ORIGINAL RESEARCH

Effect of Language Arousal Nursing Combined with Thermal Insulation Nursing on MAP, SPO_2, NRS and Adverse Reactions in Elderly Patients Undergoing Spinal Fracture Surgery Under General Anesthesia

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ABSTRACT

Objective • To evaluate the effects of language awakening nursing and thermal insulation nursing on anesthesia in elderly patients undergoing spinal fracture surgery.

Methods • Randomized control method was used in this study, 200 elderly patients who underwent spinal fracture surgery under general anesthesia between January and December 2022. Among the patients, 100 cases were selected as the observation group, and the other 100 cases were included in the control group by the random number table method. The control group was treated with thermal insulation nursing, and the observation group was given language arousal nursing (a type of care that helps patients regain consciousness after surgery or anesthesia) combined with thermal insulation nursing (A nursing method for maintaining a patient's body temperature in a medical setting).

Results • After the intervention, the observation group showed shorter extubation time, awaking time, eye-opening time, and respiratory recovery time compared to the control group ($P < .05$). Systolic, diastolic, and MAP decreased in both groups after the intervention, with the observation group showing lower values ($P < .05$). Heart rate at 5 and 10 minutes after extubation decreased in both groups, with the observation group having a lower heart rate than the control group ($P < .05$). There were no significant differences in SPO_2 between the groups after intervention ($P > .05$). The observation group reported milder pain and a lower incidence of anesthesia-related adverse reactions ($P < .05$). These findings suggest that language arousal nursing combined with heat preservation nursing improves anesthesia recovery in elderly patients undergoing spinal fracture surgery, leading to better outcomes and reduced adverse events.

Conclusion • Combining language arousal and thermal insulation nursing enhances anesthesia recovery in elderly spinal fracture surgery patients, leading to optimized blood pressure, heart rate, reduced pain, and fewer anesthesia-related adverse events. (*Altern Ther Health Med.* 2023;29(8):764-769).

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INTRODUCTION

Spinal fractures, particularly of the cervical and lumbar spine, are prevalent in clinical settings. Spinal fractures in the elderly are mostly caused by osteoporosis. With the aging of China's population, its incidence is gradually increasing.[1] Studies have shown that the incidence of spinal fractures accounts for 49% of elderly fractures.[2] Due to the loss of bone mass in the elderly and the decrease of bone density with age, osteoporosis is further caused. In addition, the elderly have poor self-care ability and are prone to falls and injuries, which may lead to spinal fractures in the elderly.[3] The disease is mainly manifested as spinal pain, deformity,[4] which leads to abnormal spinal function of patients. Severe cases can result in paralysis, which has adverse effects on the quality of life of patients.[5] The primary treatment for this condition is internal fixation, aiming to reduce the fracture.[6] Still, this operation has great trauma and may cause severe hemodynamic fluctuations,[7] and the patient is an elderly group, and the body has poor tolerance. Due to the long duration of operation, the amount of anesthetic drugs used is more than that of ordinary surgery. On one hand, hemodynamic fluctuations during the operation increase the possibility of incomplete awakening and analgesia.[8] Therefore, it is very important to take effective perioperative anesthesia

management. Routine perioperative anesthesia management attaches importance to vital signs monitoring, anesthetic drug dosage adjustment, etc., but the problems of intraoperative hypothermia and postoperative recovery have not been solved.[9] Intraoperative heat preservation nursing gives patients a full range of heat preservation nursing during the perioperative period, including the temperature and humidity of the operating room and the ward, and the heating treatment of the equipment and drugs used to help patients maintain normal body temperature.[10] While language arousal can directly act on the brain with the help of sound signals by language, promote the brain to induce brain waves, accelerate the cerebral blood flow, promote the dilution of anesthetic drugs, gradually reduce the inhibitory effect of anesthetic drugs on the brain of patients, and promote the rapid recovery of patients after surgery.[11] In the existing studies, warming care and language arousal care are rarely used in the perioperative nursing of elderly patients with spinal fracture surgery under general anesthesia. The research objective of this study is to investigate the impact of perioperative nursing interventions, including intraoperative heat preservation nursing and language arousal nursing, on the anesthesia recovery of elderly patients undergoing spinal fracture surgery under general anesthesia. This study aims to address these gaps by investigating the impact of perioperative nursing interventions on anesthesia recovery in elderly patients undergoing spinal fracture surgery.

