The impact of individualized care after artificial knee replacement surgery for patients with valgus deformity of the knee[†]

Original article

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Abstract: **Objective:** To evaluate the perioperative nursing of total knee arthroplasty for patients with valgus deformity of the knee.
Methods: Seventy-six patients who underwent surgical treatment were enrolled in the study from March 2014 to March 2018. The patients in the control group were treated with routine nursing. The experimental group was treated not only with routine nursing but also with health education, psychological care, family social support, and other nursing intervention. Hospital for special surgery and Pittsburgh sleep quality index were used to evaluate the effect of nursing intervention on patients after operation.
Results: All the index scores of the experimental group were lower than those of the control group ($P < 0.05$), indicating that the function of the diseased limb and the patient's sleep status improved significantly after the intervention.
Conclusions: Individualized nursing can improve the recovery of limb function and improve the patients' quality of life. It is very effective for nurses to implement individualized nursing measures for patients after surgery.

Keywords: total knee replacement • nursing • individualization • perioperative period • valgus deformity of the knee

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1. Introduction

The deformity of genu valgus is often caused by dysplasia of femoral lateral condyle, rheumatoid arthritis, and osteoarthritis. It is often associated with bone defects of lateral condyle of the femur and lateral plateau of the tibia, dislocation of the patella, stabilization of the external rotation of the tibia, and the contracture of a posterolateral complex of the knee joint and other diseases.¹ Valgus deformity of the knee joint is one of the serious complications in the late stage of knee joint disease. They are mainly seen in patients with rheumatoid arthritis, osteoarthritis, traumatic arthritis, metabolic osteopathy, congenital dysplasia of the lateral femoral condyle, and patients with a history of surgery that has altered the line of force of the lower extremity.² The common clinical types of valgus deformity of knee joint are SOO classification, Ranawat classification, and Krackow classification. Although the incidence of valgus deformity is less than the varus deformity, the operation is more difficult and the technical requirements are higher.³ The techniques of the osteotomy and soft-tissue balance are most difficult to hold, and there is no unified technical specification at home and abroad. TKA is an effective method to treat the end-stage disease of the knee joint. It can effectively relieve knee joint pain, recover knee joint function, and improve the patients' quality of life.⁴⁻⁶ Due to the increasing population of elderly, the patients suffer from knee joint diseases increased and the application of TKA has also become mature than before.⁷⁻⁹ The curative effect of TKA is related not only to the type of prosthesis, the amount of annual operation, appropriate osteotomy, and proper soft tissue balance but also to perioperative nursing care.¹⁰ This research aims to compare the differences between the effect of routine care and individualized care after artificial knee replacement for valgus knee joint deformity to provide a basis for better clinical decision-making.

2. Materials and methods

2.1. Design

This study used a quasi-randomized controlled trial design. The Ethical Review Board of The Second Affiliated Hospital of the Nanjing University of Chinese Medicine approved the study (2014-441). Written informed consent was obtained from the participant before inclusion.

2.2. Participants

Based on the calculation results of sample size described in previous studies,¹⁰ the sample size

required for this test was estimated. From March 2014 to March 2018, 76 patients (39 males and 37 females) with an average age of 67.8 years (53–82 years) were treated in our hospital; In 35 cases left knee and in 41 cases right knee was operated on. The body mass index was 22.5–27.9 kg/m² (mean 25.9 kg/m²). Etiology: in 46 cases of osteoarthritis, in 10 cases of rheumatoid arthritis, and in 20 cases of traumatic arthritis. The main clinical symptoms were severe knee joint pain and severe pain during weight-bearing. Seventy-six patients were divided into a treatment group ($n = 37$) and a control group ($n = 39$) according to the parity of the last number of the ID card number. There were no significant differences in sex, age, occupation, educational level, stage of the disease, marital status, and surgical scheme between the two groups ($P < 0.05$).

2.3. Surgical method

All the operations were performed by the same group of surgeons. The anterior median incision was made to remove the internal and external meniscus and anterior cruciate ligament, the knee flexion was 90, and the location, reaming and osteotomy was performed. After an osteotomy, the residual osteophyte around the joint was removed and the lateral soft tissue of the contracture was released step by step, and the rectangular space was obtained by extending the joint at the narrow part of the osteotomy space. The tibia and femur prosthesis were fixed with bone cement, and polyethylene liner was installed after ensuring the balance of flexion and extension space and soft tissue. After prosthesis replacement and fixation, the joint capsule and soft tissue around the knee joint were injected with "cocktail" analgesics.¹¹ The patellar was checked, a drainage tube was placed in the incision, then the incision was sutured layer by layer, and then bandage it was applied under pressure.

