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Original Article

Early rehabilitation nursing on prevention of deep venous thrombosis of lower extremities after spinal fractures

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Abstract: Objective: The aim of this study was to explore the effects of early rehabilitation nursing on prevention of deep venous thrombosis of lower limbs after spinal fractures. Methods: Sixty-eight patients with spinal fractures were selected as study subjects. Sixty-eight patients were randomly divided into the experimental group and control group, with 34 patients in each group. The control group received routine nursing intervention. The experimental group received early rehabilitation nursing intervention based on routine nursing intervention. Postoperative lower limb pain rates, lower extremity deep venous thrombosis, lower extremity swelling, hospital stay, negative emotional scores, and nursing satisfaction were compared between the two groups. Results: Postoperative lower limb pain rates and lower extremity deep venous thrombosis were significantly lower in the experimental group than the control group ($P<0.05$). Lower limb swelling and hospitalization times of the experimental group were significantly lower than the control group ($P<0.05$). SAS scores and SDS scores of the experimental group were significantly lower than those of the control group ($P<0.05$). Nursing satisfaction of the experimental group was significantly higher than that of the control group ($P<0.05$). Conclusion: Early rehabilitation nursing intervention for patients with spinal fractures can effectively reduce incidence of postoperative deep venous thrombosis and improve the relationship between nurses and patients. It has a good influence on the rehabilitation of patients with postoperative spinal fractures. It is worthy of clinical promotion.

Keywords: Spinal fracture, postoperative deep venous thrombosis of the lower extremities, early rehabilitation care, usual care

Introduction

Spinal fractures are a more serious type of fracture caused by indirect external forces. Spinal fractures will not only have a huge impact on the normal physiological function of patients, but also greatly reduce quality of life. This brings great pain to patients [1, 2]. Treatment of spinal fractures is mainly surgical treatment. However, postoperative patients are required to rest in bed for a long time because of severe pain. This may cause muscle atrophy, slow blood flow, and deep vein thrombosis of the lower extremities [3, 4]. Venous thrombosis is a disease that results from increased blood viscosity and platelets, due to various causes. This results in increased blood coagulability and decreased pressure of venous return [5]. Venous thrombosis of the lower extremities is one of the common complications after spinal fracture surgery [6]. In patients with spinal fractures, deep venous thrombosis of the lower extremities will not only prolong recovery times of patients, but also greatly reduce quality of life. This may cause a heavy burden on society and families [7]. To reduce incidence of deep vein thrombosis in lower extremities after orthopedic surgery, many methods have been used. For example, foot vein pulse pumps and postoperative anticoagulant drugs have been used, but the effects are not satisfactory [8]. Therefore, how to improve the occurrence of deep venous thrombosis of lower extremities after surgery is an urgent problem that needs to be solved.

In recent years, studies have shown that appropriate nursing intervention after surgery can

effectively prevent the formation of deep venous thrombosis of lower limbs. This is of great clinical significance for patients undergoing orthopedic surgery [9]. For example, studies concerning the application effects of comprehensive nursing intervention in surgery of lower limb fractures have found that incidence of deep venous thrombosis of lower limbs is significantly lower than that of patients under conventional nursing [9]. Early rehabilitation nursing is a relatively rapid development of rehabilitation nursing mode [10]. It has good effects in many diseases, including cerebral thrombosis [11]. However, studies concerning its application after operations in patients with spinal fractures have been rare.

Therefore, aiming to explore the preventive effects of early rehabilitation nursing on the prevention of postoperative deep venous thrombosis of patients with spinal fractures, the present study was conducted.

Materials and methods

General information

A total of 68 patients with spinal fractures were selected, including 41 males and 27 females. The average age of patients was (40.38±3.52) years old. Moreover, 21 patients had lumbar spine fractures, 25 patients had thoracic spine fractures, and 22 patients had cervical spine fractures. Patients were randomly divided into the experimental group and control group, according to nursing methods applied, with 34 patients in each group.

Inclusion exclusion criteria

Inclusion criteria: Patients that met diagnostic criteria for the spine were included.

