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The value of stepped nursing intervention model in total knee replacement patients with osteoarthritis

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Abstract

Objective: To investigate the value of stepped intervention model in total knee replacement (TKR) patients with osteoarthritis (OA). METHODS: During the period of March 2023-20243, 90 total knee replacement patients with osteoarthritis (OA) were randomly selected during this time period and divided into the control group (45 cases) and the observation group (45 cases). The observation group was managed using a stepped intervention model; the control group was managed according to the conventional care model. Knee mobility was assessed at the time of discharge, 1 month, 3 months and 6 months respectively, and pain scores were also evaluated between the groups. RESULTS: Comparison of knee mobility data, P>0.05 at the time of discharge; knee mobility of the observation group was significantly higher than that of the control group at 1 month, 3 months and 6 months after discharge (P<0.05); comparison of pain scores, before the intervention (P>0.05), and 3-12d after the intervention, the observation group's pain scores were significantly lower than that of the control group (P<0.05). DISCUSSION: The stepped nursing intervention model can significantly improve knee mobility and effectively reduce pain in patients with osteoarthritis total knee arthroplasty.

OA is a common degenerative joint disease, especially in the knee joint area manifested as articular cartilage degeneration, joint space narrowing, bone spur formation and other symptoms, which seriously affects the quality of life of patients. With the arrival of the aging society, the incidence of OA has been increasing year by year, especially in the middle-aged and elderly

groups, the incidence of osteoarthritis of the knee is high, and it has become an important cause of motor dysfunction worldwide [1]. For patients with advanced OA, especially those with severely damaged knee joints, total knee replacement (TKR) is an effective treatment that can significantly relieve pain and improve joint function; however, postoperative rehabilitation management is crucial, and good nursing interventions can promote postoperative recovery, reduce complications, and improve patient satisfaction. At present, the conventional nursing model mainly relies on a single intervention method, which can relieve patients' symptoms to a certain extent, but the effect is more limited [2]. In recent years, the stepped nursing intervention model, as a step-by-step and personalised nursing strategy, has achieved good results in a variety of diseases, but the research on its application in patients with osteoarthritis after total knee arthroplasty is still insufficient. The stepped care intervention model emphasises the gradual adjustment of the care plan according to the specific needs of the patient, the changes in condition and the recovery process, and is able to achieve a more refined and differentiated care management. Therefore, this study aims to investigate the effects of the stepped nursing intervention model on knee mobility and pain management in patients undergoing total knee arthroplasty, and to assess its application value in postoperative rehabilitation. It is reported as follows:

1. Information and Methods

1.1 General information

During the period from March 2023 to March 2024, 90 cases of osteoarthritis total knee arthroplasty patients were randomly selected during this time period and divided into the control group (45 cases) and the observation group (45 cases). In the control group, there were 20 males (44.44%) and 25 females (55.56%), aged 45-80 years, with a mean age of (67.32±7.04) years; the BMI range was 21.5-30.2 kg/m², with a mean BMI of (26.10±2.18) kg/m². In the observation group, there were 21 males (46.67%) and 24 females (53.33%); age range: 46-81 years, mean age (67.47±6.98); BMI range: 22.0-30.5 kg/m², mean BMI (26.18±2.21) kg/m². The baseline data of the enrollees were compared (P>0.05) and were comparable.

Inclusion criteria: confirmed diagnosis of osteoarthritis of the knee, requiring total knee arthroplasty; age ≥45 years old, able to cooperate with postoperative rehabilitation; no serious cardiac, hepatic, renal and other organ dysfunction. Exclusion criteria: the presence of serious complications or those who cannot tolerate general anaesthesia; the combination of other major

joint or spinal pathologies; those who have not completed at least 1 month of follow-up after surgery.

