are due to medication side effects.[10]

Mental distraction, music, hypnosis, therapeutic touch, warm and cold therapy, massage, and transcutaneous electrical nerve stimulation are among the nonmedicinal interventions commonly used to improve patients' physical and mental comfort.[11] Complementary therapies for pain control, including aromatherapy, herbal medicine, homeopathy, reflexology, and muscle relaxation, can help relieve pain with minimum risk for patients.[12] Relaxation aims to reduce anxiety, decrease muscle and bone tension, and indirectly relieve pain and reduce tension related to the body's physiological status.[12-14]

Benson's relaxation technique is known for decreasing the pain, stress, and anxiety or for increasing sleep quality.[13] Benson's relaxation is one of the best muscular relaxation techniques that is effective on the pulse rate, respiratory function, and heart workload.[15] Benson's technique works by the alignment of the hypothalamus and decreasing the sympathetic and parasympathetic stimuli.[16]

Several studies showed that relaxation is effective in reducing pain. Benson's relaxation technique is simple, easy to learn and implement, and does not require high cost.[17] Benson's muscle relaxation, as a nonmedicinal complementary method for pain control, can reduce or eliminate spinal anesthesia–induced pain by adjusting the perceived pain.[13] Relaxation can also decrease heart rate, respiration, and blood pressure.[14]

Therefore, the present study aimed to compare the effectiveness of Benson's relaxation method for decreasing the pain score of patients undergoing urologic and general surgery against a control group in a randomized clinical trial.

Methodology

Study Design

In a randomized controlled clinical trial and after obtaining approval from hospital authorities, patients were selected by using the convenience sampling from the candidates of urologic and general elective surgeries. The setting was surgical wards of the general tertiary hospital in Kermanshah, Iran. Inclusion criteria were as follows: (1) patients selected for spinal anesthesia, (2) patients aged between 18 and 60 years, (3) patients with the ability to read and write, (4) patients having pain in the anesthetized area, (5) patients lacking neuropsychiatric disorders, (6) patients not using sedative medication, (7) nondrug users, (8) patients with a lack of mental and behavioral disorders.

In the intervention and control groups, the cases were matched based on the type of surgery and surgical duration. For example, during the evaluation of the intervention and control groups, two cholecystectomy patients were selected with almost same conditions.

The research objectives were explained to participants, and written consent obtained. Patients were randomly allocated to the intervention and control groups. A demographic questionnaire was completed, and an audio CD about training of relaxation was given to the intervention group along with an educational brochure. Patients were asked to practice relaxation until the day of surgery by using audio files and educational brochures. Before the intervention, participants were trained how to use a visual analog scale (VAS) ranging from 0 to 10. At that time, the researcher followed up the patients via telephone.

On the day of surgery, the patients in the intervention group practiced Benson relaxation technique in a quiet and private environment in the ward under the supervision of a researcher (first author) and then the patient transferred to the operation room. After surgery, regaining patient's consciousness was assessed by the first author. This assessment included assessment of reversing of sense of ending by using the needle and also the muscle tone of the abdominal and lower limbs. Then, the pain level was assessed by the researcher in the PACU. The patient's pain just at injection site for spinal anesthesia was evaluated by VAS, and the blood pressure and pulse rate were measured. The relaxation method was then used: patients in the intervention group were asked to lie down in a comfortable position, close his/her eyes, relax all muscles deeply, starting from the feet to the face while breathing by nose, be aware of breathing, pay attention to breathing and easily exhale with the lips while saying the word 'one' repeatedly, and breathe normally. This procedure was repeated 10 to 20 minutes based on patient's tolerance. After the intervention period, the patient was asked to change his position. At this time, the researcher evaluated the rate of pain using the VAS again and also measured the blood pressure and pulse rate.

The amount of anesthetic agent used and the conditions of doing it were the same in both the groups. In this case, the anesthesiologist considered the amount of anesthetic agent based on expected surgical incision and surgery duration. The anesthesiologist attempted to inject the prescribed amount of anesthetic into the spinal field. The researcher matched the intervention and control groups based on anesthetizing and surgical conditions. For example, if a patient in the intervention group had varicocele surgery with a 10-cm incision, the control sample was also selected with a similar condition.

In the control group, after patient's consciousness was regained, pain was evaluated, and they were exposed only to regular routine medical care. After 20 minutes, the pain was evaluated again.

