



Research

The Effect of Su Jok on Pain, Anxiety, and Quality of Recovery After Lumbar Disk Surgery: A randomized, controlled study

Niran Coban, PhD, RN^{a,*}, Sonay Goktas, PhD, RN^{b,2}

^a Department of Surgical Nursing, Faculty of Health Sciences, Yalova University, Yalova, Turkey

^b Department of Surgical Nursing, Hamidiye Faculty of Nursing, University of Health Sciences, Istanbul, Turkey



A B S T R A C T

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Purpose: This study aimed to evaluate the effect of Su Jok on pain, anxiety, quality of recovery, and physiological parameters after lumbar disk surgery.

Design: Randomized Controlled study.

Methods: The study was conducted with 60 eligible patients who underwent lumbar disk surgery in the neurosurgery clinic of a training and research hospital in Istanbul between December 2022 and June 2023. Patients in the intervention group ($n = 30$) received Su Jok on postoperative days 0, 1, and 2. Patients in the control group received no intervention other than routine care ($n = 30$). Study data were collected with a descriptive characteristics form, the State Anxiety Inventory, 40-item Quality of Recovery Scale, Visual Analog Scale, short-form McGill Pain Scale, and a physiological parameters form.

Findings: The patients in the study had a mean age of 47.08 ± 9.58 years, 53.3% were male, 38.3% were primary school graduates, and 58.3% were employed. The frequency of chronic disease was 30% in the Su Jok group and 33.3% in the control group. Twenty-five patients (41.7%) had diagnosed lumbar disk herniation for at least 10 years. Postintervention pain and anxiety levels were significantly lower in the Su Jok group than in the control group ($P < .05$). Quality of recovery at postoperative days 1 and 2 and post-discharge day 10 was better in the Su Jok group compared with the control group ($P < .05$). Patients in the Su Jok group also showed more favorable physiological responses ($P < .05$).

Conclusions: This study showed that Su Jok reduced the pain and anxiety levels of patients after lumbar disk surgery and increased the quality of recovery. In addition to reducing pain and anxiety, the Su Jok intervention had a favorable effect on physiological parameters.

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Lumbar disk herniation occurs as a result of structural deterioration of the load-bearing lower lumbar vertebrae, which leads to annulus fibrosus degeneration, nucleus pulposus herniation, and pain.¹ As the nerve root compression and damage associated with lumbar disk herniation can result in sciatica, surgical intervention is often preferred in treatment.² Depending on the surgical procedure, up to 80% of patients experience severe postoperative pain.^{3,4} Uncontrolled pain exacerbates the stress response and has adverse effects on multiple systems of the body, leading to respiratory, cardiovascular, gastrointestinal, renal, and immune changes.³ Higher pain levels also cause an increase in anxiety, worsening of physiological parameters, and prolonged recovery time.

Therefore, effective postoperative pain management is extremely important to reduce the neuroendocrine response to stress and postoperative organ dysfunction.^{2,5,6} Because the peripheral nerves, medulla spinalis, cortex, and limbic system are involved in the physiology of pain, various pharmacological and nonpharmacological methods are recommended to use together to ensure analgesia. This approach, which is described as multimodal analgesia, uses low doses of appropriate analgesics that affect every stage of pain transmission and supportive nonpharmacological methods to provide effective pain control and prevent unnecessary drug use.⁷ There are many nonpharmacological methods that surgical nurses can implement, including massage, hot-cold application, menthol application, vibration, transcutaneous electrical nerve stimulation, therapeutic touch, relaxation, distraction, visualization, music, acupuncture, reflexology, and Su Jok.^{8–11}

Su Jok is an alternative therapy based on traditional Korean medicine. As the name suggests (*su* means hand and *jok* means foot in Korean), Su Jok is applied to the feet and hands.^{10,12} The premise

* Address correspondence to: Niran Coban, Department of Surgical Nursing, Faculty of Health Sciences, Yalova University, Yalova, Turkey.

E-mail address: nirancoban@gmail.com (N. Coban).

¹ ORCID: 0000-0002-1926-5362.

² ORCID: 0000-0002-8168-1287.

of Su Jok is that all parts of the human body are interconnected. These connections form a harmonious whole body and work in concert to maintain its vitality.^{10,12} Su Jok is based on a number of principles: the microsystem principle, acupuncture-energy flow, reflexology principles, and the principles of treatment. The microsystem principle states that the organs and systems in the body are associated with specific areas in the hands and feet. Massage, acupressure, or acupuncture are applied to these sites to maintain balance in the body. Acupuncture and energy flow include the principles of acupuncture in traditional Chinese medicine and the regulation of energy flow in the body by applying acupressure or massage to certain points. This pressure is applied to improve the patient's energy and support their health. The principle of reflexology states that stimuli applied to specific points on the hands and feet can trigger reflex reactions in other parts of the body. These stimuli are said to activate the body's self-healing processes.^{10–13} In terms of the principles of treatment, Su Jok uses various treatment techniques such as hand or foot acupressure, massage, magnet therapy, and the use of small applicators or balls.^{10–13} The hand and foot acupressure and massage techniques of Su Jok have been associated with the gate control theory of pain, as most tactile stimuli can relieve pain by activating large fibers in the skin.¹⁴ The demonstrated effect of Su Jok in reducing pain has been attributed to this skin stimulation mechanism.^{10–13} In the literature, studies evaluating the effect of Su Jok on postoperative pain are limited.¹¹ Therefore, this study aimed to evaluate the effectiveness of Su Jok as a nonpharmacological method to reduce postoperative pain and anxiety and increase the quality of recovery after lumbar disk surgery and to determine its effect on physiological parameters.

