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Original Article

The value of targeted nursing interventions for patients with infections after liver transplant surgery

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Abstract: Objective: Our aim was to explore the value of targeted nursing intervention in the prevention of infections after liver transplant surgery. Methods: In this prospective study, we randomly divided 102 patients undergoing liver transplant surgery into the targeted nursing group (n=51) given targeted care and the conventional nursing group (n=51) given routine care. The postoperative infections and clinical outcome measures were compared between the two groups, and the adverse psychological emotions, quality of life, complications, and nursing satisfaction were compared before and after the interventions. Results: The postoperative infection and complication rates were significantly lower in the targeted nursing group than they were in the conventional nursing group (both $P<0.05$). At six months after discharge, the self-rating anxiety scale and self-rating depression scale scores were decreased in both groups compared with the scores on admission, but the scores in the targeted nursing group were much lower than those of the conventional nursing group (both $P<0.05$). Furthermore, the targeted nursing group showed significantly better somatic, social and psychological functions, material life, and nursing satisfaction, a markedly earlier time to first postoperative anal exhaust, eating and ambulation, and much shorter hospital stays than the conventional nursing group (all $P<0.05$). Conclusion: The infection rates after liver transplantation are high, but targeted nursing can reduce the infection risks and the complication rates, promote psychological health, and thus enhance the recovery and quality of life, so it is worthy of being promoted in clinical practice.

Keywords: Targeted nursing intervention, liver transplantation, infection, psychological status

Introduction

Patients receiving solid organ transplantation (SOT) need to take a large number of hormone drugs and immunosuppressive agents for a long time after surgery, which leads to decreased immune function and increased susceptibility towards infections caused by bacteria, viruses, or fungi. Once infection occurs, the efficacy of organ transplantation, and the prognosis and survival of patients are all affected [1, 2]. To date, liver transplantation (LT) has been the only effective treatment available to patients with end-stage liver disease [3]. However, given their generally poor physical fitness, long disease course and long-term use of postoperative immunosuppressive agents, as well as multiple complications in some patients (e.g., anemia, hypoproteinemia, fluid and electrolyte imbalance), these patients are immunocompromised and prone to various infections after surgery, which affects their prognosis and increases the risk of death [4-6]. Since the infection risk after organ transplantation is high, and severe postoperative infections are the main cause of death, effective preventive interventions to avoid infections are crucial to successful LT and normal graft function [7-9]. A recent study shows that the incidence of mental disorders after SOT can reach up to 30% [10]. Therefore, it is necessary to pay close attention to the mental status of patients after LT and take appropriate interventions to ameliorate their adverse emotions, which play a significant role in the prognosis.

Careful and appropriate nursing care during the perioperative period can reduce the risk of complications in patients receiving SOT [11]. Targeted nursing intervention refers to a personalized model for patient-centered care, which is commonly used in various departments (e.g., departments of surgery and neurology), and provided by the analysis of diet, daily activities and disease progression of each patient [12]. Moreover, it is reported that perioperative targeted nursing intervention can improve gastrointestinal functions and prognosis of patients with liver cancer. Unfortunately, there is limited research on perioperative targeted nursing intervention for liver transplant patients, especially on infections after LT [13]. Therefore, we investigated the value of targeted nursing intervention in the prevention of infections after LT and its effect on the adverse psychology of the patients.

Materials and methods

General data

This prospective study was conducted at the First Affiliated Hospital of Shandong First Medical University from July 2017 to December 2019. A total of 102 patients who received LT were randomly divided into the targeted nursing group (n=51) and the conventional nursing group (n=51). The patients were included if they were aged 30-70 years old, accepted a triple immunosuppressive regimen with tacrolimus, basiliximab, and mycophenolate mofetil, had primary liver cancer, and had posthepatic B cirrhosis, alcoholic cirrhosis, primary biliary cirrhosis, or acute severe hepatitis. Additionally, patients with preoperative infections, autoimmune diseases, blood system diseases, or other malignant tumors were excluded. Those with severe diseases affecting the major organs (heart, brain, kidney, etc.) or functional organ failure were also excluded. Written informed consents were obtained from all the patients and ethical approval for the study was given by the Ethics Committee of the First Affiliated Hospital of Shandong First Medical University.

Nursing methods

The conventional nursing group was given routine nursing care, including preoperative examinations, intraoperative real-time vital sign monitoring, and postoperative guidance on drug use and bedside nursing for the patients who were admitted to the ICU for one week after surgery and transferred to the general ward after their condition stabilized.

