Original Article
Effect of predictive nursing on postoperative rehabilitation and complications of patients undergoing hip replacement and maintenance hemodialysis

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Abstract: Objective: To analyze the effect of predictive nursing on postoperative rehabilitation index and complications in patients after hip replacement with maintenance hemodialysis. Methods: A total of 81 cases of patients underwent hip replacement and maintenance hemodialysis in our hospital were selected as the research objects and divided into study group (n=41) and control group (n=40) with retrospective analysis method based on different intervention method. Patients in the study group received predictive nursing, while patients in the control group received routine nursing. The hip function and activity, duration of walking with and without crutches, adverse emotions, pain and the incidence of various complications after intervention were compared between the two groups. Results: There was no significant difference in Harris score between the two groups at 7 days after intervention (*P*>0.05); the Harris scores of the study group were significantly higher than those of the control group (*P*<0.05) at 1, 3 and 6 months after intervention. Before intervention, there was no significant difference in hip activity between the two groups (*P*>0.05); 3 months surgery operation, the hip extension, abduction and rotation angle of the study group were significantly higher than those of the control group (*P*<0.05); the duration of walking with and without crutches in the study group were significantly shorter than those in the control group (*P*<0.05); the scores of adverse emotions, pain and complications in the study group were significantly lower than those in the control group (*P*<0.05). Conclusion: The implementation of predictive nursing to patients underwent hip replacement and maintenance hemodialysis can improve hip activity and joint function after surgery, accelerate postoperative recovery, relieve postoperative pain symptoms, and reduce the incidence of various complications.

Keywords: Predictive nursing, maintenance hemodialysis, hip replacement, postoperative rehabilitation, complication, effect

Introduction

Similar to uremia, end stage renal disease (ESRD) refers to the end stage of various chronic kidney diseases. With the increase of prevalence rate of various metabolic diseases in recent years, the prevalence of ESRD has been increasing year by year. The data showed that the number of patients with ESRD increased from 426,000 in 1990 to 1.065 million in 2000 and 2.31 million in 2008, and this figure is still rising at a rate of 7% each year. The number of people suffering from the disease has also been increasing in China, which has put great pressure on society and residents [1-3].

Hemodialysis is to remove the blood from the body to the outside of the body, exchanges of substances in the dialyzer composed of hollow fiber with the principles of dispersion, ultrafiltration, adsorption and convection, so as to remove the metabolic waste, maintain the electrolyte and acid-base balance of the body, and remove excess water from the body, and then the purified blood is returned to the body [4, 5]. With extensive application in clinic, maintenance hemodialysis is regarded as a treatment to prolong the survival time of patients with ESRD by medical profession. However, in practice, due to abnormal bone metabolism and endocrine, as well as the long-term hormone therapy, the incidence of bone amyloidosis and renal osteopathy in patients with ESRD is significantly increased. The prevalence of hip diseases such as avascular necrosis of femoral head, osteoarthritis, and femoral neck fracture

is significantly higher than that of ordinary people. Most of these patients need hip replacement to maintain a normal life [6-8]. The report points out that patients underwent hip replacement and maintenance hemodialysis are often accompanied with high complication incidence and mortality. The cause is related to the patient's metabolic imbalance and surgical trauma stress [9]. Predictive nursing is also known as advanced nursing, which means that before implementing the nursing, the nursing staff will predict the possible problems of patients during the nursing process, clarify the key points of nursing, and take relevant preventive measures in a predictive manner to minimize the incidence of complications of patients and improve the quality of nursing, so as to realize the transformation of nursing care from passive to active. At present, there have been many clinical researches on predictive nursing. This nursing method can not only cultivate the active nursing behavior of nursing staff and make them develop independent thinking and study ability, but also provide patients with safe, orderly and high-quality individualized nursing service and improve the satisfaction of patients. This study aims to analyze the feasibility of predictive nursing in patients underwent hip replacement and maintenance hemodialysis, so as to provide corresponding clinical basis for improving the postoperative joint function and accelerating postoperative rehabilitation of these patients.

Materials and methods

General information

A total of 81 patients underwent hip replacement and maintenance hemodialysis in our hospital were selected as the research objects and divided into study group (n=41) and control group (n=40) with retrospective analysis method based on different intervention method.