1.2 Methods

The control group was intervened according to the conventional nursing mode: patients were given postoperative basic nursing care, such as observing vital signs, keeping the operative area clean and dry, and changing dressings regularly to prevent infection; and patients were instructed to take deep breaths, cough and expel sputum to prevent pulmonary complications. According to the pain score, appropriate analgesic drugs are given to ensure the patient's postoperative comfort; the degree of pain is regularly assessed, and the drug dosage or mode of use is adjusted to avoid excessive pain Early postoperative period, passive joint movement is carried out according to the doctor's instructions, and the range of motion is gradually increased; the patient is encouraged to carry out isometric contraction training of the leg muscles, to promote the functional recovery of the knee joint, and at the same time, the patient is instructed to eat a diet to ensure sufficient protein, Vitamin and mineral intake; psychological counselling for patients to relieve anxiety and enhance their confidence in recovery.

The observation group adopted a stepwise intervention model; (1) early postoperative care (0-3 days after surgery): nursing staff measured blood pressure, heart rate, respiration and temperature every 2 hours to ensure that no abnormalities occurred. Closely monitor wound exudate and signs of infection within 24 hours after surgery, change dressings in a timely manner, and keep wounds clean and dry. According to the patient's pain score, analgesic drugs were given at the right time to ensure patient comfort and reduce postoperative discomfort. Nursing staff help patients to carry out passive knee flexion and extension training, gradually increase the range of joint movement to prevent postoperative joint stiffness, nursing staff guide patients to carry out passive movement of the lower leg, if necessary, use elastic stockings or pneumatic compression devices. (2) Mid-operative care (4-14 days after surgery)::Nursing staff perform active knee flexion and extension exercises on patients every day, and begin to guide patients to perform active knee activities. According to the patient's tolerance, gradually increase the amplitude of joint activity, and record the angle of joint activity, to ensure that the amount of activity gradually increased but not excessive, according to the patient's pain score to adjust the use of medication, and increase the application of physiotherapy, such as the use of hot packs, cold packs alternating treatment to relieve the pain and swelling of the knee joints, in addition, for the postoperative patient's psychological problems, the nursing staff began to strengthen the psychological counselling to

give the patient confidence in postoperative recovery and reduce anxiety and depression. (3) Late postoperative care (15-30 days after surgery): Patients were instructed to start more active exercise training, including gait training, upright walking and progressive stair descent training. Nursing staff provide assistance to patients when walking to ensure a stable gait and reduce the risk of falling. While knee mobility is restored, nursing staff assess the patient's gait and instruct the patient in the correct use of assistive devices, such as crutches or walkers, to help the patient regain the ability to walk independently.

1.3 Evaluation criteria

(1) Knee joint function: track and record the free mobility of the knee joint of the patients at 1 month, 3 months and 6 months after discharge from the hospital, let the patients sit on a smooth seat with their legs straight and relaxed, place the arthrometer in front of the knee joint and make sure it is aligned with the joint, let the patients flex the knee joint, bend the lower leg towards the buttocks until it reaches the maximal flexion position, place the two arms of the measuring instrument on the thigh and calf, and make sure that the instrument stays smooth and record the data [3].

(2) Pain level: respectively, before the intervention, 3-12 days of the intervention patients pain score measurement application of objective indicators, that is, the NRS scoring scale (pain scale) for evaluation, the score between 0-10 points, 0 points (no pain), 1-3 points (mild pain), 4-6 points (moderate pain), 7-9 points (severe pain), 10 points that is severe pain.

1.4 Statistical methods

SPSS 24.0 was used to process the data, and the count data were tested by chi-square (χ^2) and presented as n (%), while the normally distributed measurements were tested by t-test and expressed as "$\bar{x} \pm s$". $p<0.05$ indicates significant differences.

