



# Effect of postural nursing intervention on preventing pressure injury after thoracolumbar incision and internal fixation in southern China

Xia LI<sup>1#</sup>, Jing XU<sup>1#</sup>, Chunxiang NI<sup>1\*</sup>, Minhui GU<sup>1\*</sup> 

## Abstract

The purpose of this study was to investigate the effect of postural nursing intervention on patients with moderate pressure ulcers through posterior thoracolumbar incision and internal fixation. A total of 100 patients were divided into a control group and an experimental group. The satisfaction rate of nursing care, incidence of complications, hospital stay, incidence of pressure ulcers, and VAS score of pain before and after operation were recorded in the 2 groups. Compared with the control group, the patients in the experimental group has higher satisfaction rate, shorter hospitalization time, and lower incidence of pressure ulcers and complications (all  $P < 0.05$ ). The VAS score of the control group ( $2.83 \pm 0.56$ ) was higher than that in the experimental group ( $1.28 \pm 0.57$ ) all  $P < 0.05$ ). Postoperative thoracolumbar vertebral incision and internal fixation surgery for patients with postural nursing intervention can not only improve the satisfaction rate of nursing, reduce the occurrence of complications, shorten the length of hospitalization, but also reduce the incidence of intraoperative pressure ulcers.

**Keywords:** pressure ulcer; internal fixation surgery; posterior thoracolumbar incision; posture nursing intervention.

**Practical Application:** Postural nursing intervention prevents pressure injury after thoracolumbar incision.

## 1 Introduction

Thoracolumbar fractures are mainly due to indirect or direct violence in the spine (Vanek et al., 2020; Wallace et al., 2019; Mazel & Ajavon 2018). If the treatment is not timely or the method is not appropriate, it is easy to cause complications such as nerve damage and vertebral body instability, affecting the patient's normal life and work (Okano et al., 2019; Lee et al., 2019). Surgery is currently the main clinical treatment of thoracolumbar vertebral fractures (Ye et al., 2017). Different bending rod angles have different effects on the reduction of Cobb angle and the height of the anterior edge of the vertebral body (Qin et al., 2020; Javadi & Naderi 2015).

Thoracolumbar fractures often occur in daily activities and traffic accidents, often leading to partial or complete loss of the body's trunk weight-bearing function. People with nerve damage may have lower limb dysfunction or even complete paralysis. The paralyzed person stays in bed for a long time, urinates and incontinences, and is prone to pressure ulcers, which seriously affects the patient's quality of life. Pressure ulcers are soft tissue ulcers and necrosis caused by persistent ischemia, hypoxia, and malnutrition due to long-term compression of local tissues, often a comorbidity of a certain disease.

Thoracolumbar fractures are more common in the clinic, these patients have high risk and severe symptoms, and need to stay in bed for a long time after the completion of surgical treatment (Ansar et al., 2020; Spiegl et al., 2019). Most patients are prone to complications after surgery, which affects their

recovery. At the same time, it is easy to cause psychological disorders and induce bad emotions, which will greatly affect the recovery of patients after surgery (Oh & Seo 2019; Barakat et al., 2019). Posterior thoracolumbar spine incision and internal fixation surgery is a more effective plan for the treatment of thoracolumbar vertebral fractures, but if improper posture care is performed during the operation, pressure ulcers are prone to occur and affect postoperative rehabilitation (Wang et al., 2017a). The purpose of this study explores the effect of posture nursing intervention on pressure ulcers in the posterior thoracolumbar incision and internal fixation surgery, and provides a scientific basis for postoperative care of such patients in southern China.

## 2 Materials and methods

### 2.1 Recruitment of research subjects

A total of 102 subjects were included in this study, all of them were patients with thoracolumbar vertebral fractures received from January 2018 to December 2019 in South China \*\*\* Hospital. Inclusion criteria: complete clinical data, confirmed by X-ray examination to meet the diagnostic criteria for thoracolumbar fractures (Spiegl et al., 2019), signed informed consent, and received posterior thoracolumbar incision and internal fixation surgery. 100 patients were randomly divided into a control group and a test group, 50 in each.

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<sup>1</sup> Department of Operating Room, Zhangjiagang TCM Hospital Affiliated to Nanjing University of Chinese Medicine, Suzhou City, Jiangsu Province, China

<sup>#</sup>Co-First Authors.