MATERIALS AND METHODS

General Information

Study Population. A total of 200 elderly patients with spinal fractures treated in our hospital from January 1, 2022, to December 31, 2022 were selected as the research objects. Among them, 100 participants were selected as the observation group, and the remaining 100 participants were selected as the control group by random number table method. Prepare a pre-generated table of random numbers with random numbers in no particular order. A starting position is randomly selected from the table, and then numbers are selected one by one in the order of the random number table, each number associated with a patient. These numbers determine which group each patient is assigned to. The detailed information of participants is shown in Table 1. There were no significant differences in gender, age, ASA classification, or body mass index between the observation and control groups ($P > .05$).

Table 1. General Information

Group	Gender (Male/Female)	Age (years)	ASA Classification	BMI (kg/m^2)
Observation	56/44	70.63 ± 3.37	43/57	29.37 ± 2.71
Control	58/42	70.31 ± 3.52	41/59	29.63 ± 2.79

Note: Data presented as mean ± standard deviation (for age and BMI) or count (for ASA classification). There were no significant differences in gender, age, ASA classification, and BMI between the two groups ($P > .05$).

Inclusion Criteria and Exclusion Criteria

The rationale for inclusion and exclusion criteria is to ensure the study's accuracy and reliability and protect the study subjects' safety and rights.

Inclusion criteria: (1) meeting the diagnostic criteria of spinal fracture, the patient has a significant fracture of the spine, including cervical, thoracic, or lumbar spine;[13] (2) Participants aged 65 years and older; (3) All included participants received general anesthesia for spinal fracture surgery and were classified as ASA grade I or II; (4) ASA grade I-II;[13] (5)All patients and their families consented to the study and signed the consent form.

Exclusion criteria: (1)combined cognitive and mental disorders; (2)People who are unable to communicate and have hearing impairment; (3)Combined with serious lesions of major organs such as heart and lung; (4)Patients with severe bleeding.

Methods

Routine Perioperative Anesthesia Management. Both groups received routine perioperative anesthesia management. The details were as follows: (1) Preoperative. Medical staff explained the surgical process of spinal fracture surgery under general anesthesia to patients, inform patients of anesthesia related knowledge and precautions during surgery, help them gain a basic understanding of the procedure, strengthen the patients' rapport with nurses, and communicate with patients more. Patients were informed of possible adverse reactions during general anesthesia, such as pain and laryngeal foreign body sensation, and guided to prepare psychologically with positive and optimistic language to relieve their nervous emotions. The patients were instructed to open their eyes and gently clenc their fists after hearing the instructions during the recovery period. If the patients opened their eyes, they could hear the sounds of the surrounding environment and the voices of medical staff and family members. By actively communicating with patients, we can master their psychological state, interests and hobbies, and obtain patients' good trust in medical staff. (2) During operation. Before the patient enters the operating room, the medical staff actively communicates with him to make the patient familiar with his voice and remember his language characteristics. Then the same medical staff entered the operation together with the patient, communicates with the patient in a positive and conciliatory tone, and provides psychological guidance to the patient to appease his nervous and anxious psychological state and guide him to carry out the operation in a good psychological state. To avoid the patients' nervous emotions leading to the failure of the operation, deepen the patients' familiarity with the voice and language characteristics of the medical staff, popular science the recovery process after general anesthesia, and guide the patients to cooperate with the medical staff to implement nursing to promote the recovery. The lung protective ventilation strategy was used before anesthesia, and the use of large amounts of muscle relaxants was avoided. The blood pressure, heart rate, and body temperature of the

patients were detected during the operation, and the dosage of anesthetic drugs was adjusted. (3) After surgery. When the patient hears the instructions of the medical staff, he should actively respond to them when he can, so that the medical staff can judge the patient's condition more correctly; During the slow recovery process, do not move, in case you pull the medical equipment attached to your body.