Inclusion criteria: (1) Objects were diagnosed with hip fracture and traumatic arthritis by imaging diagnosis and required hip replacement [10]; (2) Unilateral hip replacement; (3) Clear consciousness, and able to cooperate with research; (4) Complete clinical records; (5) Graded I-III by American Society of anesthesiologists; (6) Hemodialysis treatment >1 year. This study has been approved by the Ethics Committee of the First People's Hospital of Wenling. Informed consent were signed and provided by patients or their family members.

Exclusion criteria: (1) Patients with combined mental illness; (2) Allergic to the investigational drugs; (3) Patients with combined active infection; (4) Patients with combined malignant tumor; (5) Patients with combined coagulation dysfunction; (6) Patients with combined auto-immune diseases; (7) Patients with spinal diseases affecting lower extremity activity; (8) Peritoneal dialysis patients.

Rejection criteria: (1) Patients had other emergency case and affected the intervention in the investigation; (2) Those who voluntarily ask to withdraw during the investigation.

Intervention methods

Patients in both groups received same preoperative evaluation, including detailed medical history, laboratory test, evaluation of cardiopulmonary function and cardiac function, identifying the presence of underlying diseases, assessment of liver and kidney function and intraoperative risk factors assessment *etc*. Then, preoperative preparation was performed, including fasting water, anesthesia risk assessment, *etc*. Operated by the same group of doctors, the patients in both groups were given general epidural anesthesia during the surgery, had incision on the posterolateral side of the hip joint, and implanted prosthesis according to the standard joint replacement. After surgery, patients were performed with the routine rehabilitation exercise.

In the control group, patients received routine nursing of hip replacement, including the use of corrective shoes, keeping the affected limb neutral, observing the affected limb, incision nursing, management of tubes, turning care *etc*.

In the study group, patients received predictive nursing with the following measures: (1) By formulating predictive nursing plan, establishing a predictive nursing group, the common complications for patients underwent hip replacement and maintenance hemodialysis were listed through meeting discussion, brainstorming, literature review, analysis of past cases, *etc*., and the factors that may affect the postoperative rehabilitation were analyzed, and targeted

predictive care plan was also developed. (2) Patients were given psychological care. These patients tended to have more evident adverse emotions due to long-term illness and hemodialysis, including anxiety, depression, silence, pessimism and even despair. This affects the progression of treatment and the patient's prognosis. Nursing staff conducted targeted communication interviews, psychological counseling, and also encouraged families to actively interact with patients, relieve their adverse emotions and improve their confidence in treatment. (3) Through distributing materials, WeChat push, video broadcast, *etc*., health education was conducted to patients to improve their knowledge of the condition and alleviate their negative emotions. (4) Targeting at patients with low immunity and poor tolerance in maintenance hemodialysis, specialists in nephrology, hemorrhagic, cardiology, and nutrition were consulted before surgery, the preoperative nutrition intervention programs were developed for patients to improve their surgical tolerance. (5) Patients were given hemodialysis related care. The common complications in hemodialysis patients were fully considered. During the surgery, hemodialysis routine were strictly observed; operations such as venipuncture, blood collection *etc*. on the limbs with internal fistula were prohibited, and the medical staff in the hemodialysis room were invited to participate if necessary. (6) Postoperative nutrition management was performed in patients. The impact of malnutrition on postoperative recovery was fully understood. Patients were actively monitored for albumin after surgery, and performed intravenous infusion of human albumin when necessary, and strengthened protein intake after operation (daily intake >12 g/kg, and mainly high-quality animal protein). (7) Patients were given predictive nursing on complications. Postoperative patients have high incidence of complications, such as infection, bleeding, thrombus, mental disorders *etc*. Therefore, patients received predictive nursing after surgery, such as antibacterial body wash, cough after surgery, wearing elastic socks, and active joint function exercise *etc*.

Observation index and evaluation standard

Differences of hip joint function scores among different time groups after intervention: The hip joint function for the patients in two groups was evaluated at 7 days, 1, 3 and 6 months after surgery with Harris score on hip joint. Harris scale is a commonly used evaluation scale for hip conserving and joint replacement, which includes four items of pain, function, deformity and activity, with a full score of 100. The higher score indicates the better recovery of hip function for the subject [11].