Research Methods

Study Aim and Design

A randomized controlled study was conducted to determine the effect of Su Jok on pain, anxiety, and quality of recovery after lumbar disk surgery. During the planning phase, the study was registered at [ClinicalTrials.gov](https://clinicaltrials.gov) (ID: NCT05711706).

Sample Size Calculation

Power analysis was performed in the G*Power 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf, Germany). package program to determine the number of patients to include in the study sample. Using the mean pain score from a similar study by Şimşek and Alpar¹¹ as a reference, for 95% confidence, 95% power, and an effect size of $d = 0.91$, the study should be conducted with a minimum of 54 patients (27 in each group). To ensure adequate power and considering potential losses during the study, we decided to include a total of 60 participants.

Participants

The population of the study consisted of a total of 104 individuals who presented to the neurosurgery clinic of a training and research hospital between December 2022 and June 2023. Patients who were 18 years of age or older, underwent lumbar disk surgery for the first time under general anesthesia, stayed in the hospital for at least 72 hours, had not received analgesic for at least 3 hours, were able to communicate, were conscious and oriented to person, place, and time, and provided informed consent were included in the study (Fig. 1).

Randomization and Blinding

To prevent selection bias, the participants were randomized to the Su Jok (intervention) group ($n = 30$) and the control group ($n =$

30) using a random number table created in Microsoft Excel. Due to the nature of the study, blinding of the researcher and patients was not possible. However, the statistician who performed the data analysis was blinded to the study groups.

Intervention

The patient rooms in the hospital where the study was conducted had a maximum occupancy of four patients. When possible, the Su Jok intervention was performed while the patients were alone in the room to avoid having any effect on patients in the same room assigned to the control group. If another patient was present in the room, the intervention was carried out behind a privacy screen. The routine clinical protocol, including daily follow-up of vital signs and administration of medications prescribed by the physician, was implemented for patients in both groups. Su Jok was administered only during hospitalization. None of the patients required intravenous analgesics at discharge. Patients who reported pain after discharge were advised to contact the hospital for comprehensive evaluation and treatment.

Su Jok Procedure

The researcher performing the Su Jok intervention had completed training by the International Su Jok Association and received a certificate in the practice of Su Jok. They further enhanced their knowledge and skills in a Su Jok Workshop Training. For the intervention in this study, mung beans from a certified organic producer were used.

The patient was informed about the steps of the procedure before initiating the Su Jok intervention. The researcher first ensured hand hygiene, then placed the patient in a comfortable position considering their limitations. The researcher rubbed their hands together to warm them, then held the patient's hand. The researcher took the Su Jok applicator and identified reflex points on the hand that corresponded to the patient's areas of pain. The patient was asked to indicate when they experienced pain and regression at the points where the applicator touched. Painful reflex points corresponding to the surgical areas were detected on the back of the patient's hand. When each reflex point was detected, a mung bean was placed at the point and fixed with medical tape. The same procedure was repeated for each pain point until the patient stated that there was none remaining. The seeds were massaged in small circles for 30 minutes (Fig. 2). The researcher ensured that the seeds remained at the fixed point for 6 hours. During this time, the patients were asked to apply pressure on the seeds and massage in a circular motion for 1 to 2 minutes every 2 hours. At the end of the 6 hours, the seeds were removed by the patients. Su Jok was performed once daily for a total of 3 consecutive days. Each session was performed at the same time of day, with a 24-hour interval between applications to ensure consistency.

Control Group (Usual Care)

Patients in the control group received no intervention, except for the usual care provided by the nurse and physician in the neurosurgery ward according to routine clinical protocols. Assessments were performed at the same intervals for all patients in both groups.

Outcome Measures

Data were collected using a descriptive characteristics form, physiological parameters form, the State Anxiety Inventory (SAI), 40-item Quality of Recovery Questionnaire (QoR-40), Visual Analog Scale (VAS), and the short-form McGill Pain Questionnaire (SF-MPQ). The first interview with each patient was held in the