Control Group: Heat Preservation Nursing. The control group received heat preservation nursing. The details were as follows: (1) preoperative. Before the patient entered the operating room, the operation was preheated by air conditioning equipment, and the temperature was controlled at about 24°C after preheating. After disinfection of the operating area, sterile cloth was laid, the temperature was controlled between 22°C and 25°C, and the humidity was controlled at about 50%. (2) during operation; During the operation, the cloth dressing, the entire surgical field and the surgical dressing were kept dry and clean. The liquid needed to be used during the operation was first placed in a 37°C incubator, and warm saline was used to rinse during the operation to reduce the energy consumption of the patient's body. Cover with sterile dressing heated to about 40°C in time. (3) postoperative. The changes of the patient's body temperature were closely monitored, and the warming blanket was used before arriving at the ward to maintain the room temperature at about 27°C to promote the patient's metabolism and speed up his recovery.

Observation Group: Language arousal Nursing. The observation group was given language arousal nursing on the basis of the control group. The details are as follows: Before the operation, the medical staff informed the family members of the patients about the benefits of language arousal, so that they had a certain understanding of language arousal and increased their cognition, so that the family members of the patients could actively cooperate with the medical staff in the process of language arousal nursing and avoid the family members of the patients being too anxious to cause the medical staff to be unable to correctly implement the nursing. At the same time, the family members of the patients were guided to record what they wanted to say to the patients through mobile phone recordings. It is convenient for medical staff to play it on a loop during language arousal. After stopping the use of anesthetic drugs, the same medical staff was responsible for awakening the patient, calling the name of the patient every 15 seconds, and telling the patient about the people or things he was familiar with in a positive and encouraging tone to increase the patient's trust in the source of the voice. When the patient made actions such as opening his eyes and gently clench his fist, the language call was effective, and at the same time, the prepared family recordings were played in a loop. The recording was played once every 20 s. Then the medical staff continued to give instructions and guided the patient to complete the actions such as opening eyes and gently clench fist in the instructions, while paying attention to the clinical indications of the patient.

Observation indicators

For both groups, we recorded the following aspects of anesthesia recovery: extubation time, awake time, eye-opening time, and spontaneous breathing recovery time. Quality of anesthesia recovery was recorded in the two groups of patients with extubation time, awake time, eye opening time, spontaneous breathing recovery time.

Blood pressure indicators. Systolic blood pressure, diastolic blood pressure and mean arterial pressure (MAP) were compared between the two groups before and after the perioperative nursing intervention. The multi-function monitor [Euromeda Monitor s/5, DeenEuromeda International Trading (Shanghai) Co., LTD.] was used to detect the systolic, diastolic, and MAP of the two groups before and after the perioperative nursing intervention.

Heart rate and blood oxygen saturation (SPO_2) were compared between the two groups 5 and 10 minutes after extubation. The heart rate and SPO_2 of the two groups before and after perioperative nursing intervention were detected by a multi-function monitor.

Pain degree. The pain degree of the two groups after the perioperative nursing intervention was compared, and the pain was evaluated by the numerical rating scale (NRS),[14] which was 0-10 points to represent different degrees of pain:

- No pain: 0 points;
- Mild pain (does not affect sleep): 1-3 points;
- Moderate pain (affects sleep): 4-6 points;
- Severe pain (severely affects sleep): 7-10 points Moderate pain was 4-6 points, and sleep was affected; Severe pain was scored from 7 to 10 and severely affected sleep.

We recorded the incidence of anesthesia-related adverse reactions, including symptoms such as headaches, chills, restlessness, and hypothermia, and then calculated their occurrence rate

Statistical analysis

Data analysis was performed using SPSS version 22.0 (IBM, Armonk, NY, USA, χ^2 test was used for enumeration data (%), rank sum test was used for ranked data, and *t* test was used for comparing means. $P < .05$ was used for statistical difference.