Exclusion criteria: Exclusion criteria included: Patients with severe viscera or immune diseases; Patients with malignant tumors; Patients with severe infections; Patients with coagulation disorders; Patients with contraindications for surgery; Patients with cognitive and communication disorders; Patients that did not cooperate with the experiment. All patients and families agreed to participate in the experiment and provided informed consent. This study was approved by the Ethics Committee of Affiliated Hospital of Jining Medical University.

Nursing methods

Patients in both groups were treated with spinal fusion, decompression, resection of broken bones, and reinforcement with internal fixators. Patients in the control group were given routine care, including routine diet care and monitoring of vital signs. Patients in the experimental group received early rehabilitation nursing based on routine nursing. A rehabilitation nursing plan was formulated according to the specific conditions of the patients. Specific nursing measures were as follows: 1. Psychological care: Since patients with spinal fractures need to stay in bed for a long time after surgery, they are under great psychological pressure. They are anxious about whether they can recover. Nursing staffs should keep an eye on the psychological status of patients and actively carry out healthy education. They should communicate with patients more often. Negative emotions of the patients should be timely channeled and the rehabilitation process and methods should be carefully explained to the patients. This will give the patients an understanding of the rehabilitation process. Staff should organize the exchange meetings of patients with spinal fractures in the hospital, so that patients with better recoveries can share their rehabilitation and history, encouraging other patients. This allows patients to be more active in convalescence, with an optimistic mindset; 2. Rehabilitation nursing training: Patients were placed in the supine position after the operation, slightly elevating the lower limbs of the patients to promote venous reflux. During night rest, patients are instructed and helped to wear stretch socks to prevent varicose veins in the lower extremities. Lower limbs were massaged twice a day to stimulate the backflow of blood in the lower limbs. Patients are instructed to help with extended flexion exercises with alternate leg elevations. These exercises are stopped when the patient feels fatigued; 3. Postoperative pain care: Postoperative pain is common in patients with spinal fractures, having a negative impact on the patient's normal recovery. It is necessary to spread the knowledge of pain to patients as soon as possible, so that patients have a clear understanding of postoperative pain. On the premise of doctor's guidance, appropriate analgesic drugs are given to the patients to alleviate postoperative pain and improve comfort levels

Table 1. General information table

Factor	Test group n=34	Control group n=34	X^2/t	P
Sex			0.061	0.804
Male	21 (61.76)	20 (58.82)		
Female	13 (38.24)	14 (41.18)		
Age			0.059	0.808
≥40	19 (55.88)	18 (52.94)		
<40	15 (44.12)	16 (47.06)		
BMI			0.060	0.806
≥22	20 (58.82)	19 (55.88)		
<22	14 (41.18)	15 (44.12)		
Fracture site			0.269	0.874
Thoracic vertebra fracture	12 (35.29)	13 (38.24)		
Lumbar fracture	10 (29.41)	11 (32.35)		
Fracture of cervical vertebra	12 (35.29)	10 (29.41)		
Education level			0.073	0.787
Below junior high school	9 (26.47)	10 (29.41)		
Junior high school or above	25 (73.53)	24 (70.59)		
Do you drink alcohol			0.059	0.808
Yes	18 (52.94)	17 (50.00)		
No	16 (47.06)	17 (50.00)		
Liver function index				
Serum total protein g/L	70.88±2.17	71.05±2.26	0.316	0.753
Glutamic pyruvic transaminase μmol/L	26.35±4.19	25.96±4.07	0.389	0.698
Total bilirubin μmol/L	11.58±2.26	11.49±2.33	0.162	0.872

and nursing cooperation. At the same time, patients are given routine injections of low molecular heparin to encourage them to get out of bed as soon as possible; 4. Diet nursing: Patients are given a diet plan and instructed to drink water. The patient should eat as little or as little as possible of spicy and greasy foods. Patients are instructed to eat more vitamins and protein-rich foods, maintaining the amount of water to ensure smooth urine.