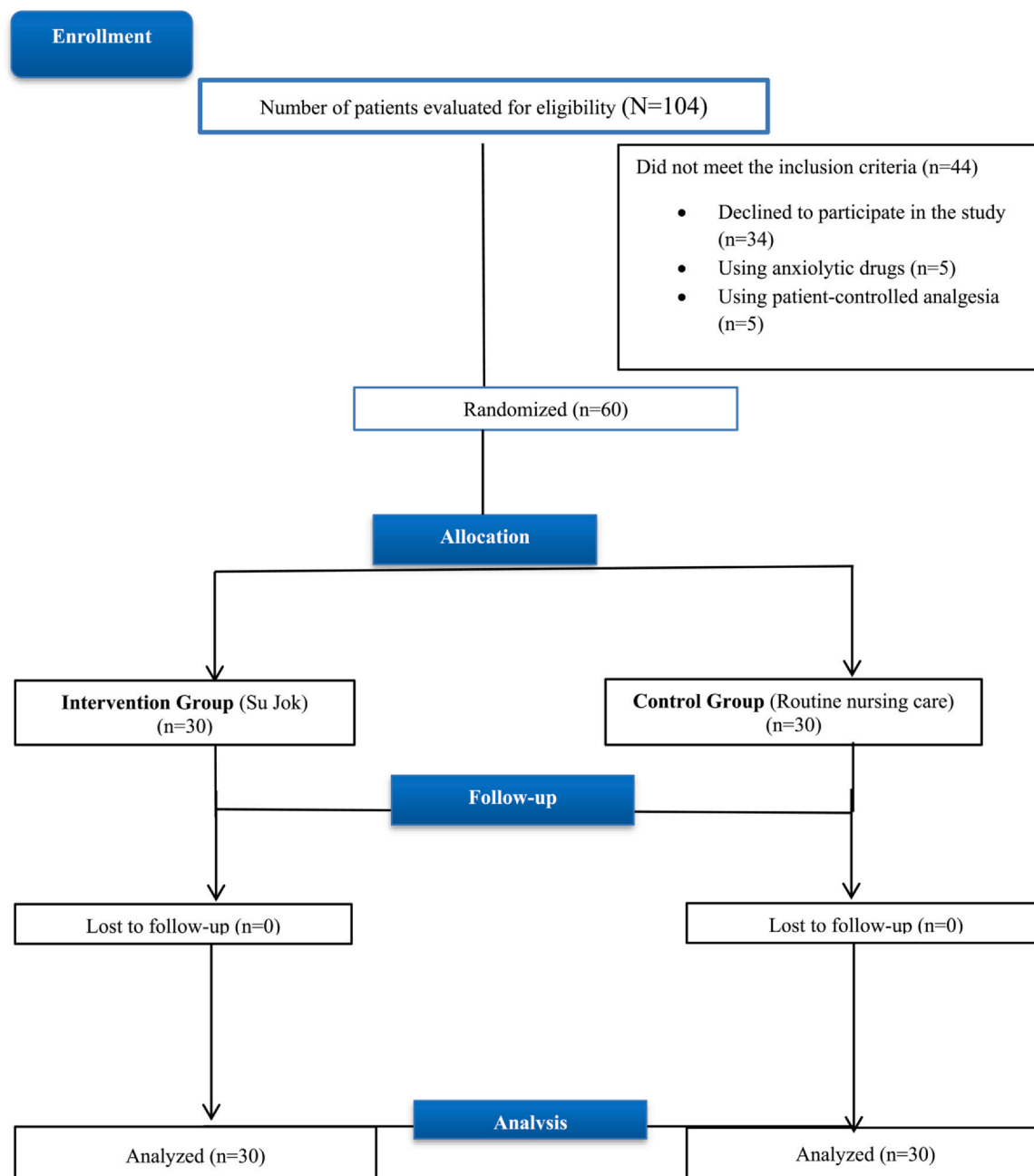


Figure 1. Flowchart of the study (CONSORT 2010). This figure is available in color online at www.jopan.org.

patient room the day before the surgery (preoperative day 1). This interview involved no intervention. The patients were informed about the study and signed the voluntary consent form. The descriptive characteristics form and SAI were completed. The second interview was held after surgery (postoperative day 0). The SF-MPQ, SAI, VAS, and QoR-40 were administered before any intervention was performed. Patients in the Su Jok group then underwent the Su Jok intervention for 30 minutes. To evaluate the effect of Su Jok, the SAI and VAS were administered again 15 minutes after the intervention. The third and fourth interviews with the patients consisted of the same assessments performed in the same manner. In the fifth interview conducted at the patient's follow-up appointment 10 days after discharge, the QoR-40 was administered. The patients in the

control group received only the usual care and were assessed in the same way at the same intervals. The primary outcomes of this study were changes in the patients' pain and anxiety scores.

Descriptive Characteristics Form

This form was created by the researcher in line with the literature and consisted of a total of 16 questions.^{1,15,16} These included questions about the patient's age, gender, marital status, education level, employment and income status, disease duration, place of residence, presence of chronic disease, family history of herniated disk, methods of pain control, time of last analgesic use, and pain location, type, duration, and mitigating and aggravating factors.

