

## Review Article

# Effects of comprehensive nursing combined with enteral nutrition support on life quality and blood glucose control of patients with both esophageal carcinoma and diabetes mellitus

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**Abstract:** Objective: To explore the effects of comprehensive nursing intervention on life quality and physical and mental statuses of patients with both esophageal carcinoma (EC) and diabetes mellitus (DM). Methods: A total of 64 patients diagnosed with both EC and DM in our hospital were collected as research subjects, of which 33 patients were nursed under a comprehensive nursing intervention mode as the observation group, and the rest were nursed under a routine nursing mode as the control group (n=31). The two groups were compared in life quality, blood glucose control, incidence of postoperative complications, nursing satisfaction, hospitalization time, life quality, self-rating anxiety scale (SAS) score, and self-rating depression scale (SDS) score. Results: Before treatment, there was no difference between the two groups in fasting blood glucose (FBG), while after treatment, both groups showed significantly decreased FBG ( $P<0.05$ ), and the observation group showed significantly lower FBG than the control group ( $P<0.05$ ). The observation group showed a significantly lower incidence of postoperative complications, and a significantly higher nursing satisfaction than the control group, and the observation group also experienced much shorter hospitalization time than the control group (all  $P<0.05\%$ ). In addition, the observation group had higher life quality scores than the control group. Before nursing, there was no significant difference between the two groups in SAS and SDS scores ( $P>0.05$ ), while after nursing, both groups had lower SAS and SDS scores ( $P<0.05$ ), and the observation group had lower scores than the control group (both  $P<0.05$ ). Conclusion: Comprehensive nursing combined with enteral nutrition support can significantly improve the blood glucose control ability, life quality, and physical and mental statuses of patients with both EC and DM, and can effectively improve their nursing satisfaction, so it is worthy of popularization and application in clinic practice.

**Keywords:** Comprehensive nursing, enteral nutrition support, esophageal carcinoma combined with diabetes mellitus, life quality

## Introduction

Esophageal carcinoma (EC) is a malignant tumor with extremely high morbidity and mortality [1, 2]. Its occurrence is related with many factors. EC patients are often complicated with diseases such as respiratory system diseases, cardiovascular disease, malnutrition, and diabetes mellitus (DM), which seriously hinders the recovery of body health and is prone to cause complications such as lung or incision infection and anastomotic leakage [3, 4]. DM is one of the most common endocrine and metabolic disorders, and is also one of the independent risk factors for surgical operation. In re-

cent years, the number of cases of DM in China has gradually increased due to various reasons, causing greater incidence of DM [5, 6]

EC occurs in the digestive system, which hinders the patients eating. Patients with EC often suffer from poor metabolic disorder due to poor nutritional status [7]. For patients with both EC and DM, fasting and surgical stress response will intensify their postoperative blood glucose fluctuations, which will lead to disorders of glucose metabolism and destroy immune function, thus enhancing the possibility of complications [8-10]. Routine nursing at this stage is beneficial to the recovery of the patients, but it is

unable to meet the expectations of medical staff and patients' families, because under such nursing, patients still suffer from excessive weight loss, low immunity and high susceptibility to infection after operation [11, 12]. Because of the particularity of clinical symptoms of patients with EC and DM, in addition to corresponding clinical treatment measures, effective and scientific nursing intervention also plays an extremely important role in slowing down the disease rate [13, 14]. With the change of social medical modes, patients raise increasingly higher requirements for nursing service quality, and the traditional nursing mode can no longer meet their needs. Therefore, besides good special nursing for diseases, a systematic and standardized comprehensive nursing intervention method should also be developed based on individual patients' actual situation and their relevant requirements for life quality [15, 16].

Previous studies concluded that comprehensive nursing was conducive to the recovery of patients [17, 18], but there are few studies on it in patients with both EC and DM. Therefore, this study tried to explore the application value of comprehensive nursing in patients with both EC and DM by applying such nursing modes to them, so as to provide a feasible nursing intervention measures for those patients.

### Materials and methods

#### *Clinical data of patients*

A total of 64 patients with both EC and DM undergoing surgery in our hospital from April 2017 to December 2018 were collected as research subjects. Thirty-three of them were randomly selected and nursed under a comprehensive nursing mode as the observation group, and the rest were nursed under a routine nursing mode as the control group. The mean age of the observation group was (48.29±4.61) years, while that of the control group was (46.67±3.58) group. All the patients were diagnosed with squamous cell carcinoma, and with type 2 diabetes mellitus before surgery. All of them were treated with esophageal cancer radical operation under general anesthesia, and 21 of the patients were additionally treated with dual-incision esophageal stomach and neck anastomosis of the left neck and left chest. The inclusion criteria of the patients

were as follows: patients diagnosed with EC based on gastroscopy and pathological diagnosis, patients meeting the clinical diagnostic criteria for DM, namely FBG equal to 7.0 mmol/L or more, 2 hour postprandial blood glucose (2 h PG) equal to 11.1 mmol/L or more, glycosylated hemoglobin (HbA1c) equal to 6.5% or more, patients who had not received radiotherapy and chemotherapy before and after surgery, patients with detailed clinical data and intact files, patients willing to cooperate for the treatment, determination, and follow-up, patients undergoing esophageal cancer radical operation under anesthesia. The study was approved by the Medical Ethics Committee of our hospital, and each patient signed an informed consent form after understanding the study. The exclusion criteria of the patients were as follows: patients with mental disease, patients without independent consciousness, patients with congenital immunodeficiency, patients comorbid with severe infection, inflammatory disease, severe cardio-cerebrovascular disease, other malignant tumors, liver or kidney function obstacles, or other immune system diseases, patients who had taken drugs (including albumin) affecting the serum protein level within 2 weeks after surgery, patients with severe blood coagulation dysfunction, and pregnant or lactating women.

#### *Nursing methods*

All the patients were operated on with esophageal cancer radical operation through posterolateral incision based on the left approach under general anesthesia and double lumen endotracheal catheter intubation, and then monitored and treated in care units in the thoracic surgery department after operation. Patients in the control groups were nursed under a routine nursing mode: 1. Information and guidance on related drugs were provided to each patient. 2. The patients were asked to have a balanced diet for nutrition maintenance. 3. The nursing staff were arranged to provide daily life nursing for the patients. Patients in the observation group were nursed based on the operation as follows: (1) enteral nutrition nursing mode (early enteral nutrition and auxiliary vein nutrition): early enteral nutrition was carried out from the Flocarenasojejunal tube to the distal end of duodenum Treitz ligament at 6 h after anesthesia. The enteral nutritional sus-

pension (NUTRICIA Pharmaceutical (Wuxi) Co., Ltd., H20030038) was adopted to give the patients 83.7-104.6 J/kg of calories each day. At 24 hours after operation, the suspension was infused at an isotonic low-speed and small-dose administration, and then it was infused at gradually increased infusion concentration, speed, and total dose according to the patients' tolerance until the targeted calorie intake was achieved. It was recommended that 1/3 of the total amount be given within 24 hours after operation, the remaining 2/3 be given within 24-48 hours after operation, and a full amount be given 48 hours after operation until successful normal gastrointestinal nutritional intake. During infusion, equilibrium liquid was infused into patients intravenously to address liquid shortage, and the blood glucose changes of the patients were carefully monitored to prevent the patients from suffering from discomforts such as being hungry and satiety based on their subjective feeling. Glucose-insulin-electrolyte was intravenously administered to the patients to regulate their blood glucose level, wherein the ratio of glucose to insulin dosage was controlled at 4-6 g glucose/1U insulin. Enteral nutrition was given by keeping the temperature of the input nutrient solution constant at 35-37°C through a full-automatic electric heater. The patients were instructed to keep a semi sitting position during total enteral nutrition to effectively prevent reflux aspiration. An intravenous micro-dosage pump was employed to pump continuous 24-hour, low-dose, and exogenous insulin into the patients to control their blood glucose level. (2) Psychological nursing for patients before operation: the patients were nursed individually and personally according to their sex, age, and education background. Nursing staff were arranged to intervene more with the patients' psychology, to explain the methods of blood glucose control and nutritional support during the peri-operative period to the patients, to introduce the necessity of surgery to them so that they could be psychologically prepared and cooperate with treatment. Nursing staff were also ready to explain the symptoms such as abdominal pain, abdominal distension, and diarrhea after operation to the patients, and to help them take drugs to in a timely manner to relieve symptoms and psychological burden and complete treatment; (3) Diet nursing: nursing staff were arranged to provide necessary nutritional support for the sake of patients' rapid recovery

during patients' hospitalization. In order to achieve this, it was necessary to customize personalized recipes according to each patient's own conditions, prohibit each patient from eating spicy, raw, or cold food, and strictly prohibit each patient from bad habits such as smoking and drinking; (4) Environmental nursing: measures were taken to ensure good environment and sanitation in wards, to control the temperature at 23-25°C and humidity at 50%-60%, and to carry out regular air disinfection. At the same time, in order to ensure quiet environment for the patients, loud noise is forbidden near the wards. In contrast, patients in the control group were nursed with total parenteral nutrient during hospitalization from 6 h after anesthesia, and continuously and intravenously infused with nutrient solution.

### *Observation indexes*

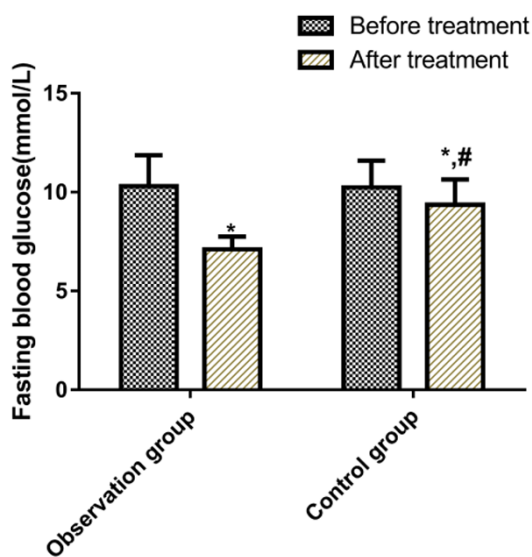
The nursing staff were arranged to comprehensively and systematically evaluate each patient in terms of physiology, psychology and health about 3 days before his/her discharge, to record his/her potential health problems and to take targeted actions. After discharge of the patient, a specialized nursing staff was designated to comprehensively and patiently follow the patient by telephone one time per week for 15-30 min per time. The nursing quality during the nursing period were analyzed statistically through a questionnaire survey. The anxiety and depression scores of the two groups before and after treatment were compared mainly by the self-rating anxiety scale (SAS) and the self-rating depression scale (SDS) [19]. Each scale covers 20 items, 1-4 points for each item. One point stands for no or little anxiety or depression, 2 points for sporadic anxiety or depression, 3 points for frequent anxiety or depression, and 4 points for very frequent or persistent anxiety or depression. The score is recorded as the sum total points of each item multiplied by a coefficient of 1.25. A higher score indicates more severe anxiety or depression. The nursing satisfaction of the two groups was compared after treatment through a self-made *Questionnaire of Nursing Satisfaction in Hospitalized Patients* of our hospital. The questionnaire offered options of high satisfaction, satisfaction, basic satisfaction, and dissatisfaction. The questionnaire covered the attitude of nursing staff, ward environment, incident handling and nursing effect. The nursing was scored

**Table 1.** Comparison between the two groups in general data

Item	The observation group (n=33)	The control group (n=31)	t/ $\chi^2$	P
Sex			0.542	0.462
Male	19 (57.58)	15 (48.39)		
Female	14 (42.42)	16 (51.61)		
Age (Y)	48.29±4.61	46.67±3.58	1.563	0.123
Smoking history			0.521	0.470
Yes	7 (21.21)	9 (29.03)		
None	26 (78.79)	22 (70.97)		
Drinking history			0.169	0.866
Yes	23 (69.7)	21 (67.74)		
No	10 (30.3)	10 (32.26)		
Body mass index (kg/m <sup>2</sup> )	22.56±1.75	22.33±2.62	0.415	0.679
Place of residence			1.058	0.304
Rural area	17 (51.52)	12 (38.71)		
Urban area	16 (48.48)	19 (61.29)		
Education background			2.103	0.147
≤ Senior high school	13 (39.39)	7 (22.58)		
> Senior high school	20 (60.61)	24 (77.42)		
Working status			2.680	0.102
Yes	15 (45.45)	8 (25.81)		
No	18 (54.55)	23 (74.19)		

number of patients highly satisfied with the nursing + the number of those basically satisfied with the nursing/the total number of patients. The life quality of the two groups before and after treatment was compared according to a life quality scale developed by the European Organization for Research and Treatment of Cancer for assessing the life quality of cancer patients [20]. The scale is for overall health, which covers five functions including body function, role function, emotion function, cognitive function, and social function, and three symptom aspects including fatigue, pain, nausea and vomiting. A higher score indicates better life quality of the patient.

*Statistical analysis*



**Figure 1.** Comparison between the two groups in fasting blood glucose (FBG). Note: \*P<0.05 vs. the situation before treatment, #P<0.05 vs. the control group after treatment.

with a total score of 100 points: A score equal to 90 points and above for high satisfaction, a score between 71 and 89 points for basic satisfaction, a score below 70 points for unsatisfied. The nursing satisfaction was recorded as the

In this study, the collected data were analyzed statistically using the medical statistical analysis software SPSS20.0 (Asia Analytics Formerly SPSS, China), and visualized into figures using GraphPadPrism8 (San Diego Graphpad Software Co., Ltd. the United States). Enumeration data were expressed by [n (%)], and comparison of them was carried out using the chi-square test, and expressed by  $\chi^2$ . Measurement data were expressed by the mean ± standard deviation (mean ± sd), and comparison between two groups about the data was carried out using the independent-samples T test, and expressed by t. Comparison about ranked data was performed using the rank sum test, and expressed by Z. P<0.05 indicated a significant difference.

**Results**

*General data*

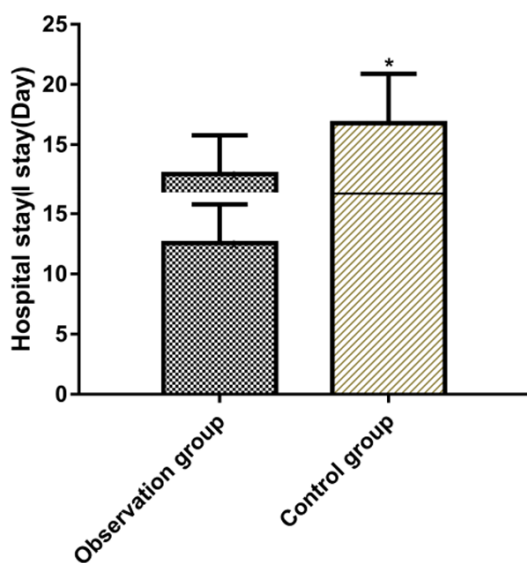
Comparison of clinical data between the two groups revealed that there was no significant difference between the two groups in general data including six, age, smoking history, drinking history, body mass index, place of residence, education background, and working statues (all P>0.05). **Table 1.**

**Table 2.** Comparison between the observation group and the control group in the incidence of postoperative complications [n (%)]

Item	The observation group (n=33)	The control group (n=31%)	$\chi^2$ value	P-value
Ketoacidosis	1 (3.03%)	2 (6.45%)	0.648	0.518
Hypoglycemia	2 (6.06%)	4 (12.9%)	0.881	0.348
Hyperglycemia	1 (3.03%)	3 (9.68%)	1.205	0.272
Hyperosmolar coma	1 (3.03%)	3 (9.68%)	1.205	0.272
The total incidence	5 (15.15%)	12 (38.71%)	2.458	0.033

**Table 3.** Comparison between the two groups in satisfaction

Item	The observation group (n=33)	The control group (n=31%)	$\chi^2$ value	P-value
Dissatisfied	2 (6.06%)	8 (25.81%)	4.727	0.030
Basically satisfied	14 (42.42%)	10 (32.26%)	0.705	0.401
Very satisfied	17 (51.52%)	13 (41.94%)	0.589	0.443
Nursing satisfaction	31 (93.94%)	23 (74.19%)	4.727	0.030



**Figure 2.** Comparison between the two groups in hospitalization time. Note: \*P<0.05 vs. the observation group.

*Comparison between the two groups in FBG*

Before treatment, there was no difference between the two groups in FBG, while after treatment, both groups showed significantly decreased FBG, and the observation group showed significantly lower FBG than the control group (P<0.05). **Figure 1.**

*Comparison between the two groups in relevant postoperative complications*

The observation group showed a total incidence of postoperative complications of 15.15%, with ketoacidosis in 1 patient (3.03%), hypoglycemia in 2 patients (6.06%), hyperglycemia in 1 patient (3.03%), and hyperosmolar coma in 1 patient (3.03%), while the control group showed a total incidence of postoperative complications of 38.71%, with ketoacidosis in 2 patients (6.45%), hypoglycemia in 4 patients (12.9%), hyperglycemia in 3 patients (9.68%), and hyperosmolar coma in 3 patients (9.68%), so the incidence of complications in the observation group was significantly lower than that in the control group (P<0.05). **Table 2.**

complications in the observation group was significantly lower than that in the control group (P<0.05). **Table 2.**

*Comparison between the two groups in satisfaction*

Analysis of nursing satisfaction of the two groups revealed that the observation group showed a significantly higher nursing satisfaction than the control group (P<0.05). **Table 3.**

*Comparison between the two groups in hospitalization time*

Comparison between the two groups in hospitalization time revealed that the observation group experienced much shorter hospitalization time than the control group (P<0.05). **Figure 2.**

*Comparison between the two groups in life quality score*

Before nursing, there was no significant difference between the two groups in life quality score (body function, cognitive function, role function, emotion function, social function, and overall health) (P>0.05), while after nursing, both groups had significantly higher life quality scores (P<0.05), and the observation group had higher scores than the control group (P<0.05). **Table 4.**

**Table 4.** Comparison between the two groups in life quality score

	The observation group (n=33)		t	P-value	The control group (n=31%)		t	P-value
	Before treatment	After treatment			Before treatment	After treatment		
Body function	84.27±8.31	94.25±8.15	4.926	<0.001	83.64±8.29	88.64±8.29*	2.375	0.021
Cognitive function	71.24±12.35	81.67±11.48	3.553	<0.001	70.69±11.53	76.39±10.24*	2.058	0.044
Role function	70.24±10.26	82.47±12.15	4.320	<0.001	70.11±9.87	75.11±9.29*	2.054	0.044
Emotion function	66.37±9.28	75.42±10.22	3.766	<0.001	66.24±9.19	70.91±8.14*	2.118	0.038
Social function	68.36±13.14	81.55±12.29	4.211	<0.001	67.81±12.45	75.42±10.13*	2.640	0.011
Overall health	53.21±10.34	64.31±5.87	5.363	<0.001	51.92±11.32	60.24±9.35*	3.155	0.003

Note: \*P<0.05 vs. the observation group.

**Table 5.** Comparison between the two groups in SAS and SDS scores

Item	SAS score		SDS score	
	Before treatment	After treatment	Before treatment	After treatment
The observation group (n=33)	52.14±3.71	42.27±2.34	52.47±3.51	44.74±2.87*
The control group (n=31)	52.23±3.85	44.35±2.61	52.67±4.387	48.96±3.51*
P-value	0.924	<0.01	0.841	<0.01
t	0.095	3.365	0.202	5.279

Note: \*P<0.05 vs. the the group before treatment.

*Comparison between the two groups in SAS and SDS scores*

Before nursing, there was no significant difference between the two groups in SAS and SDS scores (P>0.05), while after nursing, both groups had significantly lower SAS and SDS scores, and the observation group had significantly lower scores than the control group (P<0.05). **Table 5.**

**Discussion**

EC is one of the more common malignant tumors in China. With the incidence of DM increasing year by year, there are more and more patients with EC complicated with DM [21]. EC surgery is highly traumatic. Patients undergoing this surgery not only suffer from surgical trauma, but also have to suffer from a long period of fasting after surgery and chemotherapy, which causes great stress on the mind and body of the patients [22]. After surgery, the persistent pain, sputum retention, long-term fasting, and inability to eat normally will further worsen the nutritional status of the patients, and the patients may suffer from weight loss, hypoproteinemia, electrolyte disorder, or immune dysfunction, and face much higher risks of complications such as pulmonary infection and anastomotic leakage [23, 24]. Under the

current clinical routine postoperative nursing conditions, most of EC patients live with bad physical conditions and recovery, and poor life quality after surgery [25]. DM is an independent risk factor for surgical operations. Therefore, it is particularly important to intensify nursing care to the patients after EC radical operation [26].

The gastrointestinal mucosa of EC patients is impaired during surgery, so enteral nutrition support is conducive to the recovery of the patients after surgery, because it can not only improve the nutritional status of the patients, but also can help to avoid intestinal bacterial translocation, maintain the integrity of intestinal mucosa structure, and reduce postoperative gastrointestinal complications [27]. This study provided comprehensive nursing to the patients in the observation group based on enteral nutrition support to improve the postoperative recovery and quality of life for them. The results revealed that before treatment, there was no difference between the two groups in FBG, while after treatment, both groups showed significantly decreased FBG, and the observation group showed a lower FBG than the control group, which indicated that nutritional support could effectively improve blood glucose control ability of the patients with both EC and DM.

With the development and progression of the modern medical nursing intervention modes, the nursing concept has also changed greatly. In addition to improving the treatment, the patient's pain and depressed mentality should be taken into account and relieved, so as to achieve the purpose of improving their life quality [28, 29]. Especially patients with both EC and DM usually understand their disease severity and suffer from severe psychological pressure and negative emotions. At this time, if there was no timely and effective psychological guidance for them, they will often feel desperate and eventually abandon treatment. Comprehensive nursing is enriched by preoperative education, nursing about blood glucose and nutrition, and guidance in exercise and diet for the patients, which not only improves the psychological endurance of patients, but also provides comprehensive nursing support for them. Comprehensive nursing intervention improves treatment confidence for patient's recovery. Comprehensive nursing intervention gives targeted prevention and treatment to prevent adverse reactions in the treatment process, and under this nursing mode, any adverse reaction will be reported to doctors in time for symptomatic treatment [30, 31]. In this study, compared with patients undergoing EC radiotherapy and chemotherapy nursed under routine nursing mode, those nursed under comprehensive nursing intervention mode had significantly improved life quality scores, which indicated that comprehensive nursing intervention could significantly improve life quality of the patients. The incidence of complications in patients with both EC and DM nursed under comprehensive nursing intervention was significantly lower than those under routine nursing intervention, suggesting that comprehensive nursing intervention could significantly lower incidence of adverse reactions and relieve the pain caused by treatment. Moreover, the anxiety and depression scores of patients with the two diseases nursed under comprehensive nursing intervention were significantly lower than those nursed under routine nursing intervention, suggesting that comprehensive nursing intervention could relieve the negative emotion of patients and was better than routine nursing. Furthermore, after comprehensive nursing intervention, the nursing satisfaction of the patients undergoing EC radiotherapy and chemotherapy significantly improved.

To sum up, comprehensive nursing combined with enteral nutrition support can significantly improve the blood glucose control ability, life quality, and physical and mental statuses of patients with both EC and DM, and can effectively improve their nursing satisfaction, so it is worthy of popularization and application in clinic practice.

### Disclosure of conflict of interest

None.

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