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# Effects of Stepwise Rehabilitation Nursing Intervention on Patients with Lumbar Disc Herniation After Minimally Invasive Surgery and Japanese Orthopedic Association Score

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**ABSTRACT**

**Objective:** To evaluate the effects of stepwise rehabilitation nursing intervention on patients with lumbar disc herniation (LDH) after minimally invasive surgery and the Japanese Orthopedic Association (JOA) score.

**Methods:** A total of 120 LDH patients undergoing minimally invasive surgery in our hospital from January 2017 to October 2019 were enrolled and divided into two groups (n=60) using a random number table. In control group, routine nursing was given, based on which stepwise rehabilitation nursing was given in observation group. The lumbar pain score, comfort score, lumbar function score, lumbar mobility, negative emotion score, sleep status indices, quality-of-life score and nursing satisfaction were compared between the two groups.

**Results:** After nursing, the lumbar pain score was lower in observation group than that in control group, and the comfort score was higher in observation group than that in control group (P<0.05). The JOA score and lumbar mobility were higher in observation group than those in control group (P<0.05). Both anxiety and depression scores were lower in observation group than those in control group (P<0.05). Compared with those in control group, the sleep latency was shortened, the actual sleep duration was prolonged, and the sleep quality score declined in observation group after nursing (P<0.05). Observation group had a higher quality-of-life score than control group (P<0.05). The overall nursing satisfaction in observation group (96.67%) was higher than that in control group (81.67%) (P<0.05).

**Conclusion:** Stepwise rehabilitation nursing can reduce lumbar pain after minimally invasive surgery, enhance comfort, improve lumbar function and mobility, help reduce negative emotions, raise both sleep quality and quality of life, and make LDH patients more satisfied with nursing services.

**KEYWORDS:** lumbar disc herniation; minimally invasive surgery; stepwise rehabilitation nursing; quality of life

## INTRODUCTION

Lumbar disc herniation (LDH) is a common spinal disease, and patients are mostly accompanied by lower back pain and numbness of lower limbs, seriously affecting their daily life [1-3]. Minimally invasive surgery is dominated in the clinical treatment of LDH, but the recovery effect on lumbar function of patients is unsatisfactory if only surgical treatment is conducted. In view of this, it is clinically believed that necessary nursing intervention is needed for surgical patients with LDH. Stepwise rehabilitation nursing is a rehabilitation nursing plan implemented in stages based on the specific conditions of patients. In this paper, 120 LDH patients undergoing minimally invasive surgery in our hospital from January 2017 to October 2019 were enrolled for a randomized controlled study, aiming to explore the improvement effect of stepwise rehabilitation nursing on the lumbar function of LDH patients after minimally invasive surgery.

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## MATERIALS AND METHODS

### Baseline Clinical Data

A total of 120 LDH patients undergoing minimally invasive surgery in our hospital from January 2017 to October 2019 were enrolled and divided into two groups, with 60 cases in each group, using a random number table. In control group, there were 32 males and 28 females aged 37-81 years old, with an average of (59.18 ± 12.65) years old. In observation group, there were 33 males and 27 females aged 36-82 years old, with an average of (59.47 ± 12.53) year old. The gender and age were comparable between the two groups (P>0.05). This study was approved by the Medical Ethics Committee, and the patients and their families were informed of the study and signed the consent.

Inclusion criteria: (1) Patients diagnosed with LDH through imaging examination, laboratory examination and observation of clinical symptoms, (2) those aged ≥18 years old, (3) those with indications for minimally invasive surgery and undergoing minimally invasive surgery, and (4) those who had clear consciousness and could cooperate in the study.

Exclusion criteria: (1) Patients with mental disorders, (2) those with tuberculosis of lumbar spine, lumbar tumor or spinal compression fractures, (3) those with cardio-cerebrovascular diseases, (4) pregnant or lactating women, or (5) those who were lost to follow-up or dropped out of the study.

### Methods

In control group, routine nursing was given, as follows. (1) Health education: The knowledge related to LDH was explained to patients in detail in the form of health manuals and videos, and the importance of minimally invasive surgery and postoperative rehabilitation training was emphasized. (2) Psychological intervention: The caregivers talked to patients, encouraged them to express their inner thoughts, analyzed and summarized the psychological problems of patients in the process of listening to them, provided targeted psychological counseling and comforted patients. (3) Medication guidance: The drugs were administered to patients according to the doctor's advice during the perioperative period, the medication methods and precautions were explained to patients, and the vital signs were monitored and recorded after medication. (4) Functional exercise: The patients were guided for functional exercise in line with the progressive principle: first passive joint exercise of limbs in bed, and then off-bed exercise and active joint exercise.

