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Original Article

Effect of rapid rehabilitation nursing on improvement of quality of life after super-miniPCNL and risk analysis for postoperative complications

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Abstract: Objective: To investigate the effect of rapid rehabilitation nursing on the improvement of quality of life after super-miniPCNL (SMP) and the risk analysis of postoperative complications. Methods: The clinical data of 124 SMP patients who were admitted from February 2019 to February 2021 were analyzed retrospectively. Thereinto, 58 cases received routine nursing were regarded as the control group (CG), and 66 received rapid rehabilitation nursing were considered as the observation group (OG). The negative emotions, pain relief, incidence of complications and quality of life were compared. In view of the occurrence of complications, patients were divided into complication group and non-complication group, and the risk factors were assessed by logistics regression. Results: The time of fluid infusion, exhaust, defecation and hospitalization in the OG were shorter than those in the CG, and the difference was statistically remarkable ($P<0.05$). In the OG, the SF-36 and score of postoperative quality of life were obviously higher ($P<0.05$), while the postoperative visual analogue scale (VAS), self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were markedly lower. Logistics regression analysis manifested that the operation time, course of disease, stone residue, history of preoperative infection and nursing plan were independently correlated with complications. Conclusion: Rapid rehabilitation nursing for SMP patients is beneficial to accelerating postoperative recovery, reducing the occurrence of complications and improving quality of life.

Keywords: Rapid rehabilitation nursing, kidney stone, super-miniPCNL, quality of life, risk analysis

Introduction

As a common urinary disease, urinary stone disease (USD) is putting great pressure on the world health system. Statistics show that the morbidity of USD has reached 8%-15% [1, 2]. Those patients are often accompanied with renal colic, urination pain, dysuria and hematuria, which greatly damage their quality of life [3]. As a common urolithiasis, the morbidity of kidney stone (KS) has obvious regional differences. With bad living and eating habits, its morbidity is showing an increasing trend year by year [4]. Surgery is the main treatment for KS, through laser, ultrasound and aerodynamic trajectory to crush stones [5]. Although it is effective, patients are prone to adverse reactions after operation, and the recurrence rate is quite high. Postoperative residual crushed stones can cause infection, renal colic, stone recurrence and obstruction, and eventually lead to renal failure [6].

Nowadays, extracorporeal shock wave lithotripsy (ESWL), ureteroscopic lithotripsy (URSL) and percutaneous nephrolithotomy (PCNL) play a vital role in the treatment of urinary calculi. At the same time, more and more improved treatment techniques are emerging, which make it easier for us to remove stones in kidney and ureter [7, 8]. Although minimally invasive surgery has gradually become the mainstream in urolith treatment, open surgery also exerts crucial effects. For some patients with complex urolithiasis and abnormal urinary system anatomy, open surgery may be an essential choice [9]. PCNL is the gold standard procedure for large KS. Although PCNL has a good effect on

patients, the risk of intraoperative and postoperative complications still exists [10, 11].

Super-miniPCNL (SMP) with an aperture of 10 to 12F is effective in KS with larger diameter [12]. In view of the nursing model of SMP, exploring effective intervention programs that can reduce the incidence of postoperative complications and stress reaction and improve the quality of life of patients has become the focus of research. Professional nursing and rehabilitation guidance can reduce the traumatic stress of patients, shorten the duration of hospitalization, and promote the early recovery of physical function of patients [13]. Rapid rehabilitation nursing is a new nursing concept in recent years, which is scientific, rapid and comprehensive. It can optimize many nursing measures during hospitalization, so as to reduce the stress reaction caused by diseases. It has also played a key part for patients with cancer, urology, gastrointestinal diseases, etc. [14, 15]. Jiang et al. [16] mentioned that rapid rehabilitation nursing could not only recover the hip function of elderly patients with hip fracture more quickly, but also reduce the postoperative complications of patients, so that they have shorter hospital stay. Although rapid rehabilitation nursing has been validated in many surgical procedures, there are no studies to explore its effect after PCNL in patients with renal calculi.