Observation target

The experimental observation start time was after the end of the operation, while the observation termination time was at the time of discharge. First, lower limb pain rates and lower limb deep vein thrombosis rates were recorded and compared between the two groups. Next, lower limb-swelling and lengths of hospital stays were compared between the two groups. SAS and SDS scores [12] were used to evaluate and compare the negative emotions of the two groups of patients. Sf-36 quality of life scale [13] was used to evaluate and compare the quality of life of patients in the two groups. Finally, nursing satisfaction between the two groups was evaluated and compared.

Statistical methods

SPSS 19.0 software (Bo Yi Zhixun (Beijing) Information Technology Co., Ltd.) was used to perform statistical analysis on the collected data. Count data was analyzed by Chi-squared test. Measurement data are represented by mean plus or minus standard deviation. Student's t-test was used for analysis between two groups. $P<0.05$ indicates statistical significance.

Results

Comparison of general data between the two groups of patients

There were no significant differences in gender, age, BMI, and fracture sites between the two groups ($P>0.05$), suggesting that the two groups were comparable (**Table 1**).

Table 2. Lower limb pain rates and incidence of deep venous thrombosis in the two groups of patients

	Test group n=34	Control group n=34	X^2	P
Lower limb pain rate	3 (8.82)	11 (32.35)	5.757	<0.050
Incidence of deep vein thrombosis in lower extremities	1 (2.94)	7 (20.59)	5.100	<0.050

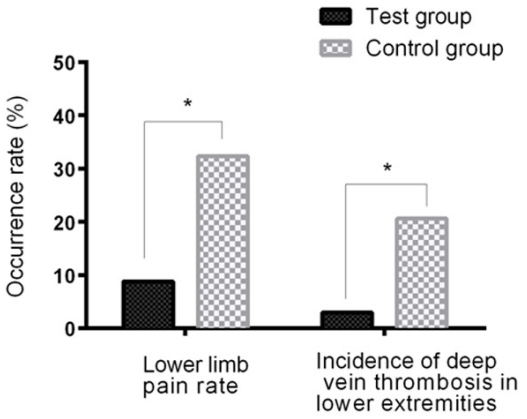

Figure 1. Lower limb pain rates and lower limb deep vein rates in both groups were significantly lower in the experimental group than in the control group. Differences were statistically significant (P<0.05). Note: *P<(0.05), compared with the control group.

Comparison of lower limb pain rates and lower extremity deep vein incidence between the two groups

In the experimental group, the number of patients with lower extremity pain was 3. The pain rate of lower limbs was 8.82%. The number of patients with deep venous thrombosis of lower extremities was 1, while incidence of deep venous thrombosis was 2.94%. In the control group, the number of patients with lower extremity pain was 11. The pain rate of lower limbs was 32.35%. The number of patients with deep venous thrombosis was 7, while incidence of deep venous thrombosis was 20.59%. Lower limb pain rates and the lower limb deep vein thrombosis rates of the experimental group were significantly lower than those of the control group. Differences were statistically significant (P<0.05) (**Table 2** and **Figure 1**).

Comparison of lower limb swelling and hospitalization times between the two groups

In the experimental group, the degree of swelling of the lower extremities was (2.01±0.47) cm. Hospitalization time was (13.58±4.66) days. The swelling degree of the lower extremities in the control group was (3.42±0.76) cm. Hospitalization time was (19.89±6.02) days. Lower limb swelling and hospitalization times of the experimental group were significantly lower than lower limb swelling and hospitalization times of the control group. Differences were statistically significant (P<0.05) (**Table 3**).

Negative sentiment scores in both groups

SAS scores and SDS scores of the experimental group after nursing intervention were (28.79±4.82) and (29.03±5.21), respectively. SAS and SDS scores of the control group after nursing intervention were (49.86 + 5.63) and (50.12 + 5.79), respectively. SAS and SDS scores of the experimental group were significantly lower than those of the control group after nursing intervention. Differences were statistically significant (P<0.05) (**Table 4** and **Figure 2**). Results suggest that early rehabilitation care also had significant improvement effects on the negative emotions of patients.