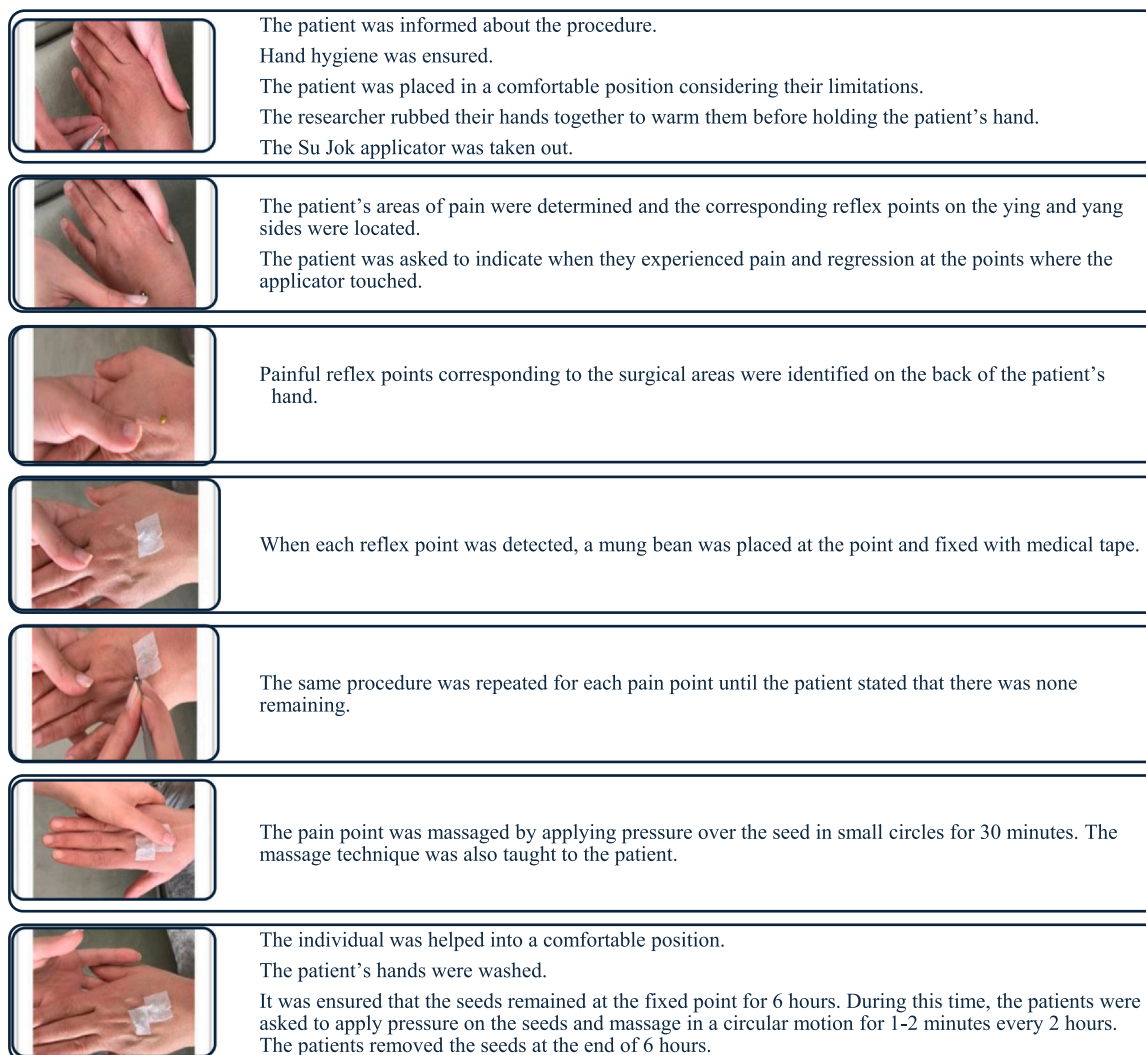


Figure 2. Steps of the Su Jok intervention. This figure is available in color online at www.jopan.org.

State Anxiety Inventory

The SAI is a tool for measuring current levels of anxiety related to a specific situation.¹⁷ The Turkish validity and reliability study was conducted by Öner and Le Compte.¹⁸ The SAI consists of 20 items rated between 1 and 4 to give a total score of 20 to 80. A higher score indicates a higher level of anxiety.^{17,18} In our study, the SAI was administered preoperatively and postoperatively to evaluate the patient's anxiety levels related to the situation. We determined the Cronbach's α value of the SAI to be 0.803.

Quality of Recovery Questionnaire

The QoR-40 was developed by Myles et al.¹⁹ and the Turkish validity and reliability study was conducted by Karaman et al.²⁰ The scale consists of 40 items in 5 subscales. Each item is scored on a Likert-type scale ranging from 1 to 5. The total score ranges from 40 to 200. A higher QoR-40 score indicates better physical and emotional well-being in the postoperative period.^{19,20} In this study, the QoR-40 was administered every 24 hours for 3 days (postoperative days 0, 1, and 2) and on postdischarge day 10. The Cronbach's α coefficient for the QoR-40 was 0.833 in our study.

Visual Analog Scale

The VAS is frequently used to assess pain severity. The scale is one-dimensional and consists of a 10-cm line marked at 0 and 10 cm (or 0 and 100 mm). The patient is asked to mark their level of pain on the line, and the score is determined by measuring from 0 to the patient's mark. Thus, a higher score indicates more pain.²¹ In this study, we used the VAS to measure postoperative pain severity before and after the intervention.

Short-form McGill Pain Questionnaire

The SF-MPQ was developed by Melzack,²² and the Turkish validity and reliability study was conducted by Biçici and Güneş.²³ The scale assesses the qualitative characteristics of pain.^{22,23} The SF-MPQ consists of three parts. The two main sections include sensory pain descriptors (score range 0 to 33) and affective pain descriptors (score range 0 to 12). Higher scores indicate increased pain severity.^{22,23} In the present study, the SF-MPQ was used in the first patient interview to identify qualitative differences in pain between the groups. The Cronbach's α value was found to be 0.730.

