



Rehabilitation treatment of enteral nutrition whey protein in lung cancer patients in southern China

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Abstract

The aim of this study is to observe the clinical efficacy of enteral nutrition support therapy in patients with lung cancer chemotherapy in southern China. 212 patients with lung cancer chemotherapy were divided into treatment group and control group, with 30 cases in each group. Patients in the two groups were treated with a normal diet, anti-infection, oxygen inhalation, antispasmodic and asthma, phlegm elimination, correction of acid-base imbalance, and electrolyte disturbance. Patients in the control group ate according to usual dietary habits, and infused intravenously with 20% fat milk 250 mL, 8.5% compound amino acid 250 mL, 10% glucose injection 500 mL and vitamins and other general nutrition support treatment. Patients in the enteral nutrition treatment group were given oral nutritional support for Lishikang integrin-type nutritional solution based on the control group. Patients with hypoproteinemia were supplemented with an appropriate amount of whey protein powder for 2 weeks. Before and after treatment, nutritional assessment, biochemical index monitoring, and adverse reactions were observed in the two groups of patients. Compared with the control group, the enteral nutrition treatment group increased anthropometric values, improved lung function, and increased serum albumin. There was a significant difference between the two groups ($P < 0.05$). Enteral nutrition support treatment can significantly improve the nutritional status of patients with lung cancer, we need improve the immune function of patients and tolerance to chemotherapy.

Keywords: lung cancer; chemotherapy; enteral nutrition support treatment.

Practical Application: Enteral nutrition support treatment can improve the nutritional status of patients with lung cancer.

1 Introduction

Lung cancer is one of the malignant tumors with a high incidence, and malnutrition is a global public health problem for the disease (Adie et al., 2020; Boldrin et al., 2019; Canale et al., 2019). According to statistics, the incidence of malnutrition in hospitalized patients with lung cancer is about 20-50% (Andrews Wright & Goss, 2019; Arroyo et al., 2019). At present, radical surgery can effectively remove the lesion, and it is still an effective method to treat early and middle lung cancer and prolong the survival time of patients (Lee et al., 2019; Lu et al., 2020; Shi et al., 2019). However, patients with lung cancer have poor nutrition status and weakened immune function before surgery (Park et al., 2020; Ulmann et al., 2019). At the same time, due to the stress response brought by surgery, malnutrition will be further exacerbated, which will affect the immune function of patients. Many patients with lung cancer due to chemotherapy-induced gastrointestinal adverse reactions and the disease itself often have varying degrees of malnutrition, and even cachexia, which seriously affects the treatment effect and prognosis of patients (Toda et al., 2020).

Because lung cancer is a malignant wasting disorder, patients with different degrees of nutritional disorders will develop as the disease progresses (Friedberg et al., 2019; Yuan et al., 2018; Zongwen et al., 2017). At the same time, as the patient's body function

decreases with age, the lack of disease recovery capabilities makes it easy to increase malnutrition. This situation not only affects the physiological parameters of the patient, but also affects its prognosis. Therefore, in the nutritional treatment of patients with lung cancer chemotherapy, it is very important to try to reverse or prevent the continued development of malnutrition. Enteral nutrition is not only safe and inexpensive, but also meets the body's normal physiological needs and protects the intestinal mucosal barrier (Ye et al., 2019; Lyu et al., 2019; Chow et al., 2020; Han et al., 2018).

Malnutrition and weakened immune function will adversely affect lung cancer patients after surgery, and are important risk factors for recurrence and metastasis (Cheng et al., 2018; Lee et al., 2017; Gavazzi et al., 2016). Studies have shown that enteral nutrition support therapy is a commonly used treatment and has an important role in improving the body's resistance. Enteral nutrition support therapy is rationally applied, and it can effectively regulate the immune and metabolism regulation by providing nutritional substrates required for cell metabolism (Yang et al., 2018; Xie et al., 2018). This study applied enteral nutrition support to patients with lung cancer chemotherapy in southern China. The clinical effects and safety of the patients were observed and their effects on the nutritional status of patients were observed.