The targeted nursing group was given targeted nursing care, namely, health education, ward nursing, respiratory nursing, pain nursing, psychological nursing and out-of-hospital nursing. As to health education, knowledge about LT was presented to the patients, and training on disinfection and isolation for the relevant nursing staff was performed before the surgery to prevent postoperative infections. As to ward nursing, a special nursing group for LT was established to reduce the frequency of staff entering and leaving the ward. The patients were admitted to the ICU for 2-3 weeks after their surgeries and transferred to the isolation ward after the CD4+ T-lymphocyte count reached $\geq 100 * 10^6$/L, their adenosine triphosphate (ATP) in CD4+ T-lymphocytes reached ≥150 μg/L, or if their condition was stabilized. As to respiratory nursing, the nurses cleared respiratory tract secretions of patients receiving mechanical ventilation promptly, and withdrew ventilators as soon as possible after their respiration stabilized. Also, the patients' families were asked to help the patients turn over every two to three hours, and to pat their backs often for sputum elimination. During the process, the sputum color and volume were observed, and sputum cultures were performed. Meanwhile, the patients were encouraged to take a deep breath to prevent atelectasis. As to pain nursing, an anesthetic pump was applied for postoperative analgesia; pethidine, morphine, and other analgesic drugs could be selected for patients with significant postoperative pain. As to psychological nursing, the nurses communicated with the patients in a gentle, patient, and meticulous way to help them better understand the disease condition and the necessity of treatment, and to build a positive attitude. Through communication, the patients' anxiety, fear, and stress were alleviated, so that they could undergo the operation in the best possible state. As to out-of-hospital nursing, six-month telephone follow-ups were adopted for all patients after their discharge to obtain information like recovery status, and to perform psychological counseling and dietary guidance.

Outcome measures

The main outcome measures: The postoperative infections of the two groups were compared, including pulmonary, urinary tract, tuberculosis, incision, and abdominal infections.

The patients were asked to return for reexamination at six months after their discharge, and the self-rating anxiety scale (SAS) and the self-rating depression scale (SDS) were used to assess their anxiety and depression. Symptoms of anxiety and depression were present in the patients with scores of 50 points or more, and higher scores indicate more severe symptoms. The scales were filled out by the patients and handed back on the spot.

Secondary outcome measures: The clinical outcome measures of the two groups were compared, including the time to first postoperative anal exhaust, eating and ambulation, as well as the lengths of their hospital stays.

The patients were asked to return for reexamination at six months after their discharge, and the six-month quality of life (QoL) after discharge was assessed using the Generic Quality of Life Inventory-74 (GQOLI-74), which included 20 factors in four dimensions (i.e., somatic function, social function, psychological function and material life) [14]. The maximum score of each dimension was 100 points, with higher scores signifying better QoL. The scales were also filled out by the patients and handed back on the spot.

Postoperative complications (e.g., pleural effusion, upper gastrointestinal bleeding, abdominal bleeding, and liver graft rejection) were compared between the two groups. If multiple complications presented in the same patient during the same period, the incidence of complications was calculated according to the number of complications, that is the incidence of complications (%) = the number of complications/total number of cases * 100.

In addition, a self-made satisfaction questionnaire was used to assess the patient satisfaction with care, which was categorized into four levels: very satisfied (90-100 points), satisfied (70-89 points), fair (50-69 points), and dissatisfied (<50 points). Satisfaction rate (%) = (very satisfied cases + satisfied cases)/total number of cases * 100.

Statistical analysis

The data analyses were performed using the SPSS 20.0 software package. Chi-square tests (χ^2 tests) or Fisher's exact tests were adopted for the comparison of enumeration data expressed as percentages (%). The measurement data were expressed as the mean ± standard deviation ($\bar{x}$ ± sd). Independent t-tests were used for the comparisons between two groups, and paired t-tests were applied for the comparisons before and after the intervention within the same group. P<0.05 was considered significantly different.

Results

Comparison of the general data

There was no statistical significance in terms of sex, age, body mass index, primary liver diseases, or intraoperative blood loss between the two groups (P>0.05), suggesting that the two groups were comparable. See **Table 1**.

Comparison of the postoperative infections

The total infection rate was lower in the targeted nursing group than in the conventional nursing group (χ^2=6.220, P=0.013). See **Table 2**.

Comparison of the SAS and SDS scores

At six months after discharge, the SAS and SDS scores were decreased in both groups compared with the scores recorded at admission, and the targeted nursing group showed a larger decrease than the conventional nursing group (both P<0.05). See **Table 3**.

Comparison of the clinical outcome measures

The targeted nursing group showed markedly earlier times to first postoperative anal exhaust, eating and ambulation, and the much shorter lengths of hospital stays (all P<0.05). See **Table 4**.