Thus, the purpose of this research is to explore the effect of rapid rehabilitation nursing in improving the quality of life of patients with renal calculi after SMP treatment, in order to provide clinical research basis.

Materials and methods

Patient data

The clinical data of 124 KS sufferers treated with SMP in our hospital from February 2019 to February 2021 were analyzed retrospectively. Thereinto, 58 cases (27 males and 31 females) received general perioperative nursing were regarded as the control group (CG), with an average age of (45.3±8.6) years, while 66 (39 males and 27 females) received rapid rehabilitation nursing were seen as the observation group (OG), with an average age of (44.5±10.1) years. This research was conducted after being approved by the Medical Ethics Committee (Approval number: IRB2019020712). Before it, all patients and their families were informed and explained the research purpose and content, and the informed consent form was obtained.

Inclusion and exclusion criteria

Inclusion criteria: 1. Patients were diagnosed with KS and met the SMP indication; 2. Age ≥18 years; 3. Mental and language impairments; 4. Patients were informed about the research, and then voluntarily signed the informed consent form.

Exclusion criteria: 1. Those who received biliary surgery in the past; 2. Patients with bleeding or severe abnormal blood coagulation; 3. Complicated with severe heart, lung, liver and kidney insufficiency; 4. Complicated with mental abnormality; 5. Pregnant or lactating women; 6. Those who failed to adhere to treatment and had poor compliance.

Nursing mode

The routine nursing program was carried out for patients in CG. 1. Preoperative nursing: KS and SMP were introduced to patients, so that they understood the disease and treatment plan, and had less preoperative stress. 2. Postoperative nursing: Nursing in terms of surgical wound, puncture site and tube drainage should be carried out regularly, and information and guidance on related drugs should be provided to patients. It was suggested that patients should have a balanced diet and adequate rest to maintain postoperative recovery. 3. Complication nursing: We informed patients about the occurrence of postoperative complications, actively observed their condition and the occurrence of complications, and intervened immediately if complications occur.

The rapid rehabilitation nursing was implemented for patients in OG. 1. Psychological nursing: After admission, the nurses paid close attention to and understood the psychological changes of patients. When patients had anxiety, fear, tension and other negative emotions, the nursed timely enlightened them, and publicized the past successful rehabilitation cases to improve their confidence. Besides, the nurs-

es also introduced the etiology, corresponding treatment methods, efficacy and prognosis to patients and their families, so that they understood the disease. 2. Preoperative preparation: Patients' condition was evaluated regularly, and the possible postoperative complications were predicted. 3. Intraoperative nursing: During the operation, patients' characteristic indicators were closely observed, and the doctor was notified immediately once the indications became abnormal, and measures were taken to intervene. 4. Postoperative nursing: The nurses in the operating room had good communication with those in the ward about the condition of patients, and guided the eligible patients to carry out rehabilitation training to ensure that they maintained a scientific, balanced and nutritious diet. 5. Complication nursing: After the operation, the vital indexes such as blood oxygen saturation, pulse, complexion and heart rate were closely monitored, and the drainage fluid and urine of patients were monitored regularly, and the abdominal wall incision and drainage tube were paid close attention to maintain the wound hygiene. Once they showed symptoms, timely and effective treatment was performed. 6. Pain nursing: For patients with strong pain, they were injected with analgesics to relieve pain, and massage and oxygen inhalation were used to relieve pain and discomfort.

Evaluation criteria

The quality of life of patients was evaluated by SF-36 score, and the score was evaluated one day before operation and one week after operation. The quality of life was evaluated from eight aspects: physiological function, role-physical, bodily pain, health, energy, social function, emotional function and mental health. The total score of each item was 100 points, and the final score was taken as the average of 8 items, the higher the score, the better the quality of life [17]. The pain of 24 h after operation was evaluated by visual analogue scale (VAS). The total score was 10 points, the higher the score, the more severe the pain [18]. Self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were used to evaluate the anxiety and depression of patients 7 days after operation. The total scores were 100 points, the higher the score, the more serious the anxiety and depression symptoms [19].