Comparison of quality of life between the two groups of patients after care

The sf-36 quality of life scale was used to evaluate the quality of life of patients in both groups after nursing care. Psychological function, physical function, social function, and role function scores of the experimental group were (96.94±16.68), (98.51±16.86), (96.79±15.13), and (97.99±15.53), respectively. Scores of psychological function, physical function, social function, and role function of the control group were (87.29±15.71), (90.03±15.26), (89.42±14.81), and (90.34±14.13), respectively. Quality of life scores of the experimental group patients were significantly higher than those of the control group. Differences were statistically significant (P<0.05) (**Table 5**).

Comparison of nursing satisfaction between the two groups

After nursing intervention, the number of patients that were very satisfied, satisfied, and dissatisfied with the nursing group was 23, 10,

Table 3. Comparison of lower extremity swelling and lengths of stays in the two groups of patients

	Test group n=34	Control group n=34	t	P
Swelling of lower limbs (cm)	2.01±0.47	3.42±0.76	9.201	<0.001
Time of hospitalization (d)	13.58±4.66	19.89±6.02	4.833	<0.001

Table 4. Comparison of SAS scores and SDS scores between the two groups of patients

	Test group n=34	Control group n=34	t	P
SAS	28.79±4.82	49.86±5.63	16.58	<0.001
SDS	29.03±5.21	50.12±5.79	15.79	<0.001

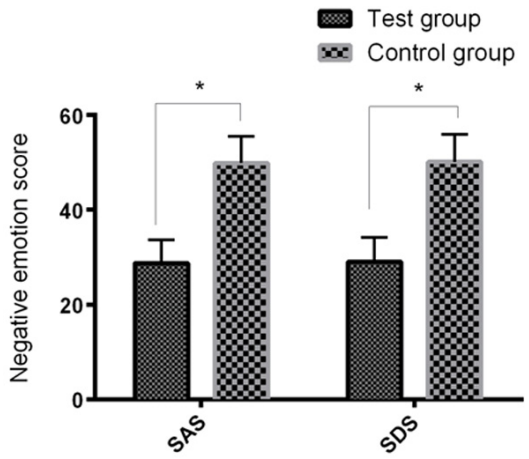

Figure 2. SAS scores and SDS scores of the two groups of patients after nursing intervention. SAS scores and SDS scores of the experimental group were significantly lower than those of the control group. Differences were statistically significant (P<0.05). Note: *P<(0.05), compared with the control group.

and 1, respectively. The satisfaction of nursing was 97.06%. The number of patients that were very satisfied, satisfied, and dissatisfied with the nursing group was 12, 13, and 9 respectively. The satisfaction of nursing was 73.53%. Nursing satisfaction of the experimental group was significantly higher than that of the control group. Differences were statistically significant (P<0.05) (**Table 6**).

Discussion

In recent years, with the continuous development of society, incidence of traffic and construction accidents has increased significantly. This has resulted in more and more patients with spinal fractures [14]. Studies have shown that most patients with spinal fractures havespinalcordinjuries.Formation of deep venous thrombosis of the lower extremities can be easily caused by improper treatment or care. Once deep venous thrombosis of the lower extremities occurs, it can have a very serious impact on the normal lives of patients, even resulting in disability [15, 16]. The main mechanism of deep venous thrombosis of lower extremities is that the blood is hypercoagulated due to venous wall injuries during the operation or long-term lying in bed after the operation. These factors eventually lead to the formation of deep venous thrombosis of lower extremities [17]. Due to the serious impact of deep venous thrombosis of the lower extremities on patients, it is clinically necessary to find a way to effectively reduce incidence.

Many methods have been used, including anticoagulation and preoperative massages of lower limbs, but without significant effects [18]. In recent years, studies [19, 20] have pointed out that, if appropriate care can be given after fractures, it can effectively reduce incidence of deep venous thrombosis in the lower limbs and promote the recovery of patients. However, the specific nursing mode that is the most effective has not been decided. Early rehabilitation nursing is a nursing mode that can be applied in many surgical operations, achieving good results [21, 22]. Therefore, the current study explored the effects of early rehabilitation care on prevention of postoperative deep venous thrombosis in patients with spinal fractures.

