

Original Article

Analyzing the effects of nutritional support nursing combined with immediate rehabilitation on the recovery of physical function after radical gastrectomy

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Abstract: The goal of this study was to explore the effects of nutritional support nursing combined with immediate rehabilitation on the efficacy of radical gastrectomy and recovery of gastrointestinal function as well as to provide guidance for clinical nursing care. A total of 529 patients with gastric cancer who were enrolled in the departments of gastroenterology and oncology of our hospital were recruited from July 2011 to June 2014. The patients were divided into two groups: the experimental group (n=265), adopting nutritional support nursing with immediate rehabilitation, and control group (n=264), using nutritional support nursing mode only based on various modes of post-operative care. Efficacy, inflammatory response, and recovery of gastrointestinal function between the two groups were observed and followed up for 3 years to determine the survival rate. The difference in hospitalization expenditure between the two groups was insignificant ($P=0.073$). Hospitalization time, inflammatory reaction, adverse reaction, gastrointestinal function recovery, and nursing satisfaction in the experimental group were significantly higher than those in the control group (all $P<0.005$). Survival rates during the first, second, and third year of experimental and control groups (85.9%, 75%, and 59.4%, respectively) were significantly higher than those of the control group (73.3%, 57.8%, and 42.2%, respectively) (all $P<0.05$). Immediate rehabilitation combined with nutritional support effectively improves patient outcomes and prognoses and is more helpful in recovering the gastrointestinal function of patients with radical gastrectomy compared with those who used nutritional support nursing only. Therefore, this should be included in the clinical use.

Keywords: Nutritional support nursing, immediate rehabilitation, radical gastrectomy, inflammatory factors, recovery of intestinal function

Introduction

Gastric cancer is the most prevalent malignancy worldwide [1] and occurs mostly in the elderly. Li et al. [2] reported that gastric cancer tends to occur in younger population. Kim et al. [3] also reported that its incidence in 2016 was 42.8% and commonly occurred in South Africa and India. Further, its extremely high occurrence and mortality rates make it the world's leading malignant tumor. According to Satoh et al. [4], approximately 1.2 million people died of gastric cancer in 2015 with the survival rate of only 29.7% for the 5-year prognosis. Due to its high incidence and mortality rates, gastric cancer has been a widely discussed subject in clinics and is a major disease that requires a

breakthrough in clinical practice. Being asymptomatic and dormant, gastric cancer/carcinoma at early stage is generally difficult to diagnose. According to Tsujiura et al. [5], only 8% of patients with gastric cancer are diagnosed in the earlier stages globally; therefore, attempts are constantly being made to determine the gold standard for its early diagnosis and simultaneously obtain more effective treatment methods for gastric cancer. Recently, with the continuous development and improvement in medical technology and equipment, radical gastrectomy has become the best method in the management of gastric cancer [6, 7]. Nakauchi et al. [8] reported a success rate of up to 96% in the use of radical gastrectomy for gastric cancer, but the prognosis is poor. Therefore,

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postoperative care of patients with radical gastrectomy has become the most important factor in determining survival prognosis. Currently, postoperative nursing care for patients with gastric cancer and the most suitable model in caring for patients undergoing radical gastrectomy remain unclear. Currently, several studies [9-11] proved that a nutritional support nursing model is highly effective and is more commonly used in clinical nursing care of patients with gastric cancer. However, Preiser et al. [12] showed that nutritional support nursing combined with immediate rehabilitation provides remarkable results. Moreover, domestic or foreign studies on patients with gastric cancer are not equally distributed.

Therefore, we hypothesized that the nutritional support combined with immediate rehabilitation for radical resection of gastric cancer would achieve more outstanding results, and the experiment would effectively guide the clinical application of nursing care in patients with radical gastrectomy.

Materials and methods

General information

A total of 529 patients diagnosed with gastric cancer and enrolled in the gastrointestinal and oncological departments in our hospital from July 2011 to June 2014 were selected as the study subjects (345 males and 184 females; aged 35-65 years, with an average age of 47.73 ± 7.44 years). All of the selected patients underwent radical gastrectomy after diagnosis and were divided into the experimental group (n=265), adopting nutritional support with immediate rehabilitation, and the control group, using nutritional support nursing only (n=264) based on different postoperative nursing care methods.

Inclusion and exclusion criteria

Inclusion criteria: All selected patients were diagnosed with gastric cancer through biopsy; after the diagnosis, were treated with radical gastrectomy; were informed with the nature of the study; and were willing to cooperate with the healthcare workers in our hospital. The patients also had complete medical records. The exclusion criteria were: patients with cardiovascular and cerebrovascular diseases, other

respiratory and digestive tract diseases, surgical intolerance, physical disability, and middle referrals were excluded. The study was approved by the ethics committee of our hospital, and signed informed consents were obtained from all patients.