Complications

The postoperative complications (bleeding, low back colic, urinary tract infection, perirenal hematoma, etc.) were recorded.

Statistical methods

The collected data were assessed via SPSS 19.0 statistical analysis software. The utilization rate of counting data (%) was evaluated via chi-square test, expressed by X^2. The measurement data in accordance with the normal distribution were represented by mean ± standard deviation (Mean ± SD). The independent sample t-test was used for the comparison between the two groups, marked by t. Multivariate logistic regression equation was used to analyze the risk factors of postoperative complications. $P<0.05$ was regarded as statistically significant.

Results

Clinical baseline data

By comparing the clinical baseline data of patients, we found that the two groups had no obviously different in age, sex, BMI, course of disease, operation time, smoking history, drinking history, preoperative infection, catheter intubation, and stone diameter, position, location and residue ($P>0.05$) (**Table 1**).

Comparison of surgical clinical indicators

Comparing the stone residual rate between the two groups, it was found that there was no significant difference in the stone residual rate between the two groups ($P>0.05$). Although the amount of surgical bleeding and operation time in the observation group were lower than those in the control group, there was also no significant difference ($P>0.05$), as shown in **Table 2**.

Incidence of postoperative complications in patients

As shown in **Table 3**, postoperative complications in both groups included postoperative bleeding, low back colic, urinary tract infection and perirenal hematoma, and the total inci-

Table 1. Clinical baseline data

Factor	Observation group (n=66)	Control group (n=58)	t/χ^2 value	*P* value
Age (year)	44.5±10.1	45.3±8.6	0.471	0.638
Sex			1.950	0.163
Male	39 (59.09)	27 (46.55)		
Female	27 (40.91)	31 (53.45)		
BMI (kg/m^2)	21.22±2.42	21.57±2.47	0.796	0.428
Course of disease (month)	10.5±5.1	11.0±5.1	0.545	0.587
Operation time (min)	57.27±8.25	55.29±7.82	1.366	0.174
History of smoking			1.189	0.276
Yes	18 (27.27)	11 (18.97)		
No	48 (72.73)	47 (81.03)		
History of alcoholism			0.123	0.726
Yes	13 (19.70)	10 (17.24)		
No	53 (80.30)	48 (82.76)		
History of preoperative infection			0.046	0.830
Yes	10 (15.15)	8 (13.79)		
No	56 (84.85)	50 (86.21)		
Catheter intubation			0.154	0.695
Yes	25 (37.88)	20 (34.48)		
No	41 (62.12)	38 (65.52)		
Stone diameter (cm)	1.74±0.62	1.62±0.68	1.028	0.306
Stone position			0.946	0.623
Left kidney	31 (46.97)	32 (55.17)		
Right kidney	27 (40.91)	21 (36.21)		
Double kidneys	8 (12.12)	5 (8.62)		
Stone location			1.486	0.476
Upper calyx	32 (48.49)	30 (51.72)		
Lower calyx	22 (33.33)	14 (24.14)		
Renal pelvis	12(18.18)	14 (24.14)		
Stone residue			0.295	0.587
Yes	5 (7.58)	3 (5.17)		
No	61 (92.42)	55 (94.83)		

BMI: Body Mass Index.

Table 2. Comparison of surgical clinical indexes

	Observation group (n=66)	Control group (n=58)	χ^2	*P* value
Stone residue			0.295	0.587
Yes	5 (7.58)	3 (5.17)		
No	61 (92.42)	55 (94.83)		
Surgical bleeding (ml)	114.61±20.11	120.64±18.67	1.723	0.088
Operation time (min)	91.24±19.13	95.84±18.64	1.352	0.179

dence of complications in the OG was markedly lower than that of the CG (P<0.05).

Comparison of clinical indexes of patients after operation

It was found that the time of fluid infusion, exhaust and hospitalization in the OG were markedly lower than those in the CG (P<0.05) (**Figure 1**).