\*Corresponding author: [djyjj01200402@163.com](mailto:djyjj01200402@163.com)

## 2.2 Nursing method

The control group was treated according to routine nursing interventions, including routine health education, psychological counseling, dietary intervention, and environmental nursing. The experimental group added posture nursing intervention on the basis of the control group: preoperative follow-up. The patients were followed up 1d before surgery to understand the patient's condition and physical condition, explain the knowledge of thoracolumbar vertebral fractures and posterior thoracolumbar incision internal fixation surgery treatment, and enable patients to master nursing cooperation skills through health education. In addition, patients are advised to cooperate well before surgery, and prepare restraint straps, grooved head pads, soft pads, prone posture pads, hand pads, head circles, etc.

Intraoperative cooperation. During the operation, assist the anesthesiologist to complete general anesthesia, and the traveling nurse cooperates with the surgeon to complete the posture. During the operation, closely observe the skin color of the patient's compressed area to ensure that the patient's head, eyes, ears, etc. are not subject to any pressure and maintain a normal state. Relax the restraint band at intervals, massage the compressed area, and check the support points of the patient's posture every 30 minutes to prevent the posture pad from sliding off.

Posture care. Try to maintain the patient's comfortable posture. After the anesthesia is successful and stable, the muscles are completely relaxed, it is difficult to support and lose self-protection ability, you need to rely on doctors and nursing staff. The patient is required to place both arms on an adjustable cushioned hand rest, the shoulder pad is at 90°, and the proximal joint cannot be higher than the distal joint. Maintain smooth ventilator management and infusion management, move the patient to the bedside, support both lower limbs, head and back, and lumbosacral region, and gently lift the affected limb on the prone position cushion. The support of the modular prone position cushion makes the chest and abdomen suspended and fixed, and assists the anesthesiologist in placing the enhanced tracheal intubation properly to avoid respiratory disorders.

Flex the hip and knee joints by 20°, and line the cushions under the main force-bearing parts such as the ribs, anterior superior iliac spine, ankle and knee joints. The patient's waist is exposed to facilitate the operation. If the patient is at the head of the bed and the foot of the bed is low, the nursing staff can lower the head of the bed to the height of the foot of the bed to maintain the balance between the two to fully expose the waist. In order to reduce the compression of the external genitalia (male) and breast (female), the patient's head can be placed on the grooved head pad to keep the head and neck level. In addition, eye protectors can be used to protect the eyes and prevent damage to the conjunctiva. Adjust the height of the prone position pad according to different body types. Obese patients should use larger pads. When placed, the abdomen should be suspended, and the upper limbs should be flexed forward to maintain the normal functional position of the patient. Scrub the pressured area with warm water once per shift.

## 2.3 Observation index

Observe and compare the nursing satisfaction rate, complication rate, hospitalization time, pressure ulcer rate, and preoperative and postoperative pain VAS scores of the two groups. Nursing Satisfaction Rate: After the completion of nursing, patients were surveyed on-site for nursing satisfaction, with a total score of 100 points. The higher the score, the higher the satisfaction rate. > 89 points are satisfied, 70-89 points are basically satisfied, <70 points are not satisfied, satisfaction rate = (satisfaction cases + basic satisfaction cases) / total cases × 100%. Pain VAS score: According to the visual simulation score method, 0 to 10 points, 0 points are completely painless, 10 points are severe pain that is unbearable, the higher the score, the more severe the pain.

## 2.4 Statistical analysis

The data of this study was statistically processed by SPSS 21.0 software. The count data is represented by [*n* (%)], and chi-square ( $\chi^2$ ) test is performed. The measurement data is expressed by (Mean ± SD) and the t test is performed.  $P < 0.05$  was considered statistically significant.

## 3 Results

### 3.1 Comparison of general characteristics between the two groups

The control group involved 34 males and 16 females. The age ranged from 22 to 61 years, with an average of (38.90 ± 3.78) years. The causes of fractures were 19 cases of car accident injuries, 23 cases of falling injuries from high places, and 8 cases of crush injuries. There were 35 males and 15 females in the test group. The age ranged from 23 to 60 years, with an average age of (38.16 ± 3.74) years. The fractures were caused by 16 cases of car accident injuries, 25 cases of falling injuries from high places and 9 cases of crush injuries. There was no statistically significant difference between the two general data groups ( $P > 0.05$ ). The statistical analysis results are shown in Table 1.