2.4. Therapeutic effect

The average tourniquet time was 85 min (75–110 min) and the mean hospitalization days were 5–7 days. All the incisions healed in the first stage without infection and skin necrosis, and complications occurred in 13 cases after the operation, and the operation was successful in all the patients, with an average tourniquet time of 85 min and an average hospitalization of 5–7 days. Among them, six cases developed symptomatic deep venous thrombosis of the lower extremity, four cases showed swelling of the lower extremity after the operation, and mild deep venous thrombosis of the lower extremity was diagnosed by ultrasound

Doppler examination. After thrombolytic therapy, one case developed quadriceps extensor knee weakness 3 months after the operation. The patient had a history of 15 years before operation, poor strength of quadriceps femoris, and poor execution of exercise after the operation. All of them were given intensive functional exercises. The symptoms were improved during the recent follow-up. The patients were followed up for 3–48 months (mean 30 months), and the results of the final follow up showed that the knee joint had normal force line, good joint prosthesis position, no loosening and osteolysis, and normal patellar trajectory. The results of the final follow-up showed that the knee joint was in a normal position, and the patella trajectory was normal in the last follow-up.

2.5. Nursing methods

The control group received routine care as follows: pre-operative preparation and guidance, keeping the ward quiet and tidy, and give current medical treatment after the operation; when the patient complained of pain, the nurse reported the syndrome to the doctor and gave an analgesic treatment according to the condition. After the implementation, the nurse observed and recorded the pain relief. The nurse carried out the doctor's orders and observed the effect of pain relief. Individualized care included:

- (1) *Interactive nursing care*: Focusing on understanding the basic situation of the patient through general interactive conversation familiar with the basic information of the patient and his family and sociocultural background, the psychological concerns of the patient in this hospital, as far as possible can build mutual trust to alleviate the patient's anxiety feeling.
- (2) *Vital signs detection*: The patients were given oxygen inhalation with an oxygen flow of 3–4 L/min. After the operation, the blood pressure, pulse, respiration, and oxygen saturation were measured dynamically by ECG monitoring. After close observation on lower limb peripheral blood supply, if the bandage is found too tight, it can be appropriately released by using a bandage.
- (3) *Drainage tube care*: After the operation, the drainage tube was kept clear and fixed properly to prevent distortion or compression. The color, nature, and quantity of drainage fluid were closely observed, and detailed records were made. The drainage tube was removed within 24–48 h after the operation.
- (4) *Pain nursing care*: Artificial knee replacement surgery trauma, postoperative pain in patients, affecting the patient's diet, sleep, mental status, and postoperative functional exercise. The principle of intraoperative injection of "cocktail" into soft tissue around the knee joint, anterior and posterior articular cavity, and lateral collateral ligament region is to eliminate the stimulation and conduction of pain caused by the surgical wound and to increase pain threshold. The objective was to effectively prevent and control postoperative pain. At the same time, indwelling the analgesia tube in the joint cavity, injecting and removing the catheter at 24 h after the operation, which can prolong the analgesia time and delay the rebound of pain.
- (5) *Complications nursing care*: Artificial knee replacement because of the long course of the disease, less activity, passive posture during operation, and the application of a tourniquet, the application of bone cement makes the possibility of indirect injury of adjacent blood vessels greater. Therefore, lower extremity venous thrombosis is the most common complication after the operation. As there was no obvious pain, nurses should closely observe the swelling of the affected limb, skin temperature changes, and venous reflux status. The patients were advised to carry out ankle joint autonomic movement and shank muscle contraction early after the operation and to prevent thrombosis with lower limb venous pump. Antithrombotic therapy was given. In addition, venous thrombosis should also prevent infection of the knee joint, as far as possible to keep the surgical incision dressing dry and clean and the combined use of antibiotics to prevent infection.
- (6) *Rehabilitation exercise*: (a) The patients and their families were instructed to carry out ankle joint autonomic activity and calf muscle contraction immediately after the patient regained consciousness. On the second day after the operation, the knee joint was resting on its back in a slightly flexed position; it could elevate the affected limb, exercise the quadriceps muscle strength of the affected limb, and, at the same time, allow the patient to try to get out of bed and move with the aid of a walker. (b) From the third day to the first week after the operation, the passive flexion of the knee joint was performed twice a day for 30 min, but the active knee extension and flexion training were advocated from 0 to 30 min and then increased between