Physiological Parameters Form

This form was prepared by the researcher and used to record the blood pressure, heart rate, and oxygen saturation levels of the patients.

Ethical Considerations

Before the study, ethical approval was obtained from the Istanbul Gedik University Human Research Ethics Committee (date: June 28, 2022, decision no: 367) and institutional permission was obtained from the hospital where the study would be conducted. All patients in the study participated voluntarily and provided written informed consent. Permission to use the data collection tools was obtained from their authors.

Statistical Analysis

The study data were analyzed using IBM SPSS Statistics for Windows version 26.0. Skewness and kurtosis coefficients were used to test numerical variables for normal data distribution. The results indicated normal distribution, so parametric statistical tests were used. Categorical variables were compared using χ^2 analysis or Fisher's exact test if the expected value assumption was not met. Continuous variables were compared between the groups using the independent-samples *t* test and within the groups using repeated-measures analysis of variance with post hoc Bonferroni test. The level of statistical significance value was accepted as 0.05 for all analyses.

Results

Descriptive Characteristics of the Participants

The patients in the Su Jok group had a mean age of 46.00 ± 9.16 years, 60% were male, 83.3% were married, 33.3% were primary school graduates, 60% were employed, and 56.7% had income equivalent to their expenses. In the control group, the mean age was 48.17 ± 10.03 years, 53.3% of the patients were women, 80% were married, 43.3% were primary school graduates, 56.7% were employed, and 63.3% had income equivalent to their expenses. The frequency of chronic disease was 30% in the Su Jok group and 33.3% in the control group. Hypertension was present in 77.8% of the patients in the Su Jok group and 90% of those in the control group. In addition, 46.7% of patients in the Su Jok group and 36.7% of those in the control group were diagnosed with lumbar disk herniation more than 10 years ago. A family history of lumbar disk herniation was reported by 43.3% of patients in the Su Jok group and 53.3% of those in the control group. There was no statistically significant difference in sociodemographic characteristics between the intervention and control groups ($P > .05$) (Table 1).

Pain, Anxiety, and Quality of Recovery

Total SF-MPQ scores assessed on the day of surgery before the intervention were 20.73 ± 8.00 in the Su Jok group and 20.77 ± 4.38 in the control group, with no statistically significant differences in total or subscale scores between the groups ($P > .05$).

According to VAS assessments of pain, there was no statistically significant difference between the groups in terms of pain scores on preoperative day 1 and before the intervention on postoperative days 0, 1, and 2 ($P > .05$). However, pain scores were significantly lower after the Su Jok intervention on all postoperative days when compared with the control group ($P < .001$ for all). When pain levels measured before and after the intervention were compared within the groups, there was a statistically significant decrease in the Su Jok group on postoperative days 0, 1, and 2 ($P < .05$). In the control

Table 1

Distribution and Comparison of Patients According to Their Descriptive Characteristics (N = 60)

	Su Jok (n = 30)		Control (n = 30)		<i>t</i>	<i>P</i>
	Mean	SD	Mean	SD		
Age (y)	46.00	9.16	48.17	10.03	-0.874	.386
	Number	%	Number	%	χ^2	<i>P</i>
Gender					1.071	.301
Female	12	40.0	16	53.3		
Male	18	60.0	14	46.7		
Marital status					0.111	.739
Married	25	83.3	24	80.0		
Single	5	16.7	6	20.0		
Education level					1.431*	.761
Primary school	10	33.3	13	43.3		
Secondary school	7	23.3	4	13.3		
High school	9	30.1	8	26.7		
University	4	13.3	5	16.7		
Employment status					0.069	.793
Employed	18	60.0	17	56.7		
Not employed	12	40.0	13	43.3		
Income status					2.292*	.314
Income less than expenses	10	33.3	11	36.7		
Income equal to expenses	17	56.7	19	63.3		
Income more than expenses	3	10.0	0	0.0		

* Repeated-measures analysis of variance.

group, only the values on postoperative day 2 differed significantly ($P < .05$) (Table 2).

Similarly, assessments of anxiety level revealed no statistically significant difference in SAI scores between the groups preoperatively or before the intervention on postoperative days 0, 1, and 2 ($P > .05$). However, the Su Jok group had significantly lower anxiety scores after the intervention on all postoperative days when compared with the control group ($P < .001$ for all). In within-group comparisons of pre- and postintervention measurements, anxiety levels in the Su Jok group were found to be significantly reduced after the intervention on postoperative days 0, 1, and 2 ($P < .001$ for all). In the control group, a significant difference was only observed on postoperative day 2 ($P < .001$) (Table 3).

In terms of quality of recovery, QoR-40 total scores did not differ significantly between the groups on postoperative day 0 but were significantly higher in the Su Jok group than in the control group on postoperative days 1 and 2 ($P < .001$) and postdischarge day 10 ($P = .035$). In both groups, QoR-40 total scores increased significantly between consecutive time points ($P < .05$). This steady increase was also observed in the QoR-40 subscales ($P < .001$ for all) (Table 4).