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2 Materials and methods

2.1 General demographic information

A total of 212 patients receiving chemotherapy for lung cancer were selected from a hospital in southern China from January 2017 to December 2018. Among them, 142 were males and 70 were females, aged 41 to 72 (55.3 ± 5.6) years old, and all were treated with chemotherapy after diagnosis of lung cancer. Lung cancer chemotherapy patients were divided into two groups, that is, the treatment group and the control group, with 106 cases in each group, and observed for 2 weeks. Patients in the two groups were matched according to sex, age, disease type, condition, nutritional status, and chemotherapy regimen. There was no significant difference between the two groups ($P > 0.05$), and they were comparable. Exclusion criteria: those with a history of metabolic disease and inflammatory bowel disease. People with concurrent heart, liver, and kidney failure. Those with gastrointestinal stress ulcers and bleeding. There are those who apply blood products.

2.2 Nutrition support methods

Control group

Eat according to the patient's usual eating habits. Peripheral intravenous infusion of 250% 20% fat milk 250 mL, 8.5% compound amino acid 250 mL, 10% glucose injection 500 mL, appropriate amount of vitamins and trace elements, and other general nutrition support treatment. 3284.4 kJ (785 kcal)/d, nitrogen is 3.47 g/d.

Treatment group

On the basis of the control group, Lisikang (Xi'an Libang Clinical Nutrition Co., Ltd.) integrin-type nutritional solution was taken orally (The main ingredients include maltodextrin, casein, whey protein, soy protein isolate, corn oil, medium chain triacylglycerol, phospholipids, glucose, dietary fiber, glutamine, multivitamin, and multimineral), 200 mL (1 kcal/mL) 4 times a day. For patients with hypoproteinemia (<27 g/L), enter an appropriate amount of whey protein powder in the intestine, 20-30 g per day, divided into two doses. Patients who cannot eat by mouth are given a nasogastric tube.

2.3 Detection indicators and methods

Before treatment and after 2 weeks of treatment, nutrition evaluation, biochemical index monitoring and clinical adverse reaction observation were performed on the two groups of patients.

Body nutrition evaluation includes weight (kg), triceps brachial skin wrinkle thickness (TSP) to measure the sebum thickness at the midpoint of the line between the left shoulder peak and the ulna olecranon, and the middle arm circumference (MAMC). Laboratory tests: blood routine, serum total protein and albumin. Clinical observation indicators include: the occurrence of adverse reactions such as diarrhea, bloating, abdominal pain, intestinal cramps, nausea, vomiting, and constipation.

2.4 Statistical methods

Data were analyzed using SPSS 23.0 statistical software. Grade data were compared using the chi-square test. Measurement data are expressed as $\bar{x} \pm s$. Group design uses t-test. Paired design uses paired t test. Bilateral $P \leq 0.05$ was considered statistically significant.

3 Results

3.1 Anthropometric value

The weight gain of patients in the control group and the treatment group before and after treatment was (0.52 ± 0.21) kg and (2.16 ± 0.75) kg, respectively, the difference was statistically significant ($t = 21.727$, $P < 0.05$). The triceps brachial skin wrinkle thickness (TSP) of the control group and the treatment group before and after treatment were (0.31 ± 0.19) mm and (2.13 ± 0.27) mm, respectively, and the difference was statistically significant ($t = 55.468$, $P < 0.05$). Patients in the control group and the treatment group before and after treatment had an increase in the middle arm muscle circumference (MAMC) by (0.58 ± 0.31) mm and (2.59 ± 0.33) mm, respectively. The difference was statistically significant ($t = 45.551$, $P < 0.05$). The analysis results are shown in Table 1.

3.2 Nutrition-related indicators

The total protein of patients in the control group before and after treatment was (42.01 ± 1.18) g/L and (46.14 ± 1.67) g/L, the difference was statistically significant ($P < 0.05$). The total protein before and after treatment in the treatment group was (42.83 ± 1.29) g/L and (53.86 ± 1.14) g/L, and the difference was statistically significant ($P < 0.05$). The difference in total protein after treatment between the treatment group and the control group was also statistically significant ($P < 0.05$). The albumin in the control group before and after treatment was (25.22 ± 3.18) g/L and (28.47 ± 3.43) g/L, the difference was statistically significant ($P < 0.05$). Patients in the treatment group before and after treatment had albumin levels of (24.09 ± 4.64) g/L and (32.43 ± 4.32) g/L, the differences were statistically significant

Table 1. Comparison of anthropometric values before and after treatment in two groups of patients.