Comparison of quality of life, negative emotions and pain management in patients after operation

SF-36 score was used to compare the changes of quality of life between groups before and after treatment. The quality of life was improved after treatment, and the score in the OG was higher than that in the CG (P<0.05). There was no marked difference in VAS, SAS and SDS scores between both groups before operation. It was found that the VAS, SAS and SDS scores in the OG were lower than that of the CG after operation (P<0.05) (**Figure 2**).

Analysis of risk factors of postoperative complications in patients

We re-divided the patients into two groups based on whether there were postoperative complications: 22 cases in the unfavorable group and 102 in the favorable group. There were remarkable differences in age, course of disease, operation time, preoperative infection history, stone residue and nursing methods between the two groups (P<0.05) (**Table 4**).

Table 3. Incidence of postoperative complications

	Observation group (n=66)	Control group (n=58)	t value	*P* value
Postoperative bleeding	2 (3.03)	3 (5.17)	4.923	0.027
Low back colic	3 (4.55)	6 (10.34)		
Urinary tract infection	1 (1.51)	3 (5.17)		
Perirenal hematoma	1 (1.51)	3 (3.45)		
Total incidence of complications	7 (10.61)	15 (24.14)		

Multivariate analysis

Through logistics regression analysis of the different factors in **Table 4**, we discovered that nursing mode, course of disease, stone residue, preoperative infection and operation time were the independent risk factors of patients (**Table 5**).

Discussion

With the increasing morbidity of KS, more and more patients develop into recurrent diseases and even renal failure [20]. It is found that the formation of KS is often related to patients' age, diet, environment and heredity, etc., resulting in the deposition of calcium, oxalic acid, uric acid, cystine and other crystal substances in the kidney [21, 22].

There are many treatment methods for patients with KS. In the past, open surgery was used for severe KS, but the postoperative recovery was often slow, so more patients tend to choose less invasive treatment [23]. ESWL is a classic method for KS, but it is not effective in some hard stones, and the residual stones can also cause perirenal edema and adhesion of surrounding tissue [24]. As a minimally invasive endoscopic surgery, URSL has less trauma and quick recovery, but it is more suitable for stones with a diameter of less than 20 mm [25]. PCNL is effective in large stones, with less trauma. The aperture of SMP is 10-12F. Because the diameter of endoscope is small, it can also pass through some narrow parts smoothly. Therefore, compared with traditional PCNL, it can reduce the probability of complications such as renal trauma bleeding, inflammation, and abdominal pain and distension [26]. Meanwhile, ultrasound-guided puncture can help the operator to grasp the location, angle and depth and prevent damage to the nearby pleura and spleen [27].

Many patients experience fear, anxiety, and sleep disturbance due to the symptoms before and after urological surgery. Simultaneously, some patients also have fear and lack of confidence in the efficacy of treatment because of their lack of understanding of the treatment method. In order to reduce the fear and anxiety of patients before and after surgery, our rapid rehabilitation nursing model explains the corresponding conditions and treatment plans, and strengthens the emotional care and pain management of patients. Furthermore, poor surrounding environmental conditions during the treatment period and postoperative recovery period, or poor medical care may affect patients' postoperative recovery. Traditional nursing methods are often difficult to deal with these psychological burdens of patients. Rapid rehabilitation nursing will formulate a more accurate and suitable preoperative and postoperative nursing plan based on the actual situation, physical and psychological conditions and individual needs of each patient.

We used SF-36 score to evaluate the quality of life of patients after operation, and found that the quality of life in the OG was higher than that of the CG, indicating rapid rehabilitation nursing could improve their quality of life more than traditional nursing methods. The 24-hour VAS, 7-day SAS and SDS scores of patients in the OG were lower than those of the CG. Rapid rehabilitation nursing had a better effect on the pain management in patients with KS, and further improved their negative emotions by strengthening the pain management. In the meantime, the clinical indexes of fluid infusion time, exhaust time and hospital stay in the OG were shorter than those of the CG, indicating that the postoperative recovery of patients received rapid rehabilitation nursing was faster than that of those received traditional nursing. Patients often need to use some antibiotics to prevent postoperative infection, and supplement with some balance fluid to maintain water and electricity medium balance, so as to provide body energy. Patients received rapid rehabilitation nursing recovered faster and had reduced time of postoperative fluid replace-