Physiological Parameters

The groups showed no statistically significant differences in systolic blood pressure, diastolic blood pressure, heart rate, or oxygen saturation values on preoperative day 1 or before the intervention on the postoperative days 0, 1, and 2 ($P > .05$). However, there was a statistically significant between-group differences in heart rate and systolic blood pressure after the intervention on postoperative days 0, 1, and 2. There were also statistically significant differences in postintervention saturation values on postoperative day 1 and in diastolic blood pressure on postoperative day 2 ($P < .05$) (Figure 3).

Discussion

Postoperative pain is a common problem, reported at rates of 47% to 100% in developed and developing countries.²⁴ When postoperative pain cannot be adequately controlled despite advances in treatment, it causes an increase in anxiety levels, prolonged

Table 2

Analysis of the Differences in the Visual Analog Scale (VAS) Scores of the Patients (N = 60)

VAS		Su Jok (n = 30)		Control (n = 30)		t	P
		Mean	SD	Mean	SD		
Preoperative day 1		7.87	1.38	7.57	1.87	0.707	.483
Postoperative day 0	Before intervention	7.27	1.44	7.23	1.52	0.087	.931
	After intervention	4.57	1.25	7.17	1.46	-7.395	<.001*
	P	<.001*		.677			
	t	15.529		0.421			
Postoperative day 1	Before intervention	5.93	1.14	5.30	1.15	1.882	.065
	After intervention	3.33	0.76	5.50	1.48	-7.138	<.001*
	P	<.001*		.526			
	t	14.704		-0.643			
Postoperative day 2	Before intervention	4.53	1.07	4.10	0.88	1.705	.093
	After intervention	2.43	0.82	4.13	0.86	-7.847	<.001*
	P	<.001*		<.001*			
	t	-113.471		-58.629			
F; P		236.886; <.001*		43.221; <.001*			

t, independent-samples t test.

* P < .05.

Table 3

Analysis of the Differences in the State Anxiety Inventory (SAI) Scores of the Patients (N = 60)

SAI		Su Jok (n = 30)		Control (n = 30)		t	P
		Mean	SD	Mean	SD		
Preoperative day 1		71.80	4.12	69.57	5.02	1.883	.065
Postoperative day 0	Before intervention	66.43	5.63	64.50	7.72	1.108	.272
	After intervention	34.87	2.86	61.60	5.76	-22.756	<.001*
	P	<.001*		.039*			
	t	33.744		2.168			
Postoperative day 1	Before intervention	53.23	7.15	56.60	8.47	-1.664	.101
	After intervention	29.67	2.59	59.73	6.27	-24.276	<.001*
	P	<.001*		.940			
	t	18.529		0.076			
Postoperative day 2	Before intervention	46.47	5.93	44.27	8.13	1.197	.236
	After intervention	25.40	2.21	43.30	7.11	-13.169	<.001*
	P	<.001*		.026*			
	t	17.052		2.352			
F; P		494.241; <.001*		68.782; <.001*			

t, independent-samples t test.

* P < .05.

recovery time, increased cost, and reduced patient satisfaction.²⁵ In effective postoperative pain management, it is important for nurses to assess the patient's pain and use nonpharmacological methods with pharmacological methods to control pain.^{26,27} Non-pharmacological methods of pain management support nursing care, increase the quality of care, reduce the need for high-dose medication, and improve the patient's quality of life.^{2,7}

Su Jok is one of the nonpharmacological methods that can be used with pharmacological methods in postoperative pain management.^{10,11,25} There are studies in the literature evaluating the effect of Su Jok on pain in different patient groups.^{10,11,28–34} Şimşek and Alpar¹¹ reported that a Su Jok intervention had a moderate effect on reducing postoperative pain severity in women who gave birth by cesarean section. Other studies have shown that Su Jok is also effective on pain not related to surgical interventions.^{28–34} In this study, we observed that the pain levels were significantly lower in the Su Jok group after the intervention when compared with the control group. This demonstrates that Su Jok is effective in reducing pain in patients who have undergone lumbar disk surgery.

Controlling patients' pain in the perioperative period is also important in terms of reducing anxiety.^{26,27} Postintervention anxiety levels were found to be significantly lower in the Su Jok group than in the control group. Repeated-measures analysis within the groups showed that anxiety levels decreased between assessments

in both groups. Although all patients experienced a reduction in anxiety during the recovery process, there was a markedly greater reduction in the Su Jok group. We encountered no study in the literature evaluating the effect of Su Jok on anxiety after surgery. However, studies on the anxiolytic effects of other non-pharmacological methods with similar working principles, such as reflexology and massage, have indicated that these interventions reduce patients' anxiety.^{35–37} Therefore, we consider our findings consistent with the literature and demonstrate that Su Jok can also be used to reduce patient anxiety levels.