5 days to reach the goal from 0 to 90 min after the operation. The knee flexion was performed twice a day for 30 min, but active knee extension and flexion were performed from 0 to 30 min. (c) The patients were discharged after 1 week, they continue the rehabilitation exercise, which includes walk as much as they can at home. About a month after the operation, training patients to walk carrying a certain weight of rice bags or sandbags around the ankle and increased quadriceps muscle strength exercise are recommended.

- (7) *Psychological care*: Most of the patients with valgus knee joint were unstable psychologically. Most of them had a long history of pain when they came to the hospital. Besides, the operation was dangerous, and they were afraid of postoperative infection, resulting in negative emotions such as fear, anxiety, pessimism, and so on. Some patients also bear additional mental stress due to family ties and financial conditions. Because of these psychological problems, we adopt individualized nursing measures, often go deep into the ward to talk with the patients, understand the psychological state of the patients, publicize knee arthroplasty for those who know their own conditions, and introduce successful cases. Guide patients to gradually relax muscle or abdominal breathing training to alleviate individual tension and anxiety. Postoperative patients after the acute phase of reasonable sleep guidance, daytime care to encourage patients to listen to radio or reading, specialist nurses consciously and patients to communicate postoperative feelings, so that their day in a natural state of consciousness, conducive to clinical observation of the disease. During night care, family members or caregivers are advised to play soothing music before bedtime, and some patients may be given low-flow oxygen for about an hour. Before going to bed at night, instruct the patient to relax, breathe calmly, close eyes, relax his muscles, and fall asleep slowly with the music.

2.6 Observation index and the evaluation standard of the curative effect

The pain degree, the range of motion of joint, muscle strength, and stability of the two groups of patients were evaluated by the knee joint function score of American Special Surgical Hospital [Hospital for special surgery (HSS)]. The recovery of the two groups of patients was compared. Pittsburgh sleep quality index (PSQI) was used to assess the postoperative sleep status. The table is composed of 19 topics and can be divided into 7 parts: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disorders, hypnotic drug use, and effects on daytime function. Each part was evaluated by 0, 1, 2, and 3 grades. The cumulative score of each part was the total score of PSQI. The higher the score, the worse the quality of sleep. According to PSQI score ≤ 3 points, 4–7 points, and > 8 points, the sleep quality was divided into three groups: good, medium, and poor.

2.7 Statistical analysis

Data were analyzed using IBM SPSS 19.0. Independent-Samples *t*-test was used to analyze continuous quantitative data, Pearson χ^2 test was used to analyze categorical variable data, and statistical significance was determined at $P < 0.05$.

3. Results

Comparison of the knee joint function score of American Special Surgical Hospital (HSS) between the two groups is given in Table 1.

Comparison of preoperative PSQI scores between the two groups is given in Table 2.

Comparison of PSQI scores between the two groups after the intervention is given in Table 3.

4. Discussion

4.1. Summary of main findings

TKA is the first choice for the treatment of osteoarthritis, joint pain, flexion contracture, valgus deformity,

	Control group	Experimental group	<i>T</i> -value	<i>P</i> -value
Preoperative	36.5 $\pm$ 6.2	38.2 $\pm$ 5.4	1.27	<i>P</i> = 0.21
Postoperative	89.4 $\pm$ 3.4	91.2 $\pm$ 2.2	-2.72	<i>P</i> = 0.01
<i>T</i> -value	-46.73	-55.28		
<i>P</i> -value	0.000	0.000		

Table 1. Comparison of HSS scores between the two groups.

Group	Number of examples	Subjective sleep quality	Sleep latency	Sleep persistence	Habitual sleep efficiency	Sleep disorder	Use of sleeping drugs	Daytime dysfunction
Control group	39	1.56 ± 0.42	1.68 ± 0.50	1.46 ± 0.32	1.43 ± 0.34	1.42 ± 0.29	0.85 ± 0.35	1.96 ± 0.77
Experimental group	37	1.72 ± 0.50	1.74 ± 0.48	1.56 ± 0.46	1.46 ± 0.43	1.47 ± 0.22	0.83 ± 0.25	1.93 ± 0.53
T-value		1.514	0.533	1.105	0.338	0.843	0.646	0.259
P-value		0.134	0.595	0.273	0.736	0.402	0.521	0.796

Table 2. Comparison of preoperative PSQI scores between the two groups.