After patients were randomly divided into two groups, the control group was given routine nursing and the experimental group was given early rehabilitation nursing based on routine nursing. In the nursing process, anticoagulation nursing was used. Psychological counseling was also conducted for patients, developing rehabilitation plans for the mechanisms of deep venous thrombosis of lower limbs, helping patients to carry out the implementation. Postoperative pain can be alleviated through the implementation of pain care. This may improve patient cooperation and the active

Table 5. Comparison of quality of life scores between the two groups of patients after nursing

	Test group n=34	Control group n=34	t	P
Psychological function	96.94±16.68	87.29±15.71	2.456	<0.050
Somatic function	98.51±16.86	90.03±15.26	2.174	<0.050
Social function	96.79±15.13	89.42±14.81	2.030	<0.050
Role function	97.99±15.53	90.34±14.13	2.125	<0.050

Table 6. Comparison of nursing satisfaction of the two groups of patients [n, (%)]

Nursing satisfaction	Test group n=34	Control group n=34	X^2	P
Very satisfied	23 (67.65)	12 (35.29)	-	-
Satisfied	10 (29.41)	13 (38.24)	-	-
Dissatisfied	1 (2.94)	9 (26.47)	-	-
Nursing satisfaction	33 (97.06)	25 (73.53)	7.503	<0.050

degree of participation in rehabilitation training. Finally, the results of this study showed that lower limb pain rates and the lower limb deep vein thrombosis rates of the experimental group were significantly lower than those of the control group. Differences were statistically significant (P<0.05). Present results suggest that early rehabilitation can effectively reduce occurrence of deep venous thrombosis of lower limbs, indicating that early rehabilitation care may be a postoperative care model for patients with spinal fractures. Previous studies [23] have reached the same conclusions, exploring the application of comprehensive rehabilitation care in patients with spinal fractures. The current study then compared lower limb-swelling and lengths of hospital stays between the two groups. Results were significant. Lower limb swelling degrees and hospitalization times of the experimental group were significantly lower than those of the control group. Differences were statistically significant (P<0.05). Finally, negative emotions, life quality, and nursing satisfaction of the patients were compared. Results showed that SAS and SDS scores of the experimental group were significantly better than those of the control group. Differences were statistically significant (P<0.05). In the process of early rehabilitation nursing implementation, this study aimed at the individual situation of patients, adopting a step-by-step method to finally achieve the nursing purpose. In addition, life quality scores and nursing satisfaction of patients in the experimental group were significantly higher than those in the control group. Differences were statistically significant (P<0.05). Deep vein thrombosis of the lower extremities may occur not only in patients with spinal fractures, but also after other orthopedic surgeries. The mechanisms of occurrence are similar. A previous study [24] explored the effects of adopting comprehensive nursing mode after major orthopedics surgeries, finding that incidence of deep venous thrombosis of lower limbs was significantly reduced in patients receiving comprehensive nursing intervention, compared with those receiving conventional nursing. It is believed that this is because proper nursing can improve the blood rheology of patients. Other studies [25] suggest that the intervention of comprehensive nursing methods in patients after spinal fracture surgeries can effectively reduce incidence of pain in lower limbs and improve nursing satisfaction. Although there are some differences between comprehensive nursing and early rehabilitation nursing, there are similarities in the implementation methods and present conclusions are confirmed.

In summary, early rehabilitation care in patients with spinal fractures can effectively reduce incidence of deep venous thrombosis of lower extremities. Moreover, it can effectively improve the negative emotions of patients, promote the rehabilitation process of patients, and improve the quality of life of patients. It is worthy of clinical promotion. However, in this study, the specific mechanisms of reducing deep venous thrombosis of lower extremities in the nursing mode were not described in detail. Occurrence of other complications of the patients was not recorded. The recovery of patients after discharge was not followed up. In the future, present researchers conduct a more comprehensive discussion on the application of various nursing modes in patients with spinal fractures after surgery.

Disclosure of conflict of interest

None.

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