RESULTS

Comparison of clinical indicators

The observation group, consisting of 100 patients, exhibited significantly shorter extubation time (20.68 ± 4.28 min), waking time (18.47 ± 3.21 min), eye-opening time (14.67 ± 2.89 min), and spontaneous breathing recovery time (16.57 ± 2.95 min). As shown in Table 2, post-intervention extubation time, waking time, eye-opening time, and respiratory recovery time in the observation group were all significantly shorter than in the control group ($P < .05$)

Table2. Comparison of clinically relevant indicators between the two groups ($\bar{x} \pm s$, min)

Group	n	Extubation time	Awake time	Eye opening time	Spontaneous breathing recovery time
Observation group	100	20.68 ± 4.28	18.47 ± 3.21	14.67 ± 2.89	16.57 ± 2.95
Control group	100	23.73 ± 4.56	21.64 ± 3.53	16.82 ± 3.02	18.72 ± 3.27
t		4.877	6.644	5.144	4.882
P value		<.001	<.001	<.001	<.001

Table 3. Comparison of blood pressure indicators between the two groups ($\bar{x} \pm s$, mmHg)

Group	n	Systolic blood pressure		Diastolic blood pressure		MAP	
		pre-intervention	post-intervention	pre-intervention	post-intervention	pre-intervention	post-intervention
Observation group	100	118.64 ± 5.67	113.42 ± 4.31[a]	73.58 ± 4.83	63.57±4.16[a]	88.60 ± 5.11	80.19 ± 4.21[a]
Control group	100	119.87 ± 5.72	116.75 ± 4.57[a]	74.26 ± 4.91	66.89±4.37[a]	89.46 ± 5.18	83.51 ± 4.44[a]
t		1.527	5.301	0.987	5.503	1.182	5.426
P		.128	<.001	.325	<.001	.239	<.001

[a]$P < .05$, compared with that before intervention

Table 4. Comparison of heart rate and SPO_2 between the two groups ($\bar{x} \pm s$)

Group	n	Heart rate (beats /min)			SPO_2(%)	
		pre-intervention	extubation 5 min	extubation 10 min	pre-intervention	post-intervention
Observation group	100	90.67 ± 5.74	85.38 ± 5.22[a]	78.27 ± 4.77[*]	87.89 ± 4.61	97.62 ± 1.34[a]
Control group	100	91.78 ± 5.87	88.59 ± 5.33[a]	82.13 ± 4.82[*]	88.52 ± 4.72	97.48 ± 1.32[a]
t		1.352	4.303	5.692	0.955	0.744
P value		.178	<.001	<.001	.341	.458

[a]$P < .05$, compared with that before intervention

Comparison of blood pressure indexes

The observation group showed significantly lower systolic blood pressure (pre-intervention: 118.64 ± 5.67 mmHg, post-intervention: 113.42 ± 4.31 mmHg), diastolic blood pressure (pre-intervention: 73.58 ± 4.83 mmHg, post-intervention: 63.57 ± 4.16 mmHg), and mean arterial pressure (pre-intervention: 88.60 ± 5.11 mmHg, post-intervention: 80.19 ± 4.21 mmHg). Before intervention, there were no significant differences in systolic blood pressure, diastolic blood pressure and MAP between 2 groups ($P > .05$). After intervention, systolic blood pressure, diastolic blood pressure and MAP were decreased in both groups, and the observation group was lower than the control group ($P < .05$), as shown in Table 3.

Comparison of heart rate and SPO2

The observation group exhibited significantly lower heart rate (pre-intervention: 90.67 ± 5.74 beats/min, extubation 5 min: 85.38 ± 5.22 beats/min, extubation 10 min: 78.27 ± 4.77 beats/min) and higher SPO_2 levels (pre-intervention: 87.89 ± 4.61%, post-intervention: 97.62 ± 1.34%). Before intervention, the two groups had no significant differences in heart rate and SPO_2 ($P > .05$). After intervention, the heart rate 5 and 10min after extubation was lower in both groups than before intervention, and the observation group was lower than the control group ($P < .05$). SPO_2 was increased in both groups compared with before intervention, and there was no difference ($P > .05$), as shown in Table 4.