Method

Nutritional support was strictly implemented in accordance with the 2008 Guidelines on Nursing Operation, [13] and intravenous nutritional support were administered to both groups on the first day postoperatively, including 50 kJ of non-protein calorie (kg/d) and 0.25 g of nitrogen (kg/d) for 5 consecutive days (including emulsified fat, hydrolyzed protein, glucose, amino acids, vitamins, electrolytes, insulin, and trace elements). Fluid diet was introduced on the second day. The experimental group received immediate rehabilitation in strict compliance with the 2011 Guidelines on Immediate Rehabilitation Nursing [14] and used the auto-control intravenous analgesia pump (if no pain relief, medical staff were informed and intramuscular injection of pethidine hydrochloride was administered for assistive analgesia). Postoperative body signs were also closely monitored. Approximately 10 hours after anesthesia, patients were encouraged to change positions, from supine to semi supine or lateral position; guided and assisted to complete simple physical activities in bed on postoperative day 1; encouraged, guided, and helped to ambulate and gradually increase the amount of activity based on the body condition; and simultaneously administered 5% glucose saline through a nasointestinal tube. The survival rate of all patients was followed up for 3 years after discharge.

Observation index

The efficacy index includes hospitalization time and expenditure and postoperative inflammatory reaction between the two groups. We use automatic biochemical analyzer detection to evaluate early serum inflammatory markers such as high-sensitivity C-reactive protein (CRP) in the serum on the postoperative third day. ELISA was used to detect tumor necrosis factor (TNF- α), interleukin-6 (IL-6), and interleukin-8 (IL-8). The method of detection was strictly in accordance with the kit instructions: Standards are set on the enzyme-coated plate. in the first

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Table 1. Comparison of clinical data between the two groups of patients (n [%])

	Test group (n=265)	Control group (n=264)	X ²	P
Age	45.24 ± 8.63	46.31 ± 9.01	t=1.39	0.164
Sex			0.49	0.484
Male	170 (64.2)	177 (67.0)		
Female	95 (35.8)	87 (33.0)		
Residence			0.32	0.573
City	152 (57.4)	145 (54.9)		
Countryside	113 (42.6)	119 (45.1)		
Smoking			0.32	0.570
Yes	162 (61.1)	155 (58.7)		
No	103 (38.9)	109 (41.3)		
Drinking			0.42	0.515
Yes	150 (56.6)	142 (53.8)		
No	115 (43.4)	122 (46.2)		
Marital status			0.53	0.465
Married	207 (78.1)	213 (80.7)		
Unmarried	58 (21.9)	51 (19.3)		
Body weight (KG)			0.69	0.156
<70	138 (52.1)	142 (53.8)		
≥70	127 (47.9)	122 (46.2)		
Pathological staging			1.03	0.310
I~II	85 (32.1)	74 (28.0)		
III~IV	180 (67.9)	190 (72.0)		

and second wells were added standard 100 µl, respectively, according to the dilution ratio of 1:2 in turn added to the standard diluent; blank and positive and negative control holes were set, and then added in each hole 10 µl of the sample to be tested; 30 min incubation after adding the sample, adding 50 µl each of the color reagents A and B, adding convulsive light and coloring for 15 minutes, adding stop solution; measuring the absorbance of each well in blank air-conditioned zero and 450 nm wavelength (OD value). post-operative adverse reaction; and nursing satisfaction points. Gastrointestinal function index includes time of postoperative flatulence, first defecation, and return of bowel sounds at discharge. Prognostic indicators include survival rates on the first, second, and third years between the two groups.

Statistical method

Statistical software SPSS 22.0 was used to analyze the data. Measurement data such as

hospitalization time, hospitalization expenditure, postoperative inflammatory reaction, and nursing satisfaction score between the two groups are all expressed as mean ± standard deviation and were compared using t test. Categorical data such as incidence of adverse reactions and patients' clinical data are all expressed as percentage rate, and the Chi square test was adopted to compare between the two groups. The survival rate was calculated using Kaplan-Meier method. A P of <0.05 suggested that the difference between the two groups was statistically significant.

Results

Comparison of clinical data between the two groups

In order to ensure the accuracy and reliability of test results, clinical data of the two groups of patients, such as age, sex, residence, smoking, drinking, marital status, body weight, and pathological stage, were compared, but showed no significant difference (P>0.05), which proved the comparability between the two groups (**Table 1**).