**Table 1.** Comparison of the general characteristics of the two groups of respondents.

Variables	Experimental group(n=50)	Control group (n=50)	$\chi^2$ or <i>t</i>	<i>P</i>
Age (yrs)	38.16±3.74	38.90±3.78	-0.979	0.33
Gender			0.047	0.829
Male	35	34		
Female	15	16		
Type of fracture			0.399	0.819
Car accident	16	19		
Falling injuries from high places	25	23		
Crush injury	9	8		

### 3.2 Comparison of related indexes after intervention of different nursing methods between two groups

The average hospital stay of the control group was  $13.20 \pm 2.29$  days, and the average hospital stay of the test group was  $8.96 \pm 1.63$  days. The difference between the two groups was statistically significant ( $t = -10.662$ ,  $P < 0.05$ ). The incidence of pressure ulcers in the control group was 28% (14/50), and the incidence of pressure ulcers in the experimental group was 6% (3/50). The difference between the two groups was statistically significant ( $\chi^2 = 8.575$ ,  $P < 0.05$ ). In the control group, 12 patients were satisfied, 25 were basically satisfied, and 13 were dissatisfied. The nursing satisfaction rate (satisfaction + basic satisfaction) was 74% (37/50). In the experimental group, 31 patients were satisfied, 17 were basically satisfied, and 2 were not satisfied. The nursing satisfaction rate (satisfaction + basic satisfaction) was 96% (48/50). The difference between the two groups was statistically significant ( $\chi^2 = 9.490$ ,  $P < 0.05$ ). The complications in the control group included 7 patients with nerve root or spinal cord injury, 4 patients with loose or broken internal fixation, 5 patients with infection, and 2 patients with pain. The rate of complications was 36% (18/50). Complications in patients in the experimental group included 2 nerve root or spinal cord injuries, 2 infections, and 1 pain. The incidence of complications was 10% (5/50), the difference between the two groups was statistically significant ( $\chi^2 = 9.543$ ,  $P < 0.05$ ). The statistical analysis results are shown in Table 2.

### 3.3 Comparison of VAS scores between the two groups

The VAS score of the control group before surgery was  $5.19 \pm 0.84$  points, and the test group of patients before surgery was  $5.40 \pm 0.87$  points. There was no statistically significant difference between the two groups ( $t = 1.201$ ,  $P > 0.05$ ). The VAS score of the control group after surgery was  $2.83 \pm 0.56$  points, and the test group was  $1.28 \pm 0.57$  points after surgery. The difference between the two groups was statistically significant ( $t = -13.708$ ,  $P < 0.05$ ). The comparison between the control group and the test group after the operation and before the operation were also statistically significant ( $P < 0.05$ ). The statistical analysis results are shown in Table 3.

## 4 Discussion

Most patients with thoracolumbar vertebral fractures are caused by high-energy trauma, and most are accompanied by spinal nerve injury to varying degrees (Piccone et al., 2020). Patients with severe illness will have high paraplegia, which will have serious adverse effects on their quality of life and health (Watanabe et al., 2019). Thoracic and lumbar fractures account for about 90% of spinal fractures (Sanli et al., 2019). Straight rod compression internal fixation can effectively perform bone graft fusion of the intervertebral space, increase the support of the anterior column and the middle column, and reduce the failure rate of internal fixation. Fusion, or posterolateral fusion, the patient's injured vertebral function can not be restored well.

In the clinical treatment of such patients, it is necessary to formulate a reasonable, effective and operable treatment plan based on spinal canal lesions and neurological symptoms (Lorente et al.,

**Table 2.** Comparison of relevant indicators after intervention of different nursing methods between the two groups.

Variables	Experimental group(n=50)	Control group (n=50)	$\chi^2$ or $t$	$P$
Hospitalization time (days)	$8.96 \pm 1.63$	$13.20 \pm 2.29$	-10.662	<0.001
Whether pressure sore			8.575	0.003
Yes	3	14		
No	47	36		
Nursing satisfaction rate			9.490	0.002
Satisfied	31	12		
Basically satisfied	17	25		
Dissatisfied	2	13		
Complication			9.543	0.002
Nerve root or spinal cord injury	2	7		
Loose or broken internal fixation	0	4		
Infection	2	5		
Pain	1	2		

**Table 3.** Comparison of VAS scores between the two groups.

Variables	Experimental group(n=50)	Control group (n=50)	$t$	$P$
Before surgery	$5.40 \pm 0.87$	$5.19 \pm 0.84$	1.201	0.233
After surgery	$1.28 \pm 0.57$	$2.83 \pm 0.56$	-13.708	<0.001
$t$	28.177	16.808		
$P$	<0.001	<0.001		

2019). Traditional therapy first expands the decompression spinal canal., then the fracture reduction and internal fixation treatment, the operation time is long, the amount of bleeding is large, a small number of elderly patients or patients with severe trauma are not easy to bear, and it is difficult to complete the treatment successfully (De Iure et al., 2018; Franklin et al., 2019). Posterior thoracolumbar vertebral open reduction and internal fixation for thoracolumbar vertebral fractures or burst fractures is the use of vertebral pedicle instruments for open reduction and can accelerate vertebral body height recovery (Cheng & Liu 2019). This treatment uses the posterior longitudinal ligament to reduce the bone mass that has penetrated into the spinal canal. During this period, it is strictly handled according to the relevant operations to ensure the successful completion of the operation and achieve the effect of cleaning the spinal canal.