Postoperative recovery is a complex process that involves physical, social, and psychological healing.³⁸ The quality of recovery is an important health outcome that is achieved as the individual regains control over these dimensions, is defined by comparative standards, and results in patients regaining pre-operative levels of independence or dependence in activities of daily living.^{35,39,40} In this study, we determined that the quality of recovery increased over repeated measures in both groups but was higher in the Su Jok group than controls. The findings obtained from measurements performed 24 hours after Su Jok intervention and on the 10th day after discharge showed that Su Jok had a positive effect on the quality of recovery. Although there are a few studies in the literature on the quality of recovery in patients with lumbar disk surgery, we found no interventional study. However,

Table 4

Comparison of the Patients' Quality of Recovery Questionnaire (QoR-40) Total and Subscale Scores (N = 60)

QoR-40		Su Jok (n = 30)		Control (n = 30)		t	P
		Mean	SD	Mean	SD		
Physical Comfort Subscale	Postoperative day 0 ¹	39.33	4.05	42.23	6.78	−2.013	.049*
	Postoperative day 1 ²	52.90	4.63	50.63	7.44	1.417	.162
	Postoperative day 2 ³	57.53	4.07	55.23	3.43	2.365	.021*
	Postdischarge day 10 ⁴	59.77	0.57	58.63	3.10	1.969	.058
	F; P	176.625; <.001*		70.257; <.001*			
	Difference	1 < 2, 3, 4 2 < 3, 4 3 < 4		1 < 2, 3, 4 2 < 3, 4 3 < 4			
Emotional State Subscale	Postoperative day 0 ¹	22.80	5.27	24.43	5.75	−1.148	.256
	Postoperative day 1 ²	37.93	4.01	31.50	5.40	5.240	<.001*
	Postoperative day 2 ³	42.07	2.27	35.87	3.82	7.637	<.001*
	Postdischarge day 10 ⁴	44.33	1.21	41.83	5.39	2.479	.019*
	F; P	235.028; <.001*		66.421; <.001*			
	Difference	1 < 2, 3, 4 2 < 3, 4 3 < 4		1 < 2, 3, 4 2 < 3, 4 3 < 4			
Patient Support Subscale	Postoperative day 0 ¹	31.87	1.76	31.17	4.16	0.849	.399
	Postoperative day 1 ²	34.23	1.14	32.97	2.89	2.231	.030*
	Postoperative day 2 ³	34.23	1.10	33.73	2.56	0.983	.330
	Postdischarge day 10 ⁴	34.40	1.43	33.97	2.17	0.913	.365
	F; P	18.168; <.001*		11.751; <.001*			
	Difference	1 < 2, 3, 4		1 < 3, 4 2 < 4			
Physical Independence Subscale	Postoperative day 0 ¹	15.50	2.98	14.57	3.85	1.050	.298
	Postoperative day 1 ²	20.20	2.12	19.17	2.49	1.728	.089
	Postoperative day 2 ³	22.53	1.17	21.87	1.50	1.920	.060
	Postdischarge day 10 ⁴	24.57	1.04	23.10	3.19	2.396	.022*
	F; P	134.747; <.001*	68.889; <.001*				
	Difference	1 < 2, 3, 4 2 < 3, 4 3 < 4	1 < 2, 3, 4 2 < 3, 4				
Pain Subscale	Postoperative day 0 ¹	21.77	3.94	23.77	3.13	−2.179	.033*
	Postoperative day 1 ²	29.37	3.27	26.47	3.58	3.274	.002*
	Postoperative day 2 ³	30.83	2.64	28.90	2.41	2.961	.004*
	Postdischarge day 10 ⁴	33.70	1.32	32.17	4.61	1.752	.085
	F; P	111.969; <.001*	36.057; <.001*				
	Difference	1 < 2, 3, 4 2 < 4 3 < 4	1 < 2, 3, 4 2 < 3, 4 3 < 4				
QoR-40 Total	Postoperative day 0 ¹	131.27	12.40	136.17	17.14	−1.268	.210
	Postoperative day 1 ²	174.63	12.44	160.73	16.60	3.671	<.001*
	Postoperative day 2 ³	187.20	6.55	175.60	9.63	5.458	<.001*
	Postdischarge day 10 ⁴	196.77	3.61	189.70	17.18	2.205	.035*
	F; P	314.814; <.001*	71.738; <.001*				
	Difference	1 < 2, 3, 4 2 < 3, 4 3 < 4	1 < 2, 3, 4 2 < 3, 4 3 < 4				

F, repeated-measurements analysis of variance; t, independent-sample t test.

* P < .05 (1-2-3-4: indicates the measurement sequence).

descriptive studies have also indicated that the quality of recovery increases over time.^{40–45} The results of these previous descriptive studies are similar to the quality of recovery observed in the patients in our control group,^{40–45} whereas the quality of recovery in the Su Jok group was higher compared with the literature data. This provides evidence that Su Jok also has a positive effect on the quality of recovery.

