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Original Article

Rehabilitation nursing for patient rehabilitation after minimally invasive spine surgery

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Abstract: Objective: To explore the effects of rehabilitation nursing interventions on pain, hospital stay, the incidence of complications, activities of daily living (ADLs) and nursing satisfaction of patients undergoing minimally invasive spine surgery (MISS). Methods: One hundred patients with lumbar disc herniation (LDH) admitted to Tangshan Gongren Hospital Rehabilitation Hospital who had undergone MISS were recruited in this study between January 2015 and December 2017 and were randomized into the control group (n=50) and the observation group (n=50). Patients in the control group were given routine nursing alone, whereas those in the observation group received rehabilitation nursing interventions in addition to usual care. Rehabilitation nursing interventions included rehabilitation exercise, pain care, psychological care, discharge guidance, complications care and sleep care. The VAS pain score, time to postoperative ambulation, length of hospital stays, the incidence of complications, the Barthel index score (ADL) and nursing satisfaction were compared between the two groups. Results: Compared with the control group, the observation group had significantly lower VAS score (P<0.001), shorter time to postoperative ambulation and hospital stays (both P<0.001), a lower rate of total complications (P=0.033), higher Barthel index score (P<0.001), as well as a significantly high rate of nursing satisfaction (P=0.004). Conclusion: For patients with MISS, rehabilitation nursing interventions can significantly relieve pain, shorten the time to postoperative ambulation and hospital stays, reduce the incidence of complications, and improve patients' ability to perform ADLs and satisfaction with nursing care. Thus, it is worthy of generalization in clinical practice.

Keywords: Rehabilitation nursing, minimally invasive spine surgery, pain, prognosis

Introduction

Minimally invasive spine surgery (MISS) has the advantages of small trauma and fast recovery from surgery, and plays a critical role in the treatment of lumbar disc herniation (LDH), spinal fracture and other spinal diseases [1, 2]. However, some studies have reported MISS may result in physical dysfunction and traumatic pain in patients [3, 4]. Perioperative nursing intervention seems particularly necessary after MISS. Currently, in the clinic setting, common nursing programs have no evident intervening effects on patients undergoing MISS, nor do they greatly impact the indicators of hospital stay, complication rates and so on. They can no longer meet the requirements of patients with MISS [5, 6]. With the changes of surgical nursing idea and higher requirements for nursing quality, it is of great significance to find new nursing interventions to improve prognosis of patients undergoing MISS.

Recently, rehabilitation nursing intervention has been applied to clinical nursing care. The major idea of the intervention is to improve the efficacy of clinical nursing care, shorten hospital stay, reduce the incidence of complications, minimize physical dysfunction and accelerate the recovery of patients by optimizing surgical and perioperative management [7]. Evidence shows that the application of rehabilitation nursing to perioperative care of patients with gastric cancer, breast cancer or rectal cancer have achieved good results [8-10]. However, there are rare reports about the use of rehabili-

tation nursing after MISS [11, 12]. Therefore, in this study, 100 MISS patients admitted to Tangshan Gongren Hospital Rehabilitation Hospital who had undergone MISS from January 2015 to December 2017 were enrolled as subjects and they were given rehabilitation nursing, with an aim to observe the effects of rehabilitation nursing on postoperative pain and prognosis of such patients.

Materials and methods

Study subjects

One hundred patients with LDH who had undergone miss in department of orthopedics of Tangshan Gongren Hospital Rehabilitation Hospital between January 2015 and December 2017 were recruited in this study. They were randomly assigned to receive either routine nursing (control group, n=50) or rehabilitation nursing intervention in addition to usual care (observation group, n=50). Inclusive criteria were (1) patients older than 18 years who had received MISS due to LDH, without surgical contraindications; (2) patients actively cooperated in this study. Exclusive criteria included (1) patients complicated with spinal stenosis, spondylolisthesis and spinal instability; (2) a history of spinal surgery; (3) severe concomitant hepatic and renal insufficiency; (4) cardiovascular and cerebrovascular disease or mental illness. All the subjects signed written informed consent, and the protocol was approved by the ethics committee of Tangshan Gongren Hospital Rehabilitation Hospital.