Comparison of hip joint activity between the two groups before and after intervention: The activity of hip joint for the patients before and 3 months after surgery was evaluated in both groups. Universal protractor or square plate protractor was used. When measuring the range of motion of the hip joint, four indices of extension, abduction, internal rotation and external rotation were evaluated. Each index was measured twice, and the average value was taken.

Comparison of walking function recovery between the two groups: The duration of walking with and without crutches for the patients was recorded in both groups, and the differences between groups were compared.

Comparison of adverse emotions between the two groups before and after intervention: The anxiety and depression for the patients in the two groups before and 3 months after surgery were compared. SAS scale was used for anxiety evaluation, which contains 20 items reflecting the anxiety of patients, including 15 positive scores and 5 negative scores. Four level scoring system of 1-4 was adopted. Based on the standard norms in China, 49 points and below were ranked as no anxiety, 50-59 points as mild anxiety, 60-69 points as moderate anxiety, and 70 points and above as severe anxiety. SDS scale was used for depression evaluation, which contains 20 items reflecting the depression of patients, including 10 positive scores and 10 negative scores. Four level scoring system of 1-4 was adopted. Based on the standard norms in China, 52 points and below were ranked as no depression, 53-62 points as mild depression, 63-72 points as moderate depression, and 73 points and above as severe depression.

Comparison of postoperative pain between the two groups: VAS scale was used to evaluate the scores of rest state VAS (RVAS), VAS in active and passive training (IVAS) and VAS in continu-

Table 1. Comparison of general clinical data between the two groups ($\bar{x} \pm s$)/[n (%)]

General clinical data		Study group (n=41)	Control group (n=40)	t/X^2	P
Gender	Male	21	20	0.012	0.913
	Female	20	20		
Average age (years)		59.19 ± 3.21	59.31 ± 3.19	0.169	0.866
Average weight (kg)		63.29 ± 2.31	63.28 ± 2.22	0.02	0.984
Average BMI (kg/m^2)		21.28 ± 1.21	21.19 ± 1.31	0.321	0.749
Average dialysis time (year)		2.18 ± 0.21	2.20 ± 0.19	0.449	0.655
Disease diagnosis	Femoral head necrosis	18	17	0.331	0.741
	Hip arthritis	13	12		
	Fracture of femoral neck	10	11		
Education level	Illiterate	2	1	0.339	0.739
	Primary school	5	5		
	Junior middle school	13	12		
	High school and above	21	22		
Marital status	Married	36	35	0.002	0.967
	Not married	5	5		
High blood pressure	Yes	26	26	0.022	0.882
	No	15	14		
Diabetes	Yes	27	23	0.598	0.439
	No	14	17		

ous passive training (PVAS) for the patients between the two groups at 3 months after surgery. As a commonly used pain assessment method, VAS scale consists of a straight line of 0-10 cm. The subject selected 1 scale to represent their pain degree according to their own situation.

Comparison of postoperative complications between the two groups: The incidence of complications, such as deep vein thrombosis, bleeding, infection and mental disorders within 3 months was recorded for the patients between the two groups with the method of following up, and the difference between groups was compared.

Statistical analysis

The collected data were input into SPSS20.0 for statistical analysis. The measurement data were expressed by $\bar{x} \pm s$. The differences between groups were compared with Student's t test. The count data were represented by [n (%)], and the differences between groups were compared with Chi square test. *P*<0.05 suggests that there is statistical significance [12].

Results

Comparison of general clinical data between the two groups

The comparison showed that there was no significant difference in general clinical data, such as gender, age, weight, dialysis time and disease type between the two groups (*P*>0.05) (**Table 1**).

Differences of hip joint function scores among different time groups after intervention