On the basis of routine nursing, stepwise rehabilitation nursing was given in observation group. The stepwise rehabilitation nursing group was built, and the members attended training about knowledge related to perioperative nursing and rehabilitation nursing for LDH, and then discussed in the group. Based on the rehabilitation demands and actual conditions of LDH patients, the stepwise rehabilitation nursing plan was developed, including the following nursing measures besides the routine ones. (1) Preoperative nursing: The structural and biomechanical characteristics of the lumbar intervertebral disc in the human body were explained to patients in detail through pictures, health manuals and videos, and the importance of correct daily activity posture for the functional recovery of lumbar intervertebral disc was emphasized. Under the condition without increasing the degree of pain, the patients were guided for moderate preoperative exercise, and practiced getting in and out of bed correctly. At the same time, the patients were encouraged, and the outcome of LDH was explained to them in detail, so as to build confidence. (2) Nursing on the day of operation: On the day of operation, after the anesthetic drug worn off, the patients were guided for rehabilitation training: first passive straight-leg raising training, and then active straight-leg raising training. After complete resuscitation, the patients were guided for ankle joint exercise as much as possible. (3) Postoperative nursing: At 1 d after operation, the patients were instructed to wear waist protector, and got out of bed for activity: first bedside standing and balance training, and then off-bed walking training. At 2-7 d after operation, the patients were instructed to gradually prolong the duration of walking, and the unreasonable aspects in the rehabilitation training were corrected. From the 8th d after operation to the 1st d before discharge, the patients were guided for lumbar dorsal muscle and abdominal muscle training, during which bending and weight bearing should be avoided as far as possible. (4) Discharge guidance: On the day of discharge, the self-made rehabilitation training manual for LDH was issued to the patients, and the patients were instructed to exercise according to the manual. The rehabilitation training must be insisted on within 3 months after operation. Moreover, the consulting hotline and WeChat public account were set up, so that the doubts of patients can be solved through telephone and WeChat.

**Observation Indices**

The lumbar pain score, comfort score, lumbar function score, lumbar mobility, negative emotion score, sleep status indices, quality-of-life score and nursing satisfaction were compared between the two groups.

Lumbar pain score: The visual analogue scale (VAS) was used for evaluation before nursing (1 d after admission) and after nursing (1 month after operation). The score ranges from 0 to 10 points, and it is directly proportional to the degree of pain.

Comfort score [4]: General comfort questionnaire (GCQ) was used for evaluation before nursing (1 d after admission) and after nursing (1 month after operation). The score ranges from 28 to 112 points, and it is directly proportional to the degree of comfort.

Lumbar function score [5]: Japanese Orthopedic Association (JOA) scale was used for evaluation before nursing (1 d after admission) and after nursing (1 month after operation). The score ranges from 0 to 29 points, and it is directly proportional to the lumbar function.

Lumbar mobility: The lumbar anteflexion, retroextension, lateral flexion and rotation angle were measured before nursing (1 d after admission) and after nursing (1 month after operation).

Negative emotion score [6]: Self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were used for evaluation before nursing (1 d after admission) and after nursing (1 month after operation). Both SAS and SDS scores are 0-100 points, and they are positively correlated with the degree of anxiety and depression.

Sleep status indices [7]: Sleep latency, actual sleep duration and sleep quality score were assessed before nursing (1 d after admission) and after nursing (1 month after operation). The sleep quality was evaluated using Pittsburgh sleep quality index (PSQI, 0-21 points), and the score is inversely proportional to the sleep quality.

Quality-of-life score [8]: The World Health Organization Quality of Life Scale Brief Version (WHOQOL-BREF) was used for evaluation before nursing (1 d after admission) and after nursing (1 month after operation). The scale includes 4 dimensions (physiology, psychology, environment and social relation). The score of each dimension ranges from 0 to 100 points, and it is directly proportional to the quality of life.

Nursing satisfaction: The self-made questionnaire was used for satisfaction survey after nursing (1 month after operation), and the total score is 100 points: high satisfaction (81-100 points), general satisfaction (60-80 points), and no satisfaction (0-59 points). Overall satisfaction = high satisfaction + general satisfaction.

**Statistical Analysis**

SPSS 26.0 software was used. The $\chi^2$ test was performed for numerical data (n), and the *t* test was conducted for quantitative data ( $\bar{\chi} \pm s$). P<0.05 was statistically significant.