Sampling

Samples were selected by convenience sampling. To prevent bias before intervention, subjects were randomly allocated to the intervention and control groups. To this end, a simple randomization method was used for random allocation (allocation concealment); thus, 64 similar cards were prepared and equally marked as 1 for the intervention or "Benson's relaxation group" (n = 32), and 2 for the control or "routine measures" group (n = 32). The patients fulfilling the inclusion criteria randomly chose a card and were enrolled in a group according to the code on the card (it is noteworthy that patients were unaware of the code meaning).

Data-Collection Tool

Data on the type of surgery and patients' weight and hemodynamic data were collected using a demographic data-collection form. The demographic questionnaire included age, gender, marital status, education, weight, height, and occupation. Pain was assessed using the VAS. The VAS consists of a straight line with the endpoints defining extreme limits such as "no pain at all" and "pain as bad as it." The patient was asked to mark his/her pain level on the line between the two endpoints.[18] The distance between "no pain at all" and the mark then defines the subject's pain. The VAS is a globally used, reliable tool for pain assessment with a high reliability and concurrent validity ($r > 0.8$; $P < .01$).[19] In this study, a score of 0 and 10 was, respectively, assigned to "no pain" and "the most intensive pain."

Data Analysis

Data were summarized through descriptive statistics as tables and mean and standard deviation. Fisher's exact and χ^2 tests were used to analyze

demographic data. Kolmogorov-Smirnov z test was performed to assess distribution normality. Mann-Whitney and Wilcoxon tests were used because of nonnormal distribution of data. The Statistical Package for Social Sciences version 23 (SPSS Inc, Chicago, Illinois) was used to analyze data.

Ethical Considerations

This study was approved by the Ethics Committee of the Kermanshah University of Medical Sciences with the code IR.KUMS.REC.1397.126 on 2018.05.22. This clinical trial was registered on the Iranian Registry of Clinical Trials (IRCT) site (www.irct.ir) and received the confirmation code IRCT20130603013568N6 on 2018.06.22. The introduction letter of the Research and Technology Deputy of the Kermanshah University of Medical Sciences was presented to the hospital for permission to collect data. The research objectives were explained to the participants, and a written consent was obtained. The confidentiality of the participants' information was ensured.

Results

In this study, 64 patients underwent surgery and were enrolled in intervention and control groups. Of these, 85.9% were male, 70.3% were married, 62.5% had a bachelor's degree, and 59.4% had an individualized job. Fisher's exact test was used to match the demographic characteristics including gender, χ^2 tests to match education and occupation, and the Yates correction test to match the marital status. The results indicated that the variables were matched in both the intervention and control groups ($P < .05$) (Table 1). In addition, the mean age of the patients was 38.20 ± 12.26 years, in the range of 19 to 60 years. The mean body mass index was 24.69 ± 4.38, ranging from 16.51 to 35.20. Based on the results of the Kolmogorov-Smirnov test, the age and body mass index of the patients showed a normal distribution in both the intervention and control groups.

The mean pain score in the intervention and control groups was 5.28 and 5.34 (Table 2), respectively, before the intervention. There was no significant difference in the mean pain score between the groups before the intervention according to the Mann-Whitney test ($P= .944$).

The findings also showed that the mean pain score in the intervention and control groups was 4.03 and 5.62, respectively, after the intervention. The Mann-Whitney test revealed a significant difference at a confidence level of 95% ($P = .001$).

The mean systolic blood pressure in the intervention and control groups was 120.59 and 118.81, respectively, before the intervention, indicating no significant difference according to Mann-Whitney test ($P = .067$). The mean systolic blood pressure after the intervention was 117.34 and 116.17, respectively, in the intervention and control groups, showing no significant difference according to Mann-Whitney test at a confidence level of 95% ($P = .219$) (Table 3).

The mean diastolic blood pressure before the intervention was 77.18 and 76.40 in the intervention and control groups, respectively, with no significant difference according to Mann-Whitney test ($P = .425$). The results also showed that the mean diastolic blood pressure after the intervention was 74.37 in the intervention group and 75.62 in the control group, with no significant difference according to Mann-Whitney test ($P = .384$) (Table 4).

The heart rate before the intervention was 70.06 and 77.82, in the intervention and control groups respectively, indicating a lack of a significant difference between the two groups according to the Mann-Whitney test ($P = .264$). Heart rate after the intervention was 74.40 and 75.46, respectively, in the intervention and control groups showing no significant difference according to the Mann-Whitney test ($P= .218$) (Table 5).