The comparison showed that there was no significant difference in Harris scores between the two groups at 7 days after intervention (*P*>0.05). As the increase of intervention time, the Harris scores of patients in the two groups were significantly improved. The Harris score of patients was significantly higher at 7 days after intervention compared with those at 1, 3 and 6 months after intervention (*P*<0.05). The comparison between groups showed that the Harris score of the patients in the study group at 1, 3 and 6 months after intervention was higher than that in the control group (*P*<0.05) (**Figure 1**).
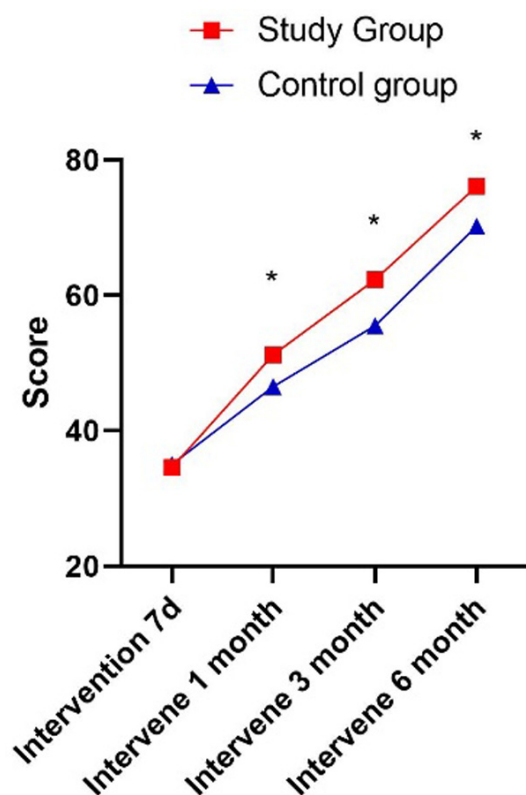
Figure 1. Differences of hip joint function scores between different time groups after intervention. The comparison showed that there was no significant difference in Harris scores for patients between the two groups at 7 days after intervention; and study group had a significantly higher Harris score at 1, 3 and 6 months after intervention than the control group (*P*<0.05); * represents that the difference between the same index groups at the same time was statistically significant.

Comparison of hip joint activity between the two groups before and after intervention

The comparison showed that there was no significant difference in hip extension, abduction, internal rotation and external rotation angle before surgery for the patients in the two groups (*P*>0.05); 3 months after intervention, the activity of hip joint for the patients in the two groups was significantly higher than that before treatment, and there was significant difference before and after surgery (P<0.05). The comparison between groups showed that the extension, abduction, internal rotation and external rotation angles of the patients in the study group were higher than those in the control group (*P*<0.05) (**Figure 2**).

Comparison of walking function recovery between the two groups

The statistics after surgery showed that the duration of walking with and without crutches of the patients in the study group was significantly shorter than those in the control group, and there was significant difference between groups (*P*<0.05) (**Table 2**).

Comparison of adverse emotions between the two groups before and after intervention

The evaluation showed that there was no significant difference in SAS and SDS scores for the patients between the two groups before the intervention (*P*>0.05); 3 months after intervention, there was no significant change in SAS and SDS scores for the patients in the control group before treatment, and there was little difference between before and after intervention (*P*>0.05); the SAS and SDS scores of patients in the study group was significantly lower than those before treatment (*P*<0.05), and with group comparison, the SAS and SDS scores of patients in the study group were lower than those in the control group (*P*<0.05) (**Figure 3**).

Comparison of postoperative pain between the two groups

The comparison showed that the scores of resting pain, passive activity pain and active activity pain for the patients in the study group were significantly lower than those in the control group at 3 months after intervention, and the differences between the groups were statistically significant (*P*<0.05) (**Figure 4**).