	<i>n</i>	Weight gain (kg)	TSP (mm)	MAMC (mm)
Control group	106	0.52 ± 0.21	0.31 ± 0.19	0.58 ± 0.31
Treatment group	106	2.16 ± 0.75	2.13 ± 0.27	2.59 ± 0.33
<i>t</i> (<i>t</i> test)		21.727	55.468	45.551
<i>P</i> (Probability)		<0.001	<0.001	<0.001

($P < 0.05$). The difference in albumin after treatment between the treatment group and the control group was also statistically significant ($P < 0.05$). Patients in the control group before and after treatment had hemoglobin (7.17 ± 1.75) g/L and (7.91 ± 2.23) g/L, respectively, and the difference was statistically significant ($P < 0.05$). The hemoglobin before and after treatment in the treatment group was (7.23 ± 1.63) g/L and (9.68 ± 2.45) g/L, the difference was statistically significant ($P < 0.05$). The difference in hemoglobin between the treatment group and the control group after treatment was also statistically significant ($P < 0.05$). The analysis results are shown in Table 2.

3.3 Clinical observation indicators

After treatment, patients in the control group and the treatment group had a decrease in white blood cell counts of 71.7% and 40.6%, respectively. The proportion of patients in the control group and the treatment group after treatment was 73.6% and 92.5%, respectively. The difference was statistically significant (Chi-square value = 13.384, $P < 0.05$). The incidences of adverse reactions after treatment in patients in the control group and the treatment group were 67.0% and 32.1%, respectively, and the difference was statistically significant (Chi-square value = 25.832, $P < 0.05$). Only a few patients in the treatment group had bloating and diarrhea, which improved after symptomatic treatment, and no serious complications occurred. The analysis results are shown in Table 3.

4 Discussion

Lung cancer is a common malignant tumor in clinical practice, which seriously threatens human health and safety (Mirtavoos-Mahyari et al., 2019; Luo & Xu, 2019). Chemotherapy is a common treatment for lung cancer patients (Guo et al., 2019; Luo et al., 2018). In the case of hunger and malnutrition, these patients are repeatedly treated with chemotherapy and radiation. Due to malnutrition, plasma protein levels in patients are reduced, and the body's absorption, distribution, metabolism,

and excretion of chemotherapeutic drugs are impaired, which significantly affects the hemodynamics of chemotherapeutic drugs (Yang et al., 2019; Wang et al., 2019; Tissot et al., 2019). As a result, patients' adverse reactions to chemotherapeutic drugs increase, the body's tolerance decreases, and the effect of antitumor treatment is affected. The effects of chemotherapeutics on the body are not limited to tumor cells, but can also affect normal tissue cells. Clinically, patients often experience nausea, vomiting, anorexia and diarrhea. Sometimes even blood in the stool can seriously affect the patient's food intake and absorption, leading to malnutrition.

Chemotherapy can also cause stomatitis, sore throat, inflammation of the gastrointestinal mucosa, and liver dysfunction, aggravating the degree of malnutrition (Miyata et al., 2017; Debeljak et al., 2018; Yu et al., 2017; Chao et al., 2017). Some patients therefore refuse treatment or are forced to terminate treatment. The method of dripping nutrient solution by the intravenous infusion set used in the past has limited effect and cannot effectively meet the nutrition needs of the patient's body. Enteral nutrition is a nutritional support means pumped into the enteral nutrition suspension through a nasal catheter (Chen et al., 2019; Wang et al., 2018). Nutrients directly enter the patient's intestine, conforming to the form of gastrointestinal movement, and will not increase the intestinal osmotic load. The patient's gastrointestinal burden is small and the adaptation is good, which is conducive to the slow and uniform absorption of various nutrients and reduces the stimulation of the digestive tract. In addition, because of the need to fast water before surgery, early enteral nutrition support can stimulate digestive tract gland secretion, promote gastrointestinal absorption and digestive function recovery, and help improve immune function.