Cyanosis and fluctuations in blood pressure and oxygen saturation are reported to occur in approximately 10% of surgical patients.^{46–48} It is important that nurses use therapeutic interventions to control these complications while monitoring vital signs.^{49–51} In the present study, postintervention systolic blood pressure, diastolic blood pressure, and heart rate were significantly lower in the Su Jok group than in the control group. Again, as there are no studies in the literature evaluating the effect of Su Jok on physiological parameters, we can only compare with studies of methods with similar working principles. While some of those studies have reported that postoperative foot massage and reflexology had a positive effect on

physiological parameters,^{37,52,53} others have shown that postoperative massage did not have a positive effect on physiological parameters.^{54,55} The favorable impact of the Su Jok intervention on blood pressure and heart rate observed in our study may be related to the decrease in pain and anxiety, as well as other reasons such as the novelty of the technique and the utilization of energy from the seeds used in Su Jok.

Limitations

This research has certain limitations. First, the results obtained from this study are limited to patients who underwent lumbar disk surgery in the hospital where the study was conducted. Second, due to the nature of the study, the clinical investigator and patients could not be blinded during the grouping, but blinding to the groups was done during data analysis. Third, there was some variability in the number of pain points identified in the patients during the Su Jok intervention (3 or 4 pain points). In terms of quality of recovery,

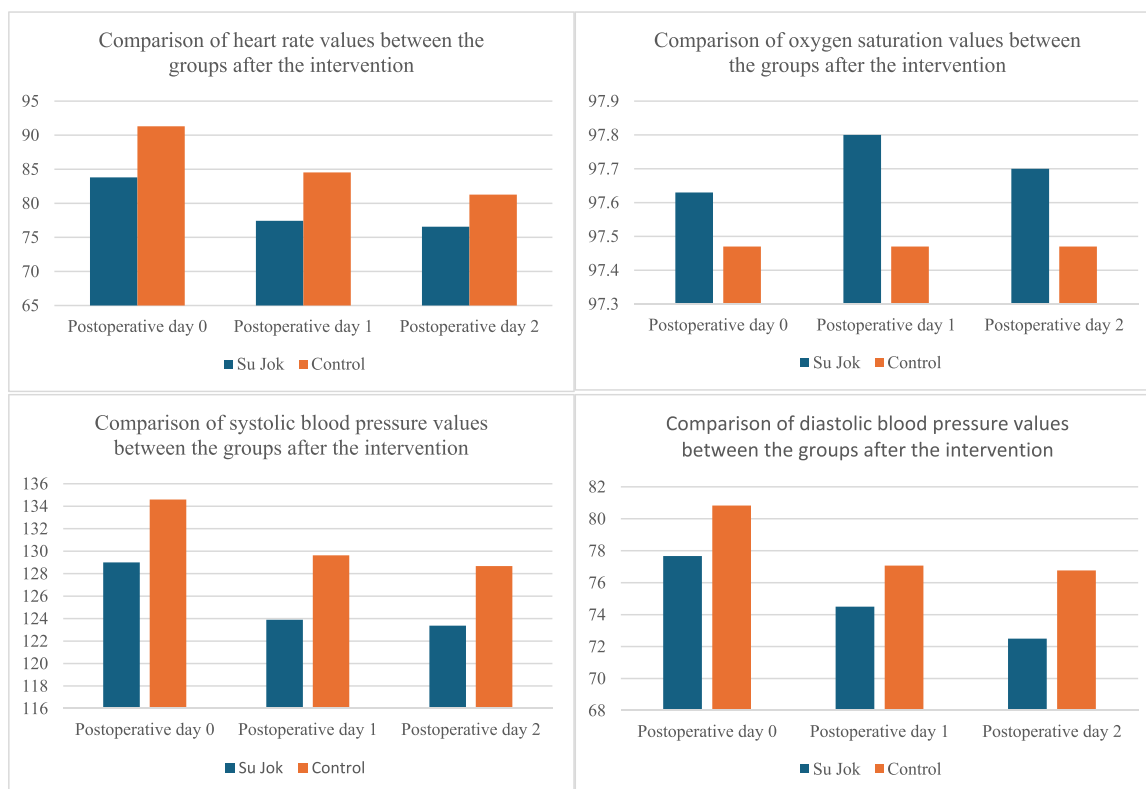


Figure 3. The comparison of physiological parameters and fatigue scores of study groups (N = 60). This figure is available in color online at www.jopan.org.

the Su Jok intervention was implemented while patients were in the hospital but could not be continued in the home care setting, and the long-term effects of Su Jok were not evaluated. Data were not collected on whether patients required or were able to continue this therapy after discharge. In addition, the unbalanced number of men and women in the study sample limits comparisons according to gender. Another factor that reduces the generalizability of the findings is the relatively small number of participants. Future research with larger, gender-balanced samples and long-term follow-up is needed to better understand the effects of Su Jok.

Conclusion

This study showed that patients undergoing lumbar disk surgery had similar pain characteristics and that those who received Su Jok had lower pain and anxiety levels and better quality of recovery than controls who received the usual care. In addition, the Su Jok intervention was shown to have a favorable effect on the patients' physiological parameters. Su Jok can be recommended to reduce pain and anxiety and increase the quality of recovery in patients undergoing lumbar disk surgery. Su Jok should be included among the nonpharmacological methods in nursing education and in-service training programs to promote its use in postoperative nursing care.

CRedit authorship contribution statement

Niran Coban: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Sonay Goktas:** Writing – review & editing, Supervision, Methodology, Investigation, Conceptualization.

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Declaration of Competing Interest

None to report.

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