**RESULTS**

**Lumbar Pain and Comfort Scores**

The lumbar pain score and comfort score were improved in both groups after nursing compared with those before nursing. After nursing, the lumbar pain score was lower in observation group than that in control group, and the comfort score was higher in observation group than that in control group (P<0.05) (Table 1).

**JOA Scores and Lumbar Mobility**

The JOA score and lumbar mobility were increased in both groups after nursing compared with those before nursing. After nursing, the JOA score and lumbar mobility were higher in observation group than those in control group (P<0.05) (Table 2).

**Negative Emotion Scores**

The anxiety and depression scores declined in both groups after nursing compared with those before nursing. After nursing, both anxiety and depression scores were lower in observation group than those in control group (P<0.05) (Table 3).

**Sleep Status Indices**

The sleep latency, actual sleep duration and sleep quality score were improved in both groups after nursing compared with those before nursing. Compared with those in control group, the sleep latency was shortened, the actual sleep duration was prolonged, and the sleep quality score declined in observation group after nursing (P<0.05) (Table 4).

**Quality-Of-Life Scores**

The quality-of-life score rose in the two groups after nursing compared with that before nursing. After nursing, observation group had a higher quality-of-life score than control group (P<0.05) (Table 5).

**Nursing Satisfaction Rates**

The overall nursing satisfaction rate in observation group (96.67%) was higher than that in control group (81.67%) (P<0.05) (Table 6).

## DISCUSSION

LDH mainly refers to the protrusion of lumbar intervertebral disc into the spinal canal due to a variety of factors, causing compression on the spinal nerve roots, manifested as lumbar pain and limitation of lumbar motion. LDH is characterized by a long course of disease, and the patients suffer from lumbago and back pain for a long time and are affected by lumbar dysfunction and limitation of lumbar motion. As a result, they often cannot be engaged in hard physical labor, seriously affecting their daily life [9-11].

Clinically, the pathogenesis of LDH remains unclear. There are many treatment means for LDH, a common one of which is minimally invasive surgery. It can remove the diseased intervertebral disc and its nucleus pulposus, thereby relieving nerve root compression and alleviating lumbar pain and limitation of lumbar motion [12-13]. However, due to the severe lumbar dysfunction in LDH patients, the lumbar function cannot be restored to the ideal state immediately after operation, so nursing intervention is still needed to further enhance the restoration of lumbar function.

During the perioperative period of minimally invasive surgery for LDH, the routine nursing measures are mainly health education, psychological intervention and medication guidance. However, such measures are less targeted and less beneficial for the rehabilitation effect on patients. As a novel nursing model, stepwise rehabilitation nursing is given in stages based on the specific conditions of patients. During rehabilitation training, the rehabilitation training program is constantly adjusted according to the conditions of patients, so that the rehabilitation training can better fit the patients, and the training process can be enhanced in a stepwise manner, which is conducive to gradually speeding up the rhythm of training and helping the patients recover step by step [14]. In this study, stepwise rehabilitation nursing was given in observation group throughout the perioperative period of minimally invasive surgery, and the patients received instructions for rehabilitation training before operation, on the day of operation, and after operation and discharge. The results showed that (1) after nursing, the lumbar pain score was lower in observation group than that in control group, and the comfort score was higher in observation group than that in control group. After nursing, the JOA score and lumbar mobility were higher in observation group than those in control group. It can be seen that stepwise rehabilitation nursing can reduce lumbar pain, enhance comfort, further improve lumbar function and relieve limitation of lumbar motion in LDH patients. (2) After nursing, both anxiety and depression scores were decreased in observation group in comparison with those in control group, indicating that stepwise rehabilitation nursing can ameliorate the mental status of LDH patients. The main reason is that it enhances the restoration of lumbar function. (3) After nursing, observation group exhibited shortened sleep latency, a prolonged actual sleep duration, a reduced sleep quality score and a raised quality-of-life score compared with those in control group. The above findings suggest that stepwise rehabilitation nursing can reduce sleep disorders and improve the quality of life of patients, mainly because it raises the rehabilitation effect and reduces the interference of lumbar dysfunction and lumbar pain in the sleep and daily life of patients. (4) The overall nursing satisfaction rate in observation group (96.67%) was higher than that in control group (81.67%). This is mainly because stepwise rehabilitation nursing can provide more considerate nursing services for patients, and enhance the rehabilitation effect on patients, making them more satisfied with nursing services.