Comparison of postoperative complications between the two groups

The comparison showed that the patients in the study group had a total incidence of 4.88%, including 1 case of postoperative bleeding and 1 case of infection; the patients in the control group had a total incidence of 22.50%, including 4 cases of DVT2, 4 cases of bleeding, 2 cases of infection and 1 case of mental disorder. The difference of complication rate between the two groups was statistically significant (*P*<0.05) (**Table 3**).
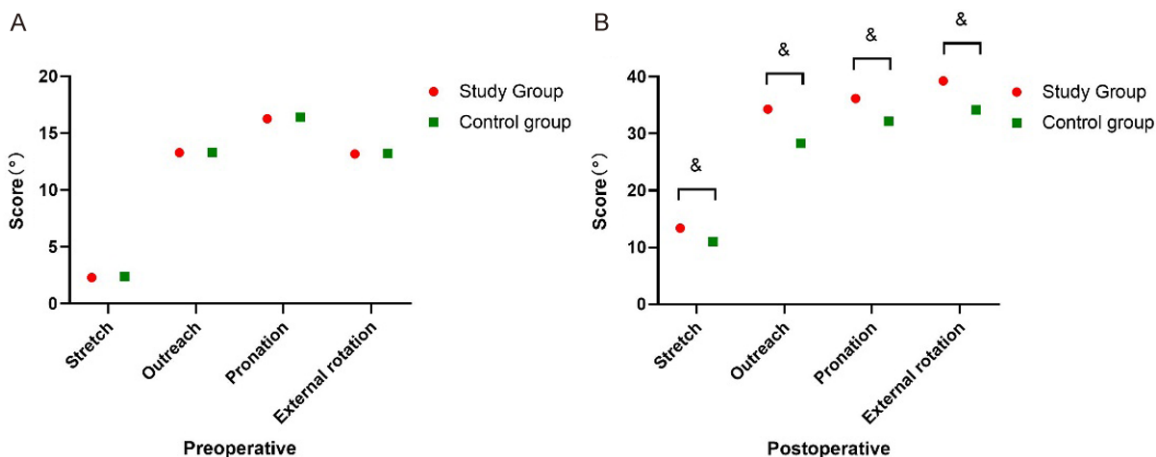
Figure 2. Comparison of hip joint activity between the two groups before and after intervention. There was no significant difference in hip joint extension, abduction, internal rotation and external rotation angle for the patients between the two groups before surgery (*P*>0.05); the reassessment for patients at 3 months after surgery showed that the hip joint extension, abduction, internal rotation and external rotation angle for the patients in the study group were higher than those in the control group (*P*<0.05); & represents that the difference between the groups was statistically significant.

Table 2. Comparison of walking function recovery between the two groups ($\overline{x} \pm s$) (d)

| Group	Cases	Duration of walking with crutches	Duration of walking without crutches
Study group	41	15.28 ± 2.31	22.38 ± 2.12
Control group	40	19.81 ± 2.22	26.18 ± 2.29
X^2	-	8.995	7.753
P	-	<0.001	<0.001

Discussion

End stage renal disease (ESRD) is a type of chronic renal disease characterized by receiving renal replacement therapy. It is the most serious stage of all kinds of chronic renal diseases and requires life-sustaining renal replacement therapy. The clinical symptoms of the patients in the early stage are not obvious. In the later period, with the accumulation of various types of toxins in the body, nausea, patients have typical clinical symptoms of uremia such as vomiting, itching of the skin, edema and anemia. The figures show that the current patients with ESRD in China is as high as 2 million; and the patients with ESRD will exceed 3 million along with the social structure of population aging, which will bring tremendous burden to social development [13, 14].

Hemodialysis is a common treatment for patients with ESRD. According to the Nephrology Data System in the United States, more than 80% of patients with ESRD selected hemodialysis treatment. The rate of hemodialysis treatment in China is as high as 90%. Hemodialysis can be effective in maintaining the life of patients with ESRD. However, the quality of life of such patients is still poor, and fatigue, itching, insomnia, metabolic imbalances and other diseases occur frequently [15]. Clinical investigations have pointed out that due to metabolic imbalances and long-term application of hormone medications, patients with maintenance hemodialysis have higher incidence of necrosis of the femoral head and hip osteoarthritis. Hip replacement can effectively improve the clinical symptoms of patients, and improve the quality of life to some extent [16]. However, in practice, high postoperative complications and fatality rate are one of the factors restricting the promotion of the surgery. Therefore, medical workers are now committed to find a safer and more effective nursing intervention to accelerate patient's postoperative recovery and reduce the incidence of postoperative complications.