Comparison of pain degree

The observation group had a higher percentage of patients reporting mild pain (56.00%) and a lower percentage reporting moderate pain (38.00%). After intervention, the pain degree of the observation group was lower than that of the control group ($P < .05$), as shown in Table 5.

Table 5. Comparison of pain degree between the two groups [n(%)]

Group	n	Mild	Moderate	Severe
Observation group	100	56 (56.00)	38 (38.00)	6 (6.00)
Control group	100	37 (37.00)	54 (54.00)	9 (9.00)
Z		2.620		
P value		.009		

Table 6. Comparison of the incidence of anesthesia-related adverse reactions between the two groups [n(%)]

Group	n	Headache	Shiver	Agitation	Low body temperature	Total amount
Observation group	100	2 (2.00)	1 (1.00)	0 (0.00)	1 (1.00)	5 (5.00)
Control group	100	6 (6.00)	3 (3.00)	2 (2.00)	3 (3.00)	14 (14.00)
χ^2		4.711				
P value		.030				

Incidence of anesthesia-related adverse reactions

The observation group had a lower incidence of headache (2.00%), shiver (1.00%), and low body temperature (1.00%). After intervention, the incidence of anesthesia-related adverse reactions in the observation group was lower than that in the control group ($P < .05$), as shown in Table 6.

DISCUSSION

Impact of Language arousal Nursing

This study found that after the intervention, the extubation time, awake time, eye opening time and respiratory recovery time of the observation group were shorter than those of the control group ($P < .05$), which indicated that language arousal nursing combined with heat preservation nursing can improve the quality of anesthesia recovery of elderly patients with spinal fracture surgery under general anesthesia. Analysis of the reasons: in the language arousal nursing, the name of the patient is called by using a positive encouraging tone after the anesthesia is stopped, so that the acoustic signal received by the patient directly acts on the

brain reticular activation system, stimulating the cerebral cortex to generate excitement, and inducing the generation of brain waves, using brain waves to transmit information to the brain pons, so as to speed up the patient's waking up.[15] When the patient's attention is stimulated by acoustic waves, it can accelerate the cerebral hemodynamics, reduce the disturbance of consciousness caused by anesthetics, and reduce the inhibitory effect of anesthetics on the cerebral cortex of patients. At the same time, with heat preservation nursing, the temperature is controlled appropriately after surgery to promote the patient's own metabolism, to speed up the recovery time of patients.

Effects on Blood Pressure and Heart Rate

This study found that after intervention, the systolic blood pressure, diastolic blood pressure and MAP of the observation group were lower than those of the control group ($P < .05$), and the heart rate of the observation group was lower than that of the control group at 5 and 10 minutes after extubation ($P < .05$). There was no significant difference in SPO_2 between the two groups ($P > .05$). It shows that language arousal nursing combined with heat preservation nursing can significantly improve the blood pressure index and heart rate of elderly patients with spinal fracture surgery under general anesthesia. It is considered that routine nursing can deepen patients' understanding of medical staff by making patients familiar with the voice and language characteristics of medical staff before and during the operation, so as to increase the familiarity of patients when they hear the call of medical staff during the recovery period, reduce the stress response of patients due to the unfamiliar environment, reduce the sympathetic nerve excitability of patients, and thus reduce the blood pressure. At the same time, through language arousal nursing, during the recovery period of the patient, the regular and rhythmic call of the medical staff can gradually restore the patient's brain receiving function, and the familiar sound and language characteristics can give the patient effective comfort, reduce the fear of the patient due to the unfamiliar environment, reduce the stress response of the patient due to external stimulation, and at the same time, with heat preservation nursing. It can reduce the oxygen consumption caused by hypothermia, and expand the peripheral blood vessels of patients through intraoperative warming to effectively reduce the temperature drop caused by anesthesia, reduce the heart load, and reduce the heart rate.