Nursing methods

After induction of general anesthesia, the patients underwent transforaminal lumbar discectomy. All the surgeries were performed by the same medical staff. The usual care program included health education, dietary guidance, preoperative preparation, postoperative monitoring of vital signs, as well as symptomatic treatment in case of changes in the disease. In addition to usual care, postoperative rehabilitation nursing interventions also included: (1) rehabilitation training, patients were guided to do rehabilitation exercise correctly (such as on-bed movement, turning the body over, abdominal and lumbar dorsal muscle exercise, and sit-to-stand movements with a waist belt); (2) pain care, patients were observed for pain changes, given celecoxib for analgesia according to the doctor's orders, and instructed to divert attention from pain; (3) psychological care, care providers were aware of the patients' psychological status, made active communication to minimize their negative emotions, helped them to have conviction to overcome the disease, and become confident in rehabilitation; (4) discharge guidance, patients were informed of the do's and don'ts and the necessity to keep functional exercise after discharge, asked to refrain from any waist load or physically strenuous activity, and develop correct postures of walking, sitting and carrying articles; (5) complication care, patients underwent nursing interventions for pulmonary infection, pressure sores, abdominal distention and deep venous thrombosis; (6) sleep care, patients were provided a quiet and comfortable environment with fewer caregivers to improve their sleep quality. The nursing interventions for the two groups of patients initiated from admission to 1 month after operation.

Outcome measures

The visual analog scale (VAS) scores were compared between the two groups on day 3 after nursing. The VAS score was used to evaluate the pain profile of patients (on a scale ranging from 0 to 10, with a score of 0 indicates no pain and 10 severe pain). In addition, time to ambulation and length of hospital stay, as well as postoperative complications were compared between the two groups. Complications included pulmonary infection, pressure sores, abdominal distension and deep vein thrombosis.

Activities of daily living (ADL) were compared between the two groups. Barthel Index Scale was used to assess the patients' ADLs 1 month after surgery [13]. The scale comprises 10 items of daily activities (feeding, bathing, dressing, grooming, continent bowels, continent bladder, toilet use, transfers (bed to chair and back), mobility (on level surfaces, 45-meter walk), and stairs (up and down). The scale had total scores of 100, with higher score indicating better performance of ADLs in patients. Patient nursing satisfaction was also compared between the two groups. Nursing satisfaction refers to patients' subjective evaluation for health education, ward environment, therapeu-

Table 1. Basic data of patients

Variable	Observation group	Control group	t/χ^2 value	*P* value
Case	50	50		
Age (year)	60.1±4.7	61.5±4.9	1.458	0.148
Male/female (n)	31/19	29/21	0.167	0.683
Hypertension	11	13	0.219	0.640
Diabetes	9	12	0.542	0.461
COD (year)	3.2±1.1	3.6±1.4	1.589	0.115
Segments of LDH			0.713	0.398
L3-L4	31	35		
L4-L5	19	15		

Note: COD denotes course of disease; LDH lumbar disc herniation.

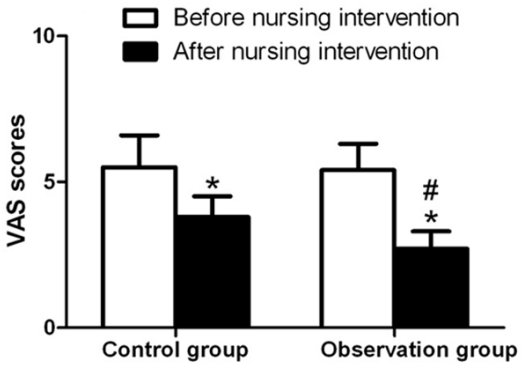

Figure 1. VAS scores of the two groups before and after nursing intervention. *P<0.001 for comparison with the VAS score before nursing intervention; #P<0.001 for comparison with the control group after nursing intervention.