As a new concept of nursing intervention in recent years, predictive nursing is also known as advanced care. Nursing staff can determine the nursing focus and implement the corresponding intervention measures by predicting
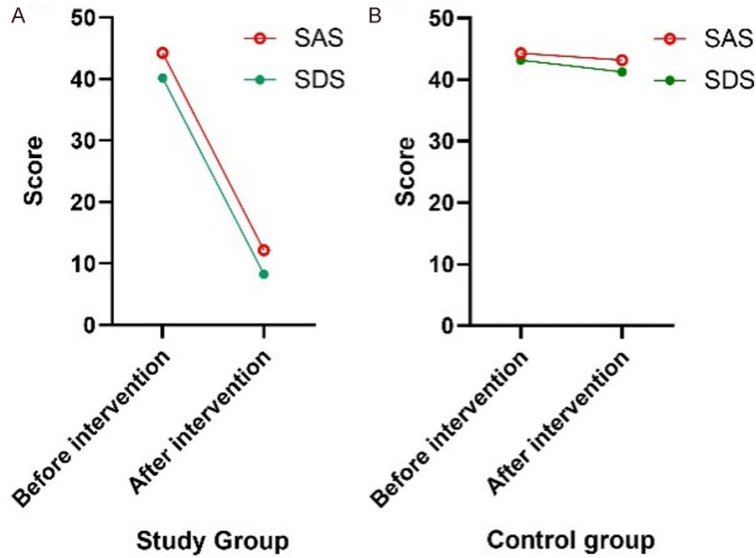
Figure 3. Comparison of adverse emotions between the two groups before and after intervention. After 3 months of intervention, there was no significant difference for the SAS and SDS scores of patients in the control group before and after treatment (B); while the patients in the study group had a significantly lower SAS and SDS scores than that before treatment (A).
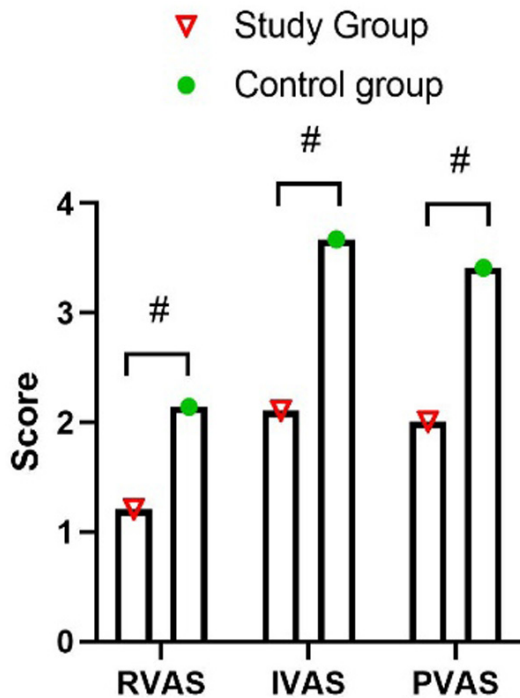
Figure 4. Comparison of postoperative pain between the two groups. The study group had a significantly lower scores of resting pain, passive activity pain and active activity pain at 3 months of intervention than the control group (*P*<0.05); # represents that the difference between the same index groups at the same time was statistically significant.

the possible problems of patients in advance before and during work, so as to improve the quality of nursing and the prognosis of patients. Based on the survey of 98 elderly patients undergoing hip replacement, predictive nursing reduced the incidence of postoperative complications from 22.45% to 6.12%, and the postoperative activity time of patients from (7.18 ± 1.20) d to (5.29 ± 1.22) d, which had a significant effect. Some research findings also showed that predictive care can alleviate anxiety and depression in hip replacement patients after surgery through psychological intervention, which has certain positive significance for accelerating postoperative rehabilitation. All these suggest that predictive nursing has good practical experience in clinical practice [17, 18].

By setting up different groups, this study analyzed the effect of predictive nursing on postoperative rehabilitation and complications of patients with hip replacement and maintenance hemodialysis. The results showed that compared with the patients in the control group with traditional nursing, patients received combined predictive nursing in the study group at 1, 3, and 6 months after surgery have a significantly higher Harris score of hip joint; and the patients' angle of hip extension, abduction, internal rotation and external rotation in the study group was significantly larger than that in the control group. This suggests that predictive nursing can effectively improve the patient's hip function after surgery and accelerate the patient's postoperative recovery process. Research showed that hemodialysis had a better filtration coefficient. It had a certain impact on the level of microelements in the body while removing the toxin of large and medium molecules, which increased the incidence of osteoporosis. The changes of bone metabolism directly affected the recovery of joint function in patients after hip replacement [19]. In this study, the hip function and activity degree for

Table 3. Comparison of postoperative complications between the two groups [n (%)]