Discussion

Results support that Benson's muscle relaxation technique can reduce the severity of postoperative spinal anesthesia–induced pain. Relaxation is a very effective therapeutic strategy for painful and stressful situations and one of the most widely used methods for pain reduction. Relaxation affects the release of endorphins by decreasing the oxygen content of tissues and the level of chemicals such as lactic acid and eliminating musculoskeletal stress and anxiety. Evidence supports

Table 1. Demographic Characteristics of Patients in the Intervention and Control Groups

Variables	Intervention		Control		χ^2 Statistic	P Value
	Frequency	%	Frequency	%		
Gender						
Male	28	87.5	27	84.4	0.129	.005*
Female	4	12.5	5	15.6		
Job						
Free job	20	62.5	18	56.3	0.263	.877**
Employee	5	15.6	6	18.8		
Others	7	21.9	8	25		
Education level						
Secondary	19	59.4	21	65.6	0.268	.875***
Diploma	7	21.9	6	18.8		
Higher education	6	18.8	5	15.6		
Marital status						
Single	8	25	11	34.4	0.674	.412***
Married	24	75	21	65.6		

*Fisher's exact test.
**χ^2 Test.
***Yates correction test.

that relaxation leads to physical relaxation and hence mental relaxation, increases in concentration, and stability of emotions and thoughts; introspection; self-purification; self-esteem; and thereby, fear reduction.[20]

Furthermore, some relaxation-associated chemical changes in the blood, such as reduced levels of adrenal hormones, lactate, and cholesterol, can cause anxiety and pain and affect the patients' hemodynamic status.[21] Relaxation reduces concern and pain by creating self-esteem and self-control and is an active strategy that generally works. Benson's

relaxation impacts sympathetic activity through increased parasympathetic activity and creates a balance between the posterior and anterior hypothalamus.[22] Increased adaptive power to cope with anxiety, supplying energy, deep sleep, and reducing fatigue, muscle strain–induced pain, and pain-induced anxiety are among the advantages of relaxation.

Relaxation decreases heart rate, respiration rate, and blood pressure. It can also reduce mild to moderate pain and is an effective way to reduce severe pain associated with drug use.[23] Various studies

Table 2. Mean Pain Score of Patients in the Intervention and Control Groups Before and After the Intervention

Variable/Group	Intervention Mean ± SD	Control Mean ± SD	Statistical Index
Pain intensity			
Before	5.28 ± 1.05	5.34 ± 1.12	P value = .944 Mann-Whitney U = −0.070
After	4.03 ± 1.23	5.62 ± 1.15	P value = .001 Mann-Whitney U = −4.508
Statistical index	P value = .001 Wilcoxon = −4.247	P value = .003 Wilcoxon = −3.000	

SD, standard deviation.

Table 3. Mean Systolic Blood Pressure of Patients in the Intervention and Control Groups Before and After Intervention

Variable/Group	Intervention Mean ± SD	Control Mean ± SD	Statistical Index
Systolic blood pressure			
Before	120.59 ± 8.32	118.81 ± 9.50	P value = .067 Mann-Whitney U = −1.833
After	117.34 ± 6.69	116.17 ± 8.89	P value = .219 Mann-Whitney U = −1.230
Statistical index	P value = .001 Wilcoxon = −3.911	P value = .083 Wilcoxon = −1.732	

SD, standard deviation.

Table 4. Mean Diastolic Blood Pressure of Patients in the Intervention and Control Groups Before and After the Intervention

Variable/Group	Intervention Mean ± SD	Control Mean ± SD	Statistical Index
Diastolic blood pressure			
Before	77.18 ± 8.12	76.40 ± 7.84	P value = .425 Mann-Whitney U = −0.798
After	74.37 ± 6.69	75.62 ± 7.09	P value = .384 Mann-Whitney U = −0.871
Statistical index	P value = .007 Wilcoxon = −2.714	P value = .317 Wilcoxon = −1.000	

SD, standard deviation.

Table 5. Mean Heart Rate of Patients in the Intervention and Control Groups Before and After the Intervention

Variable/Group	Intervention Mean ± SD	Control Mean ± SD	Statistical Index
Heart rate			
Before	79.06 ± 9.36	77.82 ± 9.06	P value = .264 Mann-Whitney U = −1.118
After	74.40 ± 7.91	75.46 ± 8.20	P value = .218 Mann-Whitney U = −1.231
Statistical index	P value = .001 Wilcoxon = −4.481	P value = .564 Wilcoxon = −0.577	

SD, standard deviation.