Comparison of efficacy between the two groups

The difference on the curative effect between the two groups was compared. The hospitalization time in the experimental group (9.24 ± 1.52 d) was significantly lower than that in the control group (12.62 ± 2.26 d) (P=0.001). However, the difference in hospitalization expenditures was statistically insignificant between the two groups (P=0.073). The serum levels of inflammatory factors were detected after the operation, which showed that CRP was significantly higher in the experimental group (47.3 ± 8.5 mg/L) than that in the control group (56.3 ± 9.6 mg/L) (P<0.001). TNF-α was also significantly lower in the experimental group (1.4 ± 0.3 pg/mL) than that in the control group (2.6 ± 0.7 pg/mL) (P<0.001). IL-6 and IL-8 were significantly lower in the experimental group (42.3 ± 8.3 ng/L and 21.2 ± 3 ng/L, respectively) than those in the control group (53.8 ± 9.6 ng/L and 27.6 ± 4.2 ng/L, respectively) (P<0.001). The difference in nursing satisfaction scores bet-

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Table 2. Comparison of the efficacy between the two groups of patients

	Test group (n=265)	Control group (n=264)	t	P
Hospitalization time (d)	9.24 ± 1.52	12.62 ± 2.26	20.19	<0.001
Hospital costs (yuan)	40532.27 ± 2084.54	39826.71 ± 1962.13	1.80	0.073
CRP (mg/L)	47.31 ± 8.51	56.37 ± 9.62	11.42	<0.001
TNF-α (pg/mL)	1.42 ± 0.36	2.63 ± 0.76	25.64	<0.001
IL-6 (ng/L)	42.36 ± 8.38	53.83 ± 9.69	14.74	<0.001
IL-8 (ng/L)	21.24 ± 3.05	27.68 ± 4.23	20.17	<0.001
Nursing satisfaction score	94.37 ± 5.03	82.36 ± 9.34	18.42	<0.001
Adverse reactions	10.9%	18.6%	χ ² =6.10	0.014

Table 3. Comparison of gastrointestinal function between the two groups of patients

	Test group (n=265)	Control group (n=264)	t	P
The first flatulence time (h)	28.62 ± 8.08	46.28 ± 12.63	19.16	<0.001
First defecation time (h)	39.82 ± 7.63	78.34 ± 18.93	30.72	<0.001
Bowel sounds recovery time (h)	19.24 ± 5.27	26.33 ± 6.07	14.35	<0.001

ween the two groups was statistically significant ($P<0.001$). Only 10.9% of the patients in the experimental group had postoperative adverse reactions, such as abdominal pain, loss of appetite, nausea, vomiting, while 18.6% in the control group had adverse reactions ($P=0.014$) (Table 2).

Comparison of gastrointestinal functions between the two groups

Post-operative gastrointestinal function between the two groups was compared and found that the first flatulence and defecation time in the experimental group (28.62 ± 8.08 and 39.82 ± 7.63 hours, respectively) were significantly shorter than those in the control group (46.28 + 12.63 and 78.34 + 18.93 hours) ($P<0.001$). Upon auscultation, clear echo bowel sound was heard at (19.24 + 5.27) hours and (26.33 + 6.07) hours in the experimental and control groups, respectively; and the experiment group was significantly earlier than that of the control group ($P<0.001$) (Table 3).

Comparison of prognosis between the two groups

Both groups were monitored and followed up for 3 years via telephone, letter, and hospital review. The cut-off time and event were August 2017 and out of contact or death of patients, respectively. Among the 529 patients, 507 were successfully followed up, 9 and 13 were out of contact in the experimental and control

groups, respectively. The success rate of follow-up was 95.84%. The 1-, 2- and 3-year survival rate were 85.9%, 75%, and 59.4% in the experimental group, while 73.3%, 57.8%, and 42.2% in the control group, indicating that the experiment group had significantly better survival than that of the control group (all $P<0.05$) (Table 4 and Figure 1).

Discussion

Currently, many studies [15-17] have been conducted in clinics to prove certain correlations between *Helicobacter pylori*, genetic genes, and dietary habits as factors associated with gastric cancer, which may have caused the high incidence of the disease. In the current clinical practice, radical gastrectomy effectively controlled the spread of tumor cells. However, it is a large area traumatic surgery, which will not only cause great damage to the patients but also adversely affect the postoperative recovery of gastrointestinal function [18, 19]. Therefore, postoperative care for patients with radical gastrectomy is to convalesce after a large area trauma. Among them, nutritional intervention has been proven suitable for postoperative nursing care of gastric cancer according to several studies [20, 21], and immediate rehabilitation is a new nursing care model recently launched, designed to accelerate the recovery time of patients who underwent the surgery and is suitable for all kinds of surgeries [22]. Immediate rehabilitation focuses on the health education, assessment of nutritional risk, enhan-

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Table 4. Survival rates between the two groups

	Test group (n=256)	Control group (n=251)	χ^2	P
The first year	85.9%	73.3%	12.49	0.004
The second year	75.0%	57.8%	16.88	<0.001
The third year	59.4%	42.2%	14.90	<0.001