2. Information and Methods

2.1 Comparison of knee mobility between groups

Comparison of knee joint mobility data, $P>0.05$ at the time of discharge; the knee joint mobility of the observation group was significantly higher than that of the control group at 1 month, 3 months and 6 months after discharge ($P<0.05$), see table 1

Table 1 Comparison of knee joint mobility between groups (± s, °)

Group	n	Discharged	Discharged for 1 month	Discharged for 3 month	Discharged for 6 month
Observation group	45	86.27±6.08	108.27±5.30	118.96±5.12	125.28±3.03
Comparison group	45	87.56±6.12	96.96±4.30	106.29±4.09	102.09±3.60
t	-	1.994	8.989	9.902	10.866
P	-	>0.05	<0.05	<0.05	<0.05

2.2 Comparison of pain level between groups

Comparison of pain scores, before the intervention (P > 0.05), 3-12d after the intervention, the observation group's pain score was significantly lower than the control group (P < 0.05), see Table 2.

Table 2 Comparison of pain scores between groups (± s)

Group	n	Before the intervention	Intervention 3 days	Intervention 6 days	Intervention 12 days
Observation group	45	5.83±0.95	2.76±0.25	2.23±0.36	1.58±0.24
Comparison group	45	5.79±0.88	3.93±0.35	2.97±0.32	2.65±0.16
t	-	1.097	3.902	3.978	3.889
P	-	>0.05	<0.05	<0.05	<0.05

3. Discussion

PWith the acceleration of global aging, osteoarthritis (OA) has become an important disease that affects the quality of life of the elderly population, especially osteoarthritis of the knee, and in severe cases, total knee replacement (TKR) is often required to improve joint function. Although TKR surgery provides significant pain relief and improves joint mobility, nursing interventions during postoperative rehabilitation are critical to patient recovery. Traditional nursing care models are relatively homogeneous and often fail to provide individualised nursing care plans according to the different needs and recovery progress of patients; therefore, how to provide more refined

and differentiated nursing interventions in the postoperative period has become an important research direction to improve postoperative rehabilitation outcomes. The stepped nursing intervention model, as a progressive and personalised nursing programme, is able to gradually adjust the content of nursing care according to the patient's condition development and recovery, so as to achieve the best recovery effect. This model has achieved good results in a variety of chronic diseases and post-surgical rehabilitation, but there is a lack of research on the application of this model in osteoarthritis total knee arthroplasty patients [4].

In this study, the observation group received stepped nursing intervention, and the results obtained showed that: the comparison of knee mobility data, $P>0.05$ at the time of discharge; the knee mobility of the observation group was significantly higher than that of the control group at 1 month, 3 months, and 6 months after discharge ($P<0.05$). The reasons for this are: firstly, the stepped intervention model emphasises early functional recovery, and knee stiffness is effectively prevented in the early postoperative period through progressively increasing passive and active knee flexion training, and through the refined rehabilitation plan, patients in the observation group were able to start joint mobility recovery training earlier on the basis of pain control, and secondly, the step-by-step progression of the step-by-step intervention model of muscle strengthening and joint stability training helps patients to strengthen the muscles around the knee joint and improve the stability of the knee joint, thus supporting a wider range of joint activities, furthermore, the individualised intervention in the model took into account the specific recovery progress of each patient, avoiding overtraining or premature loading, ensuring that the joint mobility was gradually increased within a safe range, which promoted functional recovery [5].

The difference in pain scores between the two groups before surgery was not statistically significant $P>0.05$); the pain scores of the observation group were significantly lower than those of the control group in the postoperative period of 3-12 days ($P<0.05$). The reasons for this: firstly, the stepped intervention model emphasizes personalized early pain management, 3-12 days after surgery is the critical period for patients' pain recovery, early postoperative period through systematic pain assessment and regulation, timely adjustment of analgesic measures according to the patient's degree of pain, the use of oral medication, local physiotherapy and other means to minimize pain, thus reducing the patient's discomfort, the intervention model focuses on the post-operation Early movement and joint mobility recovery, through moderate passive and active joint activity training, to promote joint fluid circulation and muscle relaxation, from the

physiological level to reduce the pain caused by joint stiffness [6].

In conclusion, the stepped nursing intervention model can significantly improve knee mobility and effectively reduce pain in osteoarthritis total knee arthroplasty patients.

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