Group	Cases	DVT	Bleeding	Infection	Mental disorder	Total incidence
Study group	41	0 (0.00)	1 (2.44)	1 (2.44)	0 (0.00)	2 (4.88)
Control group	40	2 (5.00)	4 (10.00)	2 (5.00)	1 (2.50)	9 (22.50)
X^2	-	-	-	-	-	5.357
P	-	-	-	-	-	0.021

the patients in the study group were significantly better than those of the control group at different times after surgery. It is related to that predictive nursing can affect bone metabolism in patients with hemodialysis before and after surgery. A control study on nursing care of 80 patients with hip arthroplasty showed that predictive nursing can accelerate postoperative recovery of patients and has positive significance for improving joint function of patients. It is believed in this study that predictive nursing can provide maximum conditions for functional recovery of patients after hip replacement by supplementing sufficient protein and infusing nutrient solution for patients [20]. Consequently, patients in the study group recovered faster and functioned better after surgery. This is also confirmed by the results that patients' duration of walking with and without crutches in the study group were significantly shorter than those in the control group, and the scores of RVAS, IVAS and PVAs of the patients in the study group were lower than those in the control group. In addition, this study also analyzed the influence of predictive nursing on patients' adverse emotions. The results showed that the scores of SAS and SDS of the patients in the study group were lower than those in the control group. As mentioned earlier, due to the migration of the disease and the difficulty of treatment, patients with maintenance hemodialysis tended to have more adverse emotions, while patients in the control group had no special intervention. Therefore, there was no significant improvement in the SAS and SDS scores after hip replacement. Through literature review, meeting discussion and other means, psychological intervention methods were determined for the patients in the study group. This significantly improved the patient's adverse emotions, but also affected the follow-up treatment to a certain extent. Finally, the study also compared the incidence of complications for the patients between the two groups, indicating that predictive nursing intervention has a significant effect, and it further reduces

patient's chances of postoperative mental disorders, bleeding, and infection, *etc*. According to our analysis, compared with patients with simple hip replacement, patients underwent hip replacement and maintenance hemodialysis have a higher risk of complications and greater harm, for example, intraoperative stress and electrolyte disorder in dialysis patients can significantly increase the incidence of postoperative mental disorders; therefore, predictive nursing shall be further strengthened in those patients. The nursing staff should make good protection in advance and closely observe patients' thinking dynamics, cognition, behavior, *etc*. to prevent unplanned extubation, falling out of bed, *etc*. [21].

In conclusion, the application of predictive nursing to patients underwent hip replacement and maintenance hemodialysis can help improve patients' hip activity and joint function after surgery, accelerate postoperative recovery and relieve postoperative pain symptoms, and also reduce the incidence of all types of complications for the patients. It is worthy of clinical application. The shortcoming of this study has been concluded: (1) There are too few samples included in the study, which has resulted in a lack of comprehensiveness in the results obtained; (2) The research subjects were short on follow-up time. Considering the shortcomings above, the author will conduct a study with a larger sample size and longer follow-up time in the next step, so as to provide a more detailed clinical data support for the prognosis of patients underwent hip replacement and maintenance hemodialysis.

Disclosure of conflict of interest

None.

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References

[1] Chen JL, Yang TY, Chuang PY, Huang TW and Huang KC. Pseudoaneurysm rupture with hemorrhagic shock in a patient with periprosthetic hip joint infection: a case report. Medicine (Baltimore) 2018; 97: e11028.

[2] Kim CH, Aditya K, Lee SJ, Kim HJ, Yoon KS, Kim HJ and Yoon PW. Arthroscopic treatment of psoas abscess concurrent with septic arthritis of the hip joint. Hip Int 2018; 28: 336-340.

[3] Kubo Y, Motomura G, Ikemura S, Hatanaka H, Fukushi JI, Hamai S, Yamamoto T and Nakashima Y. Osteoclast-related markers in the hip joint fluid with subchondral insufficiency fracture of the femoral head. J Orthop Res 2018; 36: 2987-2995.

[4] Berend KR, Lombardi AV Jr, Berend ME, Adams JB and Morris MJ. The outpatient total hip arthroplasty: a paradigm change. Bone Joint J 2018; 100-B Supple A: 31-35.

[5] Palsis JA, Brehmer TS, Pellegrini VD, Drew JM and Sachs BL. The cost of joint replacement: comparing two approaches to evaluating costs of total hip and knee arthroplasty. J Bone Joint Surg Am 2018; 100: 326-333.

[6] Flecher X, Ollivier M, Maman P, Pesenti S, Parratte S and Argenson JN. Long-term results of custom cementless-stem total hip arthroplasty performed in hip fusion. Int Orthop 2018; 42: 1259-1264.