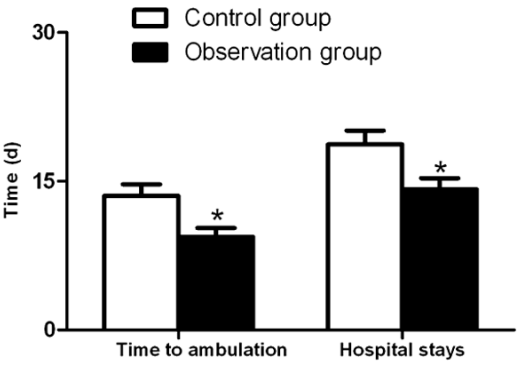

Figure 2. Time to ambulation and length of hospital stay after surgery between the two groups. *P<0.001 for comparison with the control group.

tic effect as well as work attitudes of medical staff [14]. It has a total score of 100 points, with more than 90 points indicating great satisfaction, 80 to 90 satisfaction, 60 to 79 general satisfaction, and less than 60 dissatisfaction.

Statistical process

SPSS statistical software, version 21.0, was used to process experimental data. Measurement data are expressed as mean ± standard deviation. Between-group comparisons were performed by an independent samples t test, whereas intragroup comparisons before and after nursing intervention were made by a paired t test. Count data are described as percentage, and between-group comparisons were conducted by Chi-square tests. P<0.05 was deemed to be significantly different.

Results

Basic data of patients

The two groups of patients were well-matched in age, male-female ratio, the proportions of patients with hypertension and diabetes (all P>0.05; **Table 1**).

VAS score

Before nursing intervention, there was no significant difference in VAS score between the two groups. After nursing intervention, the VAS scores of both groups were significantly lower than those before nursing intervention (both<0.001), with the VAS score favoring the observation group (P<0.001; **Figure 1**).

Time to ambulation and length of hospital stay after surgery

The time to ambulation and length of hospital stay after surgery in the observation group were significantly reduced relative to the control group (both P<0.001; **Figure 2**).

Postoperative complications

There were 5 cases of abdominal distention, 2 cases of pulmonary infection, 4 cases of pressure sores and 2 cases of deep vein thrombosis in the control group, with a rate of total complications of 26% (13/50). By contrast, one case of abdominal distention, 1 case of pulmonary infection, 1 case of pressure ulcer and 1

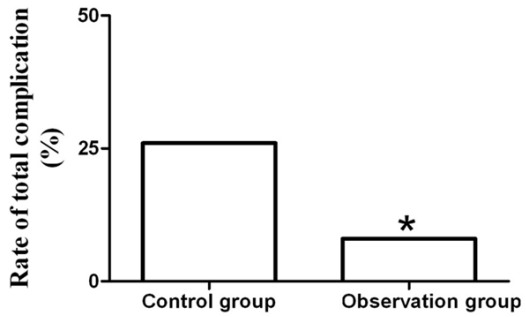

Figure 3. Rates of total postoperative complications of the two groups. *P<0.05 for comparison with the control group.

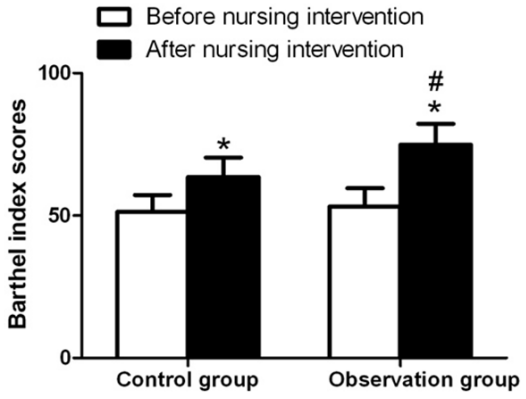

Figure 4. Barthel index scores before and after nursing intervention. *P<0.001 for comparison with the VAS score before nursing intervention; #P<0.001 for comparison with the control group after nursing intervention.