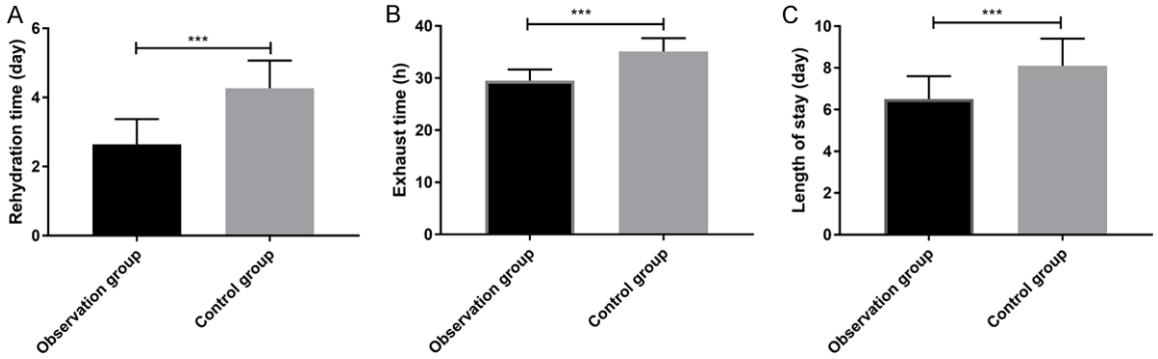

Figure 1. Comparison of postoperative clinical indexes. A. The time of postoperative fluid infusion in the observation group was remarkably lower than that in the control group. B. The postoperative exhaust time in the observation group was remarkably lower than that in the control group. C. The postoperative hospital stay in the observation group was remarkably lower than that in the control group. *P<0.05, **P<0.01, ***P<0.001.

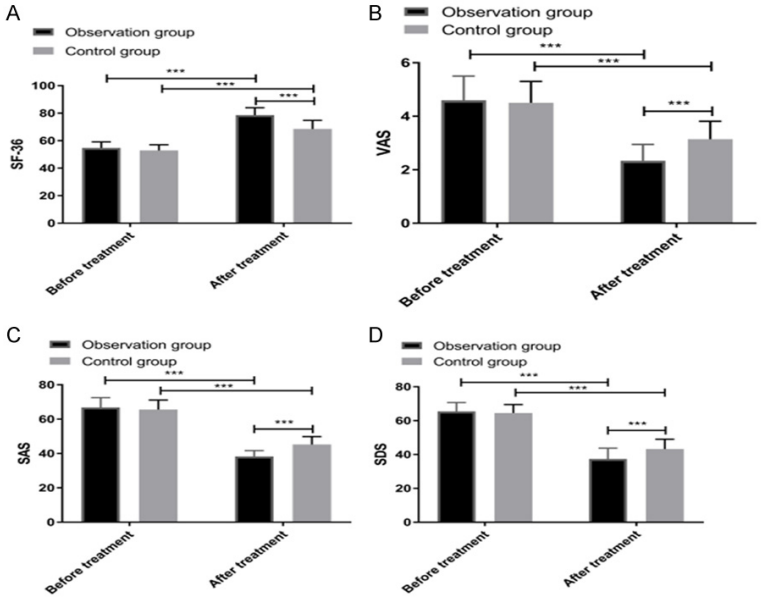

Figure 2. Comparison of quality of life, negative emotions and pain management in patients after operation. A. Changes of patients' quality of life before and after nursing. B. There was no significant difference in VAS score between both groups before operation, but the score decreased after operation. The postoperative VAS in the observation group was obviously lower than that in the control group. C. There was no significant difference in SAS score between both groups before operation, but the score decreased after operation. The postoperative SAS in the observation group was obviously lower than that in the control group. D. There was no significant difference in SDS score between both groups before operation, but the score decreased after operation. The postoperative SDS in the observation group was obviously lower than that in the control group. *P<0.05, **P<0.01, ***P<0.001.