Group	Number of examples	Subjective sleep quality	Sleep latency	Sleep persistence	Habitual sleep efficiency	Sleep disorder	Use of sleeping drugs	Daytime dysfunction
Control group	39	1.40 ± 0.48	1.65 ± 0.38	1.61 ± 0.38	1.56 ± 0.32	1.52 ± 0.36	0.79 ± 0.23	1.88 ± 0.36
Experimental group	37	1.76 ± 0.45	1.45 ± 0.25	1.12 ± 0.28	1.24 ± 0.23	1.13 ± 0.24	0.26 ± 0.12	1.48 ± 0.46
T-value		-3.369	2.695	6.372	4.983	5.526	12.493	4.234
P-value		0.001	0.008	0.0001	0.0001	0.0001	0.0001	0.0001

Table 3. Comparison of PSQI scores between the two groups after intervention.

and so on.^{12,13} It can relieve pain and reconstruct the function of the knee joint. Pain is considered to be the most common complication after TKA, and local tissue trauma is the main cause of pain after TKA.^{14,15} In the past, the nerve blocking method was used to control pain, and because of incomplete obturator nerve block, the clinical effect was not obvious. Recently, some researchers have adopted the technique of total joint analgesia, which has also achieved good results. In this group, intraoperative “cocktail” analgesia, combined with intra-articular indwelling catheter analgesia, was used to control pain 24 h after the operation. Kerr found that this analgesic method was simple, effective, and without side effects.¹⁶ Fischer confirmed that high-dose intra-articular “cocktail” can significantly alleviate pain after TKA, improve patient satisfaction, and have no side effects such as muscle weakness.¹⁷ In recent years, due to the change of medical model, inpatients pay more attention to perioperative care and hope to achieve a good perioperative process through individualized nursing.¹⁸ However, most of the patients undergoing TKA surgery are elderly patients so they have a slow sensory response, large surgical stimulation, and poor psychological endurance. At the same time, some patients do not have a high educational level and poor compliance with TKA, and some of them have a low educational level and poor compliance with TKA.^{19,20} The purpose of the operation and the implementation of postoperative rehabilitation exercises could not be understood. Table 1 shows that although HSS scores improved

in both groups after knee arthroplasty, individualized care was more effective in promoting patient recovery. Table 2 shows that there was no significant difference in sleep quality between the two groups before operation ($P > 0.05$). Table 3 shows that the sleep quality of the treatment group was significantly better than that of the control group ($P < 0.01$), which indicated that standardized nursing intervention after the operation could significantly improve the sleep quality of the patients after operation. The patients were followed up for an average of 30 months after the operation. The general status was excellent in 40 cases, good in 8 cases, and moderate in 2 cases. All patients were able to walk up and down the stairs independently, could completely self-care, and some patients could even participate in mountaineering.

5. Conclusions

To sum up, effective control of pain after total knee arthroplasty, nurses master all aspects of joint replacement of scientific nursing and rehabilitation guidance. At the same time, postoperative rehabilitation exercise is also the key to the success of the operation. It can make a reasonable rehabilitation exercise plan for patients to restore the function of the affected limb and improve the quality of life of patients. To some extent, individualized nursing can promote the recovery of patients. Therefore, clinical nurses can design a nursing plan according to the individual nursing methods

mentioned in this article, which is suitable for local patients with valgus deformity of the knee. In addition, we suggest that hospital decision-making departments should take more account of the manpower and costs of individualized care.

Limitations

Our research has two limitations. First, the study design of this article is a quasi-randomized controlled. The researchers did not randomize the included patients, which may increase the risk of bias. Second, individualized care requires more manpower and costs. In this study, human factors are less considered in the research process, which may lead to a decline in the quality of individualized care.

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Ethical approval

The study protocol was approved by the Ethical Review Board of The Second Affiliated Hospital of the Nanjing University of Chinese Medicine approved the study (No. 2014-441).

Conflicts of interest

All authors declare that there is no conflicts of interest exist.

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