In conclusion, stepwise rehabilitation nursing can reduce lumbar pain after minimally invasive surgery, enhance comfort, improve lumbar function and mobility, help reduce negative emotions, and raise the quality of both sleep and life, making LDH patients more satisfied with nursing services.

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*Table 1.* **Lumbar pain and comfort scores ( $\bar{\chi}$ ± s, point)**

| Group | Time | Lumbar pain score | Comfort score |
|---|---|---|---|
| Control (n=60) | Before nursing | 5.42±1.35 | 78.16±7.20 |
| | After nursing | 3.89±0.94# | 87.33±8.45# |
| Observation (n=60) | Before nursing | 5.34±1.39 | 78.47±7.31 |
| | After nursing | 2.91±0.87#* | 98.50±10.17#* |

#P<0.05 *vs.* the same group before nursing, *P<0.05 *vs.* control group.

*Table 2.* **JOA scores and lumbar mobility ( $\bar{\chi}$ ± s)**

| Group | Time | JOA score | Lumbar mobility (°) | | | |
|---|---|---|---|---|---|---|
| | | | Anteflexion | Retroextension | Lateral flexion | Rotation |
| Control (n=60) | Before nursing | 16.58±2.03 | 47.29±5.16 | 12.51±1.84 | 14.19±1.96 | 13.29±1.47 |
| | After nursing | 19.37±2.65# | 52.37±6.84# | 14.69±2.18# | 16.43±2.27# | 15.07±1.86# |
| Observation (n=60) | Before nursing | 16.74±2.19 | 47.53±5.08 | 12.73±1.96 | 14.31±1.93 | 13.40±1.52 |
| | After nursing | 22.09±2.71#* | 60.46±7.32#* | 17.05±2.37#* | 18.97±2.54#* | 17.12±2.05#* |

#P<0.05 *vs.* the same group before nursing, *P<0.05 *vs.* control group.

*Table 3.* **Negative emotion scores ( $\bar{\chi}$ ± s, point)**

| Group | Time | Anxiety score | Depression score |
|---|---|---|---|
| Control (n=60) | Before nursing | 54.57±6.91 | 55.28±6.74 |
| | After nursing | 47.23±5.47# | 48.37±5.86# |
| Observation (n=60) | Before nursing | 54.43±6.95 | 55.16±6.80 |
| | After nursing | 41.68±4.83#* | 42.40±5.19#* |

#P<0.05 *vs.* the same group before nursing, *P<0.05 *vs.* control group.

*Table 4.* **Sleep status indices ( $\bar{\chi}$ ± s)**

| Group | Time | Sleep latency (min) | Actual sleep duration (h) | PSQI score (point) |
|---|---|---|---|---|
| Control (n=60) | Before nursing | 64.95±12.73 | 5.89±0.57 | 15.34±2.69 |
| | After nursing | 50.87±9.45# | 6.63±0.74# | 12.65±2.24# |
| Observation (n=60) | Before nursing | 64.70±12.85 | 5.92±0.59 | 15.27±2.75 |
| | After nursing | 40.13±8.09#* | 7.49±0.86#* | 10.41±1.98#* |

#P<0.05 *vs.* the same group before nursing, *P<0.05 *vs.* control group.

*Table 5.* **Quality-of-life scores ( $\bar{\chi}$ ± s, point)**

| Group | Time | Physiology | Psychology | Environment | Social relationship |
|---|---|---|---|---|---|
| Control (n=60) | Before nursing | 69.56±5.09 | 70.38±5.20 | 69.27±4.81 | 70.09±5.18 |
| | After nursing | 77.09±6.53# | 78.12±6.17# | 76.35±5.03# | 77.94±5.23# |
| Observation (n=60) | Before nursing | 69.68±5.04 | 70.52±5.13 | 69.38±4.75 | 70.20±5.04 |
| | After nursing | 83.45±6.37#* | 84.39±6.28#* | 82.46±5.14#* | 83.57±5.69#* |

#P<0.05 *vs.* the same group before nursing, *P<0.05 *vs.* control group.

*Table 6.* **Nursing satisfaction rates [n (%)]**

| Group | n | High satisfaction | General satisfaction | No satisfaction | Overall satisfaction rate |
|---|---|---|---|---|---|
| Control | 60 | 29 (48.33) | 20 (33.33) | 11 (18.33) | 49 (81.67) |
| Observation | 60 | 35 (58.33) | 23 (38.33) | 2 (3.33) | 58 (96.67) * |

*P<0.05 *vs.* control group.