have been carried out on the effect of Benson's muscle relaxation on pain intensity. In a study on the effect of Benson's relaxation on laminectomy pain in patients admitted to AJA hospitals, Momen et al investigated the effects of interventions such as relaxation.[24] They found that relaxation is useful in reducing mild to moderate pain and is an effective solution for reducing severe pain associated with drug use. They also claimed that relaxation leads to anxiety reduction, energy supply, muscle strain–induced pain relief, anxiety-induced pain reduction, and deep sleep ease.[24]

The present study aimed at investigating the effect of relaxation on the severity of postoperative spinal anesthesia–induced pain. No significant difference was found between the intervention and control groups in terms of the frequency distribution of demographic characteristics, and thus, the groups were matched. The systolic and diastolic blood pressure and pulse rate were not statistically different in both intervention and control groups. These variables showed an abnormal distribution and were decreased significantly after performing Benson's relaxation in the intervention group. However, no significant difference was found in these variables in the control group before and after Benson's relaxation.

Study results showed a significant difference in the pain intensity in the intervention group before and after Benson's muscle relaxation; thus, the mean pain intensity in the intervention group was 5.28 and 4.03, respectively, before and after relaxation. In a study on the effect of Benson's relaxation on the open heart surgery–induced pain, Feyzi et al found a lower intensity postoperative pain after intervention in the Benson's relaxation group.[14] These results are consistent with those obtained in this study.

Mokhtari Nori et al[25] investigated the effect of Benson's relaxation and reflexology on foot pain regardless of analgesic consumption. Their results showed that pain was increased in the control group compared with that in the intervention group,[25] which is in good agreement with our results. For comparison of pain intensity in the intervention and control groups after Benson's relaxation, the results showed that pain intensity in the intervention and control groups was 4.03 and 5.62, respectively, after Benson's muscle relaxation, indicating a significant difference.

Hattan et al studied the effect of foot massage on heart surgery pain. They found that this method had no significant effect on physiological variables, and hence, no significant difference was observed between the control and intervention groups in terms of the mean pain.[26] The results of this research are not consistent with our results. As massage was the method used in this study, it cannot be ruled out or confirmed by another complementary therapy. Some studies showed even the smallest effects of relaxation on pain relief.[26]

In a study conducted in the Gonabad University of Medical Sciences, Baloochi et al investigated the effect of muscle relaxation therapy on hemodialysis pain.[27] Results of this clinical trial of 84 patients on hemodialysis showed that Benson's relaxation technique reduced pain; the pain level of patients in the control group, assessed with the McGill pain questionnaire, was 11-25 and 9-33, respectively, before and after the intervention. On the other hand, the pain severity in the intervention group was 9-33 and 6-27, respectively, before and after the intervention, indicating a significant decrease in pain intensity in the intervention group. This is consistent with our results.

In general, Benson's relaxation technique positively affects the intensity of spinal anesthesia–induced pain. As a nonmedicinal, complementary method, muscle relaxation is inexpensive, simple, devoid of adverse effects, and, most importantly, practical and applicable at any location and time. This method can be suggested as a nonmedicinal approach along with other methods. By implementing complementary therapies for pain reduction, the amount of medication consumption, which is associated with increased costs and side effects for patients and hospitals, can be decreased. The results of this study may be useful for nursing students in increasing their knowledge of complementary nonmedicinal methods. Emphasizing the importance of such studies is an effective step toward applying these methods.

Despite advantages of Benson's muscle relaxation, other medicinal and nonmedicinal treatment cannot be ignored, but the Benson technique can be suggested as a method along with other therapies for pain reduction. Benson's relaxation technique is inexpensive, free of side effects, and can be implemented by the nursing team. Although medicinal treatments can reduce patients' pain faster, complementary therapies such as Benson's smooth muscle relaxation are free of adverse effects, and self-care and self-management can be improved by educating patients properly.

Limitations

Some limitations of this study included different levels of anesthesiologists' skills in the practice of spinal anesthesia, and another problem is that

the anesthesia induction was performed by different anesthesiologists. The percent of males in the study were more than that of females, which may impact generalization of study findings. We recommend, in subsequent studies, that anesthesia be performed by unique, skilled anesthesiologists and with homogenous subjects.

Conclusion

Our hypothesis concerning the effect of Benson's muscle relaxation on pain intensity was confirmed. In other words, Benson's relaxation technique was effective on the postoperative spinal anesthesia–induced pain. Therefore, one can conclude that implementation of Benson's muscle relaxation as a nonmedicinal complementary treatment can be effective in reducing spinal anesthesia–induced pain. Nurses can use this simple inexpensive method to reduce pain in patients with no adverse effects.

Acknowledgment

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