Comparison of the six-month QoL after discharge

At six months after discharge, the somatic function, social function, psychological function, and material life scores were much higher in the targeted nursing group than they were in the conventional nursing group (all P<0.05). See **Table 5** and **Figure 1**.

Table 1. Comparison of the general data (n, $\bar{x}$ ± sd)

Items	Targeted nursing group (n=51)	Conventional nursing group (n=51)	χ^2/t	P
Gender (n)			1.933	0.164
Male	24	31		
Female	27	20		
Age (years)	56.7±5.8	57.5±6.4	0.661	0.510
BMI (kg/m^2)	23.58±3.20	24.20±2.35	1.115	0.267
Primary liver diseases (n)			2.105	0.152
Primary liver cancer	25	28		
Posthepatic B cirrhosis	11	9		
Alcoholic cirrhosis	6	4		
Primary biliary cirrhosis	4	6		
Acute severe hepatitis	5	4		
Operation time (h)	7.30±1.84	7.69±1.70	1.112	0.269
Intraoperative blood loss (mL)	4506.55±350.64	4630.08±487.50	1.469	0.145

Note: BMI: body mass index.

Table 2. Comparison of the postoperative infection rates (n, %)

Group	Pulmonary infection	Urinary tract infection	Tuberculosis infection	Incision infection	Abdominal infection	Total infection rate
Targeted nursing group (n=51)	3 (5.88)	1 (1.96)	0 (0.00)	0 (0.00)	1 (1.96)	5 (9.80)
Conventional nursing group (n=51)	7 (13.73)	3 (5.88)	2 (3.92)	1 (1.96)	2 (3.92)	15 (29.41)
χ^2						6.220
P						0.013

Table 3. Comparison of the SAS and SDS scores ($\bar{x}$ ± sd, points)

Group	SAS scores			SDS scores		
	On admission	At 6 months after discharge	Difference	On admission	At 6 months after discharge	Difference
Targeted nursing group (n=51)	45.86±4.10	38.70±3.95**	7.16±1.05	40.06±4.45	35.96±4.80**	4.10±1.14
Conventional nursing group (n=51)	46.27±4.87	43.92±4.40*	2.35±0.85	41.19±4.40	38.58±4.40**	2.61±1.02
t	0.460	6.035	25.427	1.290	5.736	6.956
P	0.646	<0.001	<0.001	0.200	<0.001	<0.001

Note: Compared with pre-intervention, *P<0.05, **P<0.01. SAS: self-rating anxiety scale; SDS: self-rating depression scale.

Table 4. Comparison of clinical outcome measures ($\bar{x}$ ± sd)

Group	Time to first postoperative anal exhaust (d)	Time to first postoperative eating (h)	Time to first postoperative ambulation (d)	Length of hospital stay (d)
Targeted nursing group (n=51)	2.49±1.29	12.09±2.88	3.98±1.20	27.96±5.50
Conventional nursing group (n=51)	3.10±1.47	15.40±3.20	5.10±1.37	31.09±7.42
t	2.227	5.491	4.392	2.420
P	0.028	<0.001	<0.001	0.017

Comparison of the postoperative complications

The total complication rate was significantly lower in the targeted nursing group than it was in the conventional nursing group (χ^2=4.518, P=0.034). See **Table 6**.

Comparison of the postoperative nursing satisfaction

The postoperative satisfaction with care was markedly better in the targeted nursing group than it was in the conventional nursing group. See **Table 7**.

Table 5. Comparison of the six-month QoL after discharge ($\bar{x}$ ± sd, points)

Group	Somatic function	Social function	Psychological function	Material life
Targeted nursing group (n=51)	46.50±5.44	42.09±4.97	45.58±5.30	50.50±6.44
Conventional nursing group (n=51)	44.06±4.60	40.04±4.80	42.90±6.04	47.78±5.09
t	2.446	2.119	2.382	2.366
P	0.016	0.037	0.019	0.020

Note: QoL: quality of life.

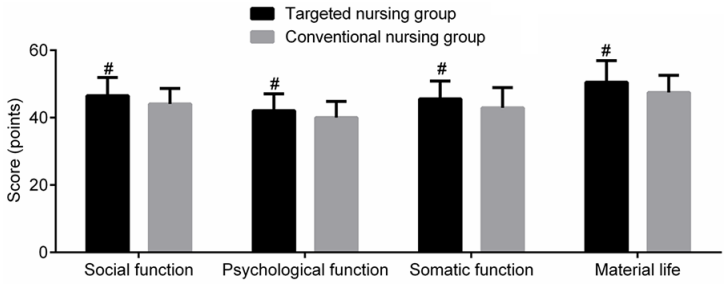

Figure 1. Comparison of the six-month QoL after discharge. Compared with the conventional nursing group, #P<0.05. QoL: quality of life.