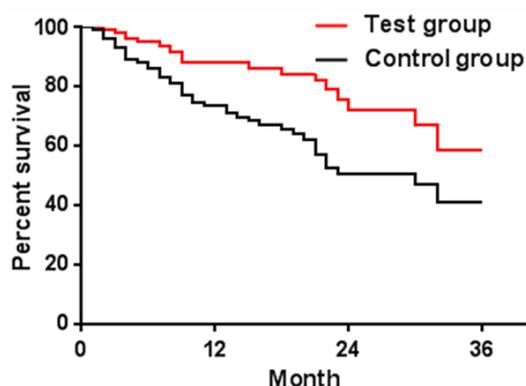


Figure 1. Survival curves during the first, second, and third years between the experimental and control groups. Survival rates during the first, second, and third years were 85.9%, 75.0%, and 59.4%, respectively, in the experimental group and 73.3%, 57.8%, and 42.2%, respectively, in the control group (all $P < 0.005$).

cement of immune function, and emphasis on postoperative exercise of patients [23], and for patients with radical gastrectomy, postoperative recovery of gastrointestinal function is a key determining factor for patient prognosis. Therefore, immediate rehabilitation combined with nutritional support was compared with nutritional support nursing care model only in patients with radical gastrectomy and aimed to prove that immediate rehabilitation combined with nutritional support nursing model can more significantly improve the prognosis of gastric cancer and to provide reference and guidance for clinical application.

The experimental results showed that hospitalization expenditures were insignificantly different between the experimental group adopting the immediate rehabilitation combined with nutritional support nursing model and the control group applying the nutritional care model only. However, adverse reactions, expression levels of inflammatory factors, nursing satisfaction, and survival rate were lower in the experiment group than the control group. The key reason for the difference between the two groups of

patients was guessed as the application of different nursing models. The excellent results of each index in the experimental group indicated that the concept of rapid rehabilitation combined with nutritional support nursing model had a very high application value for patients undergoing radical gastrectomy, which suggests that immediate rehabilitation combined with nutritional support nursing model is highly effective in patients with gastric cancer who underwent radical resection. This is consistent with the results obtained by Ikeya et al. [24] who applied immediate rehabilitation in patients with colorectal cancer, which is also evident in this experiment. Postoperatively, patients generally present loss of appetite and metabolic disorders, which directly affect the normal metabolism, respiration, and immune function, and significantly inhibit T-cell functions in patients. Nutritional support effectively supplements the amount of nutrients required, such as protein, trace elements, and electrolytes, so that the postoperative stress response can be fully coped with, and intravenous nutritional supplements will prevent the metabolism process in the digestive system and provide energy for the operation of patients' immune function. Patients undergoing radical gastrectomy often enhance the metabolism of adrenaline and amphetamine and strengthen their stress response to surgery due to long-term operation. In the immediate rehabilitation nursing model, patients' body temperature was strictly monitored to maintain a normal body temperature, which mainly helps during rehabilitation. Furthermore, liquid and drug infusion during major surgeries may induce adverse reactions such as edema, and immediate rehabilitation shortens the recovery time of gastrointestinal peristalsis activities by helping patients perform basic activities and movements. Prolonged bed rest may cause functional deterioration and induce venous thrombosis. Therefore, earlier rehabilitation is greatly associated with postoperative activities and will reduce the possibility of venous thrombosis. In addition, patients are prone to anxiety, fear, restlessness, and other negative emotions postoperatively, which will negatively impact the postoperative rehabilitation of the tumor. Furthermore, in the process of helping the patients, doctors and patients become closer, patients' confidence is improved, dependence and sense of trust on medi-

cal staff is strengthened, and patients will more effectively participate in and cooperate with the relevant treatment methods, which may result in naturally doubled efficacy. This is also consistent with the study conducted by Wakabayashi et al. [25] regarding the application of immediate rehabilitation nursing to patients with muscular atrophy, which has corroborated with the results of this study. However, practical applications in patients should be adjusted based on the condition and body function to outline the targeted nursing content.

This study aimed to compare the use of immediate rehabilitation combined with nutritional support nursing model and nutritional support nursing model only in patients who underwent radical gastrectomy. However, because of limited experimental conditions, some differences may not have been ruled out, such as the limited number of participants and relatively limited age range. The subjects in this experiment will be monitored and followed up for a longer period of time to achieve the best experimental results.

In conclusion, immediate rehabilitation nursing combined with nutritional support will more effectively improve the treatment outcomes and prognoses of patients with radical gastrectomy compared with those who used the nutritional supporting model only, which is more associated with gastrointestinal function recovery and is noteworthy in clinical application.

Disclosure of conflict of interest

None.

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