ment. We speculate that the reason is that the rapid rehabilitation nursing guides patients to carry out postoperative rehabilitation training, observes their wound condition all the time, and understands the current rehabilitation process through inquiry and observation. Xu et al. [28] and Ding et al. [29] found that rapid rehabilitation nursing could better reduce their negative emotions by strengthening care and respecting patients. At the same time, perioperative nursing can reduce patients' intraoperative and postoperative adverse reactions, so that they can recover faster after operation, which is similar to our research findings. Compared with their research, the postoperative trauma in our study is relatively small. This nursing model also reduced the incidence of postoperative complications. Postoperative bleeding, low back colic, urinary tract infection and perirenal hematoma occurred in both groups, but the incidence of postoperative complications in the OG was obviously lower than that of the CG. Finally, through the risk analysis of postoperative complications, we found that nursing mode, course of disease, stone residue, history of preoperative infection and operation time were independently correlated to postoperative complications.

There are some limitations in this study. First of all, given the low incidence of the complica-

Table 4. Univariate analysis

Factor	Unfavorable group (n=22)	Favorable group (n=102)	t/χ^2 value	*P* value
Age (year)	49.2±11.6	43.8±8.6	2.501	0.014
Sex			0.019	0.891
Male	12 (54.55)	54 (52.94)		
Female	10 (45.45)	48 (47.06)		
BMI (kg/m^2)	21.38±2.44	21.48±2.51		
Course of disease (month)	12.9±5.7	10.3±4.8	2.227	0.028
Operation time (min)	103.10±15.75	90.91±18.75	2.839	0.005
History of smoking			0.225	0.635
Yes	6 (27.27)	23 (22.55)		
No	16 (72.73)	79 (77.45)		
History of alcoholism			1.583	0.208
Yes	2 (9.09)	21 (20.59)		
No	20 (90.91)	81 (79.41)		
History of preoperative infection			10.288	0.001
Yes	8 (36.36)	10 (9.80)		
No	14 (63.64)	92 (90.20)		
Catheter intubation			0.247	0.619
Yes	9 (40.91)	36 (35.29)		
No	13 (59.09)	66 (64.71)		
Stone diameter (cm)	1.69±0.65	1.67±0.66		
Stone position			0.437	0.803
Left kidney	10 (45.45)	53 (51.96)		
Right kidney	9 (40.91)	39 (38.24)		
Double kidney	3 (13.64)	10 (9.80)		
Stone location			0.646	0.724
Upper calyx	10 (45.46)	52 (50.98)		
Lower calyx	6 (27.27)	30 (29.41)		
Renal pelvis	6 (27.27)	20 (19.61)		
Stone residue			6.097	0.014
Yes	4 (18.18)	4 (3.92)		
No	18 (81.82)	98 (96.08)		
Nursing mode			4.923	0.027
Rapid rehabilitation nursing	7 (31.82)	59 (57.84)		
Routine nursing	15 (68.18)	43 (42.16)		

Table 5. Multivariate analysis

	B	S.E	Wals	Sig.	Exp (B)	95% C.I. of EXP (B)	
						upper limit	upper limit
Nursing mode	1.764	0.713	6.122	0.013	5.834	1.443	23.586
Age	0.064	0.033	3.808	0.051	1.066	1.000	1.137
Course of disease	0.145	0.069	4.395	0.036	1.156	1.009	1.324
Stone residue	2.404	1.078	4.979	0.026	11.071	1.340	91.492
Preoperative infection history	2.49	0.746	11.15	0.001	12.056	2.796	51.98
Operation time	0.053	0.018	8.331	0.004	1.055	1.017	1.094

tions, there is no subdivision of postoperative complications to explore the risk factors of the high incidence of complications. Secondly, patients were treated with SMP, and other

treatments were not included to compare the improvement of KS treatment. In addition, whether the effect of rapid rehabilitation nursing is also suitable for other treatment schemes needs further investigation.

To sum up, rapid rehabilitation nursing for patients with KS treated by SMP is beneficial to accelerating postoperative recovery, reducing the occurrence of complications, and improving their quality of life.

Dislcosure of conflict of interest

None.

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