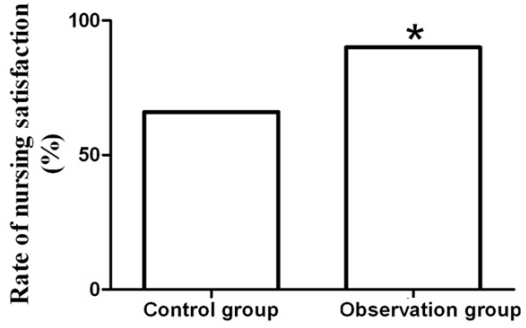

Figure 5. Rates of nursing satisfaction of the two groups. *P<0.05 for comparison with the control group.

case of deep vein thrombosis were reported in the observation group, with a rate of total complications of 8% (4/50). The rate of total complications was markedly different between the two groups (χ^2=4.536, P=0.033; **Figure 3**).

Activities of daily living

Before nursing intervention, there was no significant difference in the barthel index score between the two groups. After nursing intervention, the Barthel index scores of both groups were substantially higher than those before nursing intervention (both P<0.001). Significantly higher score was noted in the observation group than in the control group (P<0.001; **Figure 4**).

Patient nursing satisfaction

In the control group, 17 patients were unsatisfied with nursing care, with a rate of nursing satisfaction of 66%. In the observation group, 5 patients were unsatisfied with nursing care, with a rate of nursing satisfaction of 90%. There was significant difference in rates of nursing satisfaction between the two groups (χ^2= 8.392, P=0.004; **Figure 5**).

Discussion

Spinal diseases tend to affect the nerves, blood vessels and spinal cord of patients, resulting in such clinical manifestations as low back and leg pain, and mobility dysfunction. Over the years, with the progress of techniques for spinal surgery, MISS has been more extensively used in the treatment of patients. However, studies have reported that after surgery, patients are prone to severe pain, which affects their ability to perform ADLs. Besides, postoperative complications (such as abdominal distention, pulmonary infection, pressure sores and deep venous thrombosis) may also occur [15-17]. With ongoing updating of clinical nursing regimens, medical care plays an essential part in improving the therapeutic effect and prognosis of patients. In the current study, on the basis of usual care, rehabilitation nursing intervention was performed primarily targeted for patients undergoing miss, in which the perioperative patients were instructed to do rehabilitation exercise, and given pain care, psychological care, complications care, discharge guidance and sleep care. Their disease changes were also monitored closely. Rehabilitation nursing intervention can improve the compliance of patients who may become more cooperative during the treatment, reduce the stress reactions to surgery, alleviate the adverse emotional reaction of patients, and lessen hospital stay and postoperative complications, there-

by improving the surgical effect of patients. A study reported that rehabilitation nursing induced great pain relief in patients undergoing miss and enabled them to do early postoperative functional exercise [18]. Rehabilitation exercise can result in patient's better ability to perform ADLs and lower rates of pressure sores and deep venous thrombosis and other complications caused by long-term bedridden patients [19].

In the current study, among all the patients with miss, those in the observation group were assigned to receive rehabilitation nursing intervention in addition to usual care. The vas score of the observation group was significantly lower than that of the control group, indicating that rehabilitation nursing is effective in alieving pain in patients with miss, which is largely consistent with the result reported by Ozkara et al. [20]. A study stated pain relief helped patients to establish confidence in early recovery, and early rehabilitation exercise contributed to recovery of limb mobility in patients, thereby improving the prognosis indicators of patients [21]. The results of the current study revealed that after rehabilitation nursing intervention, the patients in the observation group had significantly shorter time to postoperative ambulation and hospital stay when compared to the control group. This indicates that rehabilitation nursing can significantly reduce the patients' time to recover from surgery. The incidence of postoperative complications (such as abdominal distention, pulmonary infection, pressure ulcer and deep venous thrombosis) was substantially lower in the observation group versus the control group, which also indicates that rehabilitation nursing contributed to early recovery of patients. This is consistent with the results reported by Nielsen et al. [22].