Influence on Pain and Anesthesia-Related Adverse Reactions

This study found that after intervention, the degree of pain in the observation group was lower than that in the control group ($P < .05$), and the incidence of anesthesia-related adverse reactions in the observation group was lower than that in the control group ($P < .05$), which indicated that language arousal nursing combined with heat preservation nursing can significantly improve the degree of pain in elderly patients with spinal fracture surgery under general anesthesia and reduce the occurrence of anesthesia-related adverse reactions. This conclusion is similar to the point put forward by Zhu Zhen.[16] It is considered that the sound familiar to the medical staff and the family members of the patients in the language arousal nursing can speed up the recovery of patients, reduce the phenomenon of postoperative infection and bleeding caused by the long recovery period, help the recovery of patients' physical function, and effectively improve the quality of recovery. This finding is consistent with previous research, highlighting the positive role of verbal awakening care and warming care in elderly patients undergoing spinal fracture surgery. At the same time, our study further confirmed this point of view through the support of specific data, providing a stronger basis for clinical practice. At the same time, with the heat preservation nursing, the appropriate temperature and humidity control during the perioperative period of patients can reduce the gradient difference between the core temperature and the peripheral temperature, reduce the loss of heat convection, improve the circulation ability of the patients, improve metabolism, reduce the phenomenon of hypothermia caused by anesthesia, so as to reduce the occurrence of anesthesia-related adverse reactions.

The uniqueness of this study is that it is the first time to combine verbal wake-up nursing and warming nursing for elderly patients undergoing spinal fracture surgery under general anesthesia, in order to achieve significant results in postoperative pain management and control of anesthesia-related adverse reactions. Compared with traditional nursing methods, the verbal awakening nursing adopted in this study can accelerate the metabolism and elimination of anesthesia drugs while stimulating the brain with sound signals, thereby promoting the rapid awakening and recovery of patients. At the same time, heat preservation can effectively alleviate the problem of hypothermia during and after surgery, thereby reducing the risk of complications caused by low temperature.

Limitations and Recommendations

The present study has some limitations that should be acknowledged. Firstly, the study was conducted in a single center with a relatively small sample size, which may limit the generalizability of the findings to a broader population. Therefore, future studies with larger and more diverse samples from multiple centers are needed to validate the results. For language arousal care and thermal care, the care program can be further optimized to clarify the procedure, dosage and frequency to ensure that each caregiver is able to perform these interventions correctly and effectively. At the same time, specific training can be provided for caregivers to strengthen their skills and knowledge in order to reduce variability in the implementation process. Secondly, although efforts were made to standardize the interventions and nursing protocols, there might still be variations in the implementation of language arousal nursing and heat preservation nursing by different nursing staff, which could introduce some bias into the results. Thirdly, the study focused on elderly patients with spinal

fracture surgery under general anesthesia, and the results may not be applicable to patients with different surgical procedures or age groups.

Despite these limitations, we have taken a number of steps to minimize their impact. For example, during the study design phase, we worked to select patients with similar clinical characteristics to reduce potential confounding factors. At the same time, we will also consider controlling some possible interfering variables in the data analysis to increase the reliability of the results. Despite these efforts, however, the findings need to be interpreted with caution, especially when generalized to other populations.

In conclusion, language arousal nursing combined with heat preservation nursing can significantly improve the quality of anesthesia recovery in elderly patients with spinal fracture surgery under general anesthesia, reduce their blood pressure indicators, heart rate, pain degree, and reduce the occurrence of anesthesia-related adverse reactions, which is worthy of promotion. The conclusions of this study have clinical significance: through verbal wake-up care, patients can wake up faster after the operation, reduce the hypnotic effect of anesthetic drugs, and thus reduce the incidence of postoperative drowsiness and nausea. At the same time, heat preservation care effectively avoids the problem of hypothermia during and after the operation, reduces the risk of complications such as infection and bleeding, and promotes the early recovery of patients. These practical applications have directly visible effects in clinical practice and can significantly improve the patient's surgical experience and treatment outcomes.

CONFLICT OF INTEREST

The authors have no potential conflicts of interest to report relevant to this article.

AUTHOR CONTRIBUTIONS

RX and GW designed the study and performed the experiments, XZ and QQ collected the data, XZ, QQ ,WZand DZ analyzed the data, RX and GW prepared the manuscript. All authors read and approved the final manuscript.

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