The incidence of pressure ulcers is one of the important indicators to evaluate the quality of care (Wang et al., 2017b). Therefore, it is imperative to implement a scientific pressure ulcer management method to improve the potential risk of nursing staff to predict the occurrence of pressure ulcers and effectively reduce the occurrence of pressure ulcers. For patients with thoracolumbar vertebral fractures, implementing postural care can minimize the risk of thoracolumbar vertebral fractures and pressure ulcers (Charles & Steib 2015). At the same time,

focusing on local care must also consider the whole, accurately assess the patient's nutritional status, observe eating, sleeping and rehabilitation exercises, implement holistic care, and promote the patient's early recovery.

The results of this study showed that the satisfaction rate of patients in the experimental group was higher than that in the control group, the hospitalization time was shorter than that in the control group, and the incidence of pressure ulcers and complications were lower than those in the control group ( $P < 0.05$ ). There was no statistically significant difference in VAS scores between the two groups before surgery ( $P > 0.05$ ), and the VAS scores in the experimental group were lower than those in the control group ( $P < 0.05$ ). This shows that the treatment of thoracolumbar vertebral fractures with posterior thoracolumbar incision and internal fixation while performing good posture nursing intervention can improve the satisfaction rate of nursing. At the same time, it will reduce the occurrence of pressure ulcers, reduce the incidence of complications, shorten the length of hospital stay, and improve the rehabilitation effect of patients. The treatment of posterior internal fixation can accelerate the recovery of the contour and height of the vertebral body, control the progression of the disease, avoid the aggravation of nerve damage or spinal deformity, etc., and improve the effectiveness and feasibility of the treatment of posterior internal fixation.

Patients with thoracolumbar vertebral fractures treated with posterior approach internal fixation can reduce nerve damage, have a protective effect on nerve function, and have a good preventive effect on complications (Stahl et al., 2017). However, this surgical treatment plan requires long bed rest. If the patient fails to turn over in time or the posture is not appropriate during the operation, it may induce pressure ulcers and affect postoperative recovery (Rojas-Tomba et al., 2017). The main points of clinical posture care include: maintaining spine stability, maintaining effective breathing, paying attention to pipeline management when changing posture, and reducing related soft tissue damage. During postoperative thoracolumbar incision and internal fixation, the position needs to be changed several times. The patient's muscles are relaxed after general anesthesia, and the protective reflex effect is basically weakened or disappeared. During the posture change, the normal physiological axis of the spine needs to be maintained (Gumussuyu et al., 2019). Nursing staff should coordinate well, should be stable, gentle and slow to ensure patient safety. Especially when the prone position is changed to the lateral position, due to the completion of the internal fixation surgery, in order to reduce iatrogenic injury or implant slippage, etc., there must be sufficient nursing staff to assist. The purpose is to ensure that the spine is turned over and the patient is safely placed in the lateral position.

The chest and abdomen should be suspended in the prone position so that the diaphragm breathing is not restricted (Spiegel et al., 2019; Hirschfeld et al., 2015). During the internal fixation, the prone frame is fixed so that it will not slide and displace (Li et al., 2019; Okten et al., 2015). Reduce the patient's own body pressure, avoid pressure ulcers, and correct hypoxia and carbon dioxide accumulation. After each position change, check whether the pipeline is unobstructed, and check whether the circuit is smooth and whether the electrode is pasted to avoid the pressure. When adjusting the head, support the lower jaw and the forehead, avoid supporting the face from both sides,

and prevent the face from being stretched too tight when it is lifted, which increases the chance of damage (Gumussuyu et al., 2019; Hanson et al., 2019). In addition, for female patients, their breasts should be placed inside the prone frame to reduce breast compression, and male patients should avoid penile compression.

## 5 Conclusion

In conclusion, implementing postural nursing interventions in patients with Southern China patients undergoing posterior thoracolumbar incision and internal fixation can not only improve the satisfaction rate of nursing, reduce the incidence of complications, shorten the length of hospitalization, but also reduce the incidence of intraoperative pressure ulcers. This study explores the effect of posture nursing intervention on pressure ulcers in the posterior thoracolumbar incision and internal fixation surgery, and provides a scientific basis for postoperative care of such patients in southern China.

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