Discussion

Our study revealed that the postoperative infection sites involved were the lungs, the urinary tract, the surgical incision, and the abdominal cavity in patients after LT. Among these infections, pulmonary infection was the most common type, accounting for 19.61%. A study of 36 patients receiving SOT reported by Abad et al. found that the incidence of postoperative pulmonary infection was 47.22% [15]. The difference may be related to the deviation of the sample collection. Moreover, it was also found that *Mycobacterium tuberculosis* infection occurs in 1.52%-2.29% patients receiving SOT in China [16]. Similarly, our study showed that 2 of the 102 patients developed *Mycobacterium tuberculosis* infection, for an incidence rate of 1.96%. Among the 102 patients, 13.73% of patients receiving routine nursing care had pulmonary infections, but only 5.88% of the patients receiving targeted nursing care had pulmonary infections. Although there was no significant difference in the incidences in the two groups, the patients receiving targeted nursing care showed a comparatively low incidence of pulmonary infections. In terms of the total incidences, the postoperative infection rate in the targeted nursing group (9.80%) was much lower than it was in the conventional nursing group (29.41%), suggesting that targeted nursing care can reduce the risk and incidence of infections after LT.

In addition, patients receiving SOT were reported to have various psychological disorders after surgery [17]. This is mainly because the psychological status of patients can possibly be affected by graft rejections, adverse drug reactions, and worries about the high medical costs and potential life threat of organ transplantation. In severe cases, patients can even suffer from adverse emotions such as fear, depression, and anxiety [18, 19]. Hence health education should be promoted first in patients receiving SOT, making them fully understand the necessity and importance of transplantation. Then some successful cases can be introduced to them to alleviate their tension and restlessness and to eliminate their fear of an unfamiliar surgery [20]. Meanwhile, the correct knowledge about transplantation surgery (e.g., postoperative graft rejection and adverse reactions caused by the long-term use of anti-rejection drugs) should be imparted to help patients hold scientific views and stay calm when adverse conditions really occur [21]. Furthermore, keeping a list of daily costs is recommended to ensure reasonable charges, and meticulous and careful care from family members is also advocated to enhance patient value and strengthen their confidence in overcoming the disease for its important role in rehabilitation. In our study, the SAS and SDS scores in the targeted nursing group were significantly lower than the scores in the conventional nursing group at six months after their discharge, indicating that targeted nursing care can effectively improve the postoperative psychological status of liver transplant patients.

Besides, the time to first postoperative anal exhaust, eating and ambulation, and the length of hospital stay were markedly shorter, the total complication rate was much lower, and the QoL

Table 6. Comparison of the postoperative complications (n, %)

Group	Pleural effusion	Upper gastrointestinal bleeding	Abdominal bleeding	Liver graft rejection	Total incidence
Targeted nursing group (n=51)	1 (1.96)	1 (1.96)	1 (1.96)	1 (1.96)	4 (7.84)
Conventional nursing group (n=51)	5 (9.80)	3 (5.88)	3 (5.88)	2 (3.92)	13 (25.49)
χ^2					4.518
P					0.034

Table 7. Comparison of the postoperative nursing satisfaction rates (n, %)

Group	Very satisfied	Satisfied	Fair	Dissatisfied	Satisfaction rate
Targeted nursing group (n=51)	24 (47.06)	21 (41.18)	3 (5.88)	3 (5.88)	45 (88.24)
Conventional nursing group (n=51)	18 (35.29)	17 (33.33)	9 (17.65)	7 (13.73)	35 (68.63)
χ^2					4.057
P					0.044

scores for somatic, psychological and social functions, and the material lives of the patients were significantly higher at six months after discharge in the targeted nursing group than they were in the conventional nursing group. The results suggest that the targeted nursing care can reduce the risk of complications after transplant surgery and promote the patients' rehabilitation and QoL. Additionally, we compared the satisfaction with care between the two groups, and we found that the nursing satisfaction was better in the targeted nursing group than it was in the conventional nursing group, confirming that targeted nursing care is more humanized and more consistent with the needs of liver transplant patients.

With the small sample size and limited follow-up, we are aware of that further studies on the effects of targeted nursing care on long-term QoL with larger sample sizes are needed in order to get more precise results in the future.

In summary, the infection rates after LT are high, but targeted nursing can reduce the infection risks and the complication rates, ameliorate the adverse psychological status, and thus promote the recovery and QoL, so it is worthy of being popularized in clinical practice.

Disclosure of conflict of interest

None.

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