[7] Liu Q, Geng P, Shi L, Wang Q and Wang P. Tranexamic acid versus aminocaproic acid for blood management after total knee and total hip arthroplasty: a systematic review and meta-analysis. Int J Surg 2018; 54: 105-112.

[8] Miller LE, Gondusky JS, Kamath AF, Boettner F, Wright J and Bhattacharyya S. Influence of surgical approach on complication risk in primary total hip arthroplasty. Acta Orthop 2018; 89: 289-294.

[9] Hara D, Hamai S, Komiyama K, Motomura G, Shiomoto K and Nakashima Y. Sports participation in patients after total hip arthroplasty vs periacetabular osteotomy: a propensity score-matched asian cohort study. J Arthroplasty 2018; 33: 423-430.

[10] Jo WL, Lee YK, Ha YC, Kim TY and Koo KH. Delay of total hip arthroplasty to advanced stage worsens post-operative hip motion in patients with femoral head osteonecrosis. Int Orthop 2018; 42: 1599-1603.

[11] Assi C, Kheir N, Samaha C, Kouyoumjian P and Yammine K. Early results of total hip arthroplasty using dual-mobility cup in patients with osteonecrosis of the femoral head. SICOT J 2018; 4: 4.

[12] Cheng Q, Tang JL, Gu JJ, Guo KJ, Guo WS, Wang BL and Zhao FC. Total hip arthroplasty following failure of tantalum rod implantation for osteonecrosis of the femoral head with 5- to 10-year follow-up. BMC Musculoskelet Disord 2018; 19: 289.

[13] Nishimura M and Hsu JC. Non-Vitamin K antagonist oral anticoagulants in patients with atrial fibrillation and end-stage renal disease. Am J Cardiol 2018; 121: 131-140.

[14] Van Pilsum Rasmussen S, Konel J, Warsame F, Ying H, Buta B, Haugen C, King E, DiBrito S, Varadhan R, Rodríguez-Mañas L, Walston JD, Segev DL and McAdams-DeMarco MA. Engaging clinicians and patients to assess and improve frailty measurement in adults with end stage renal disease. BMC Nephrol 2018; 19: 8.

[15] Kistler BM, Benner D, Burrowes JD, Campbell KL, Fouque D, Garibotto G, Kopple JD, Kovesdy CP, Rhee CM, Steiber A, Stenvinkel P, Ter Wee P, Teta D, Wang AYM and Kalantar-Zadeh K. Eating during hemodialysis treatment: a consensus statement from the international society of renal nutrition and metabolism. J Ren Nutr 2018; 28: 4-12.

[16] Lai TW, Ma HL, Lee MS, Chen PM and Ku MC. Ultrasonography and clinical outcome comparison of extracorporeal shock wave therapy and corticosteroid injections for chronic plantar fasciitis: a randomized controlled trial. J Musculoskelet Neuronal Interact 2018; 18: 47-54.

[17] Hu L, Zou Y, Chang SJ, Qiu Y, Chen H, Gang M, Jin Y and Lin X. Effects of botulinum toxin on improving facial surgical scars: a prospective, split-scar, double-blind, randomized controlled trial. Plast Reconstr Surg 2018; 141: 646-650.

[18] Ogawa H, Hasegawa S, Tsukada S and Matsubara M. A pilot study of augmented reality technology applied to the acetabular cup placement during total hip arthroplasty. J Arthroplasty 2018; 33: 1833-1837.

[19] Wu QS, He Q, He JQ, Chao J, Wang WY, Zhou Y, Lou JZ, Kong W and Chen JF. The role of mitofilin in left ventricular hypertrophy in hemodialysis patients. Ren Fail 2018; 40: 252-258.

[20] Piccoli GB, Cabiddu G, Moio MR, Fois A, Cao R, Molfino I, Kaniassi A, Lippi F, Froger L, Pani A and Biolcati M. Efficiency and nutritional parameters in an elderly high risk population on hemodialysis and hemodiafiltration in Italy and France: different treatments with similar names? BMC Nephrol 2018; 19: 171.

[21] Tennankore KK, Na Y, Wald R, Chan CT and Perl J. Short daily-, nocturnal- and conventional-home hemodialysis have similar patient and treatment survival. Kidney Int 2018; 93: 188-194.