Fear and limb dysfunction due to MISS seriously affect the ADLs of patients. A study reported that the Barthel Index Scale was extensively used in clinical practice, and it could be used for predicting the therapeutic effect and prognosis of patients. The scale was primarily utilized to test the ADLs performance of patients [23]. It can reflect ADLs and the degree of recovery in patients undergoing miss. The results of the current study showed that, the Barthel index score of the observation group was substantially higher than that of the control group. This implies that rehabilitation nursing intervention can improve the self-care ability of patients with MISS and also guarantees their enthusiasm for the treatment [24].

Implementing rehabilitation nursing intervention can help care providers to improve their own professional knowledge, get better understanding of the nursing programs for patients with MISS, and provide patients with more satisfying care, enhancing patients' satisfaction with the care work. The results of the current study also demonstrated that patient in the observation groups were more satisfied with nursing care than that those in the control group, which is largely similar to those of previous studies [25].

In conclusion, rehabilitation nursing intervention met the nursing needs of patients with MISS, and was effective in relieving their pain, shortening the time to postoperative ambulation and hospital stay, reducing the incidence of complications, and improving their ability to perform ADLs and nursing satisfaction. Therefore, it is worthy of clinical generalization. However, there are still some limitations in this study, such as a single-center study, small sample size, and absence of long-term follow-ups. In the future research, additional multi-center, randomized and controlled trials with larger sample size and long-term follow-ups are required for further validation.

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Disclosure of conflict of interest

None.

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References

[1] Singh S, Sardhara JC, Khatri D, Joseph J, Parab AN, Bhaisora KS, Das KK, Mehrotra A, Srivastava AK and Behari S. Technical pearls and

surgical outcome of early transitional period experience in minimally invasive lumbar discectomy: a prospective study. J Craniovertebr Junction Spine 2018; 9: 122-129.
[2] Menger R, Hefner MI, Savardekar AR, Nanda A and Sin A. Minimally invasive spine surgery in the pediatric and adolescent population: acase series. Surg Neurol Int 2018; 9: 116.
[3] Chang KY and Hsu WK. Spinal biologics in minimally invasive lumbar surgery. Minim Invasive Surg 2018; 2018: 5230350.
[4] Turel MK, Kerolus MG, David BT and Fessler RG. Minimally invasive options for surgical management of adjacent segment disease of the lumbar spine. Neurol India 2018; 66: 755-762.
[5] Marchand AA, O'Shaughnessy J, Chatillon CE, Sorra K and Descarreaux M. Current practices in lumbar surgery perioperative rehabilitation: a scoping review. J Manipulative Physiol Ther 2016; 39: 668-692.
[6] Tang YX, Feng WY and Li YL. Perioperative nursing in treating anderson II-type fracture of odontoid process with pedicle of vertebral arch fixation. Zhongguo Gu Shang 2010; 23: 885-886.
[7] Moore JL, Friis S, Graham ID, Gundersen ET and Nordvik JE. Reported use of evidence in clinical practice: a survey of rehabilitation practices in Norway. BMC Health Serv Res 2018; 18: 379.
[8] Reigle BS and Zhang B. Women's rehabilitation experiences following breast cancer surgery. Rehabil Nurs 2018; 43: 195-200.
[9] Nicholas PK, Leuner JD, Hatfield JM, Corless IB, Marr KH, Mott MK and Cross-Skinner S. Using the cancer rehabilitation questionnaire in patients with colorectal cancer. Rehabil Nurs 2006; 31: 106-113.
[10] Chasen MR and Bhargava R. A rehabilitation program for patients with gastroesophageal cancer--a pilot study. Support Care Cancer 2010; 18 Suppl 2: S35-40.
[11] Wu MS and Su SF. Nursing Care of lumbar spine fusion surgery using a semi-rigid device (ISOBAR). Hu Li Za Zhi 2016; 63: 120-126.
[12] Harvey CV. Spinal surgery patient care. Orthop Nurs 2005; 24: 426-440; quiz 441-422.
[13] Lee LC, Tsai AC and Wang JY. Need-based nutritional intervention is effective in improving handgrip strength and barthel index scores of older people living in a nursing home: a randomized controlled trial. Int J Nurs Stud 2015; 52: 904-912.
[14] Halupa CM, Halupa MS and Warren MS. Nurse satisfaction with medical emergency team nurses: a 3-year study. Dimens Crit Care Nurs 2018; 37: 217-224.
[15] Hoke N and Bradway C. A clinical nurse specialist-directed initiative to reduce postoperative urinary retention in spinal surgery patients. Am J Nurs 2016; 116: 47-52.
[16] Moojen WA, Arts MP, Jacobs WC, van Zwet EW, van den Akker-van Marle ME, Koes BW, Vleggeert-Lankamp CL and Peul WC. IPD without bony decompression versus conventional surgical decompression for lumbar spinal stenosis: 2-year results of a double-blind randomized controlled trial. Eur Spine J 2015; 24: 2295-2305.
[17] Daniels AH, Schiebert SS and Palumbo MA. Symptomatic spinal epidural hematoma after lumbar spine surgery: the importance of diagnostic skills. AORN J 2015; 101: 85-90; quiz 91-83.
[18] Waszak PM, Modric M, Paturej A, Malyshev SM, Przygocka A, Garnier H and Szmuda T. Spinal cord stimulation in failed back surgery syndrome: review of clinical use, quality of life and cost-effectiveness. Asian Spine J 2016; 10: 1195-1204.
[19] Chang V, Schwalb JM, Nerenz DR, Pietrantoni L, Jones S, Jankowski M, Oja-Tebbe N, Bartol S and Abdulhak M. The Michigan spine surgery improvement collaborative: a statewide collaborative quality initiative. Neurosurg Focus 2015; 39: E7.
[20] Ozkara GO, Ozgen M, Ozkara E, Armagan O, Arslantas A and Atasoy MA. Effectiveness of physical therapy and rehabilitation programs starting immediately after lumbar disc surgery. Turk Neurosurg 2015; 25: 372-379.
[21] Putnam EM, Koppera P, Malviya S and Voepel-Lewis T. Pain outcomes in children who received intrathecal vs intravenous opioids for pain control following major urologic surgery: a retrospective review. Paediatr Anaesth 2015; 25: 1280-1286.
[22] Nielsen PR, Jorgensen LD, Dahl B, Pedersen T and Tonnesen H. Prehabilitation and early rehabilitation after spinal surgery: randomized clinical trial. Clin Rehabil 2010; 24: 137-148.
[23] Shiao CC, Hsu HC, Chen IL, Weng CY, Chuang JC, Lin SC, Tsai FF and Chen ZY. Lower barthel index is associated with higher risk of hospitalization-requiring rneumonia in long-term care facilities. Tohoku J Exp Med 2015; 236: 281-288.
[24] Shabat S, Arinzon Z, Folman Y, Leitner J, David R, Pevzner E, Gepstein R, Pekarsky I and Shuval I. Long-term outcome of decompressive surgery for lumbar spinal stenosis in octogenarians. Eur Spine J 2008; 17: 193-198.
[25] Rushton A, Wright C, Goodwin P, Calvert M and Freemantle N. Physiotherapy rehabilitation post first lumbar discectomy: a systematic review and meta-analysis of randomized controlled trials. Spine (Phila Pa 1976) 2011; 36: E961-972.