The early rational application of enteral nutrition has the following advantages (Peng et al., 2016; Chen et al., 2014; Fujita et al., 2012): enteral nutrition is beneficial to promote the recovery of gastrointestinal function, prevent bacterial translocation, and reduce the occurrence of enteric infection. Intestinal nutrient solution is absorbed by the portal vein system

Table 2. Comparison of nutritional indexes between two groups of patients before and after treatment (g/L).

Nutrition index	Control group		Treatment group	
	Before treatment	After treatment	Before treatment	After treatment
Total protein	42.01 ± 1.18	46.14 ± 1.67 [#]	42.83 ± 1.29	53.86 ± 1.14 ^{*,#}
Albumin	25.22 ± 3.18	28.47 ± 3.43 [#]	24.09 ± 4.64	32.43 ± 4.32 ^{*,#}
Hemoglobin	7.17 ± 1.75	7.91 ± 2.23 [#]	7.23 ± 1.63	9.68 ± 2.45 ^{*,#}

Compared with control group, * $P < 0.05$; Compared with before treatment, [#] $P < 0.05$.

Table 3. Comparison of clinical observations after chemotherapy between two groups of patients.

Group	n	Decrease in white blood cell count (%)	Chemotherapy compliance (%)	Incidence of adverse reactions (%)
Control group	106	76 (71.7)	78 (73.6)	71 (67.0)
Treatment group	106	43 (40.6)	98 (92.5)	34 (32.1)
χ^2 (Chi-square value)		20.861	13.384	25.832
P (Probability)		<0.001	<0.001	<0.001

and transported to the liver. It is an active absorption process, which is beneficial to regulating visceral protein synthesis and metabolism. Enteral nutrition does not increase visceral blood flow and cardiac output, and can reduce the energy consumed by metabolic nutrients. Clinical application is simple, easy, safe and economical. Chemotherapy drugs not only have therapeutic effects, but also have serious toxic side effects. Therefore, patients with lung cancer chemotherapy are more likely to have different degrees of gastrointestinal adverse reactions during treatment, such as nausea, vomiting, diarrhea, and anorexia. Patients with serious adverse reactions even have clinical manifestations of blood in the stool, which has a more serious impact on the patient's daily diet and is prone to malnutrition.

The choice of nutritional therapy for chemotherapy patients follows the principle of "use the intestine when it is functional and can be used safely", and enteral nutrition is preferred (Lee et al., 2017; Garofolo, 2012; Nogueira et al., 2020). Enteral nutrition is not only safe and inexpensive, but also meets the body's normal physiological needs and protects the intestinal mucosa. In the case of adverse reactions to chemotherapy in patients with lung cancer, enteral nutrition support treatment should be given as soon as the gastrointestinal tract is functional. Prior to chemotherapy, nutritional needs should be emphasized, and active nutritional supplementation can reduce complications, increase tolerance of antitumor therapy, and improve the effect of chemotherapy. For most lung cancer patients with malnutrition, nutrition intervention and treatment during chemotherapy has become an indispensable comprehensive treatment. Enteral nutrition can take a small number of meals, from low concentration to high concentration, from little to more to gradually adapt the patient, and then with pure whey protein powder (Lee et al., 2017; Trindade et al., 2019). It has a very good improvement effect on patients with hypoproteinemia. After 2 weeks of nutritional support treatment, the patient's mental state has improved significantly and chemotherapy compliance has improved.

In this study, the anthropometric values and nutritional indexes of patients in the treatment group were better than those in the control group, indicating that increasing nutritional support can significantly improve the tolerance of patients with lung cancer to adverse reactions to chemotherapy. In this study, nutritional assessment and comprehensive, balanced and reasonable enteral nutrition support treatment were performed for patients in the treatment group. The results of the study suggest that the improvement of patients' nutrition-related indicators is higher than that of the control group, indicating that increasing nutritional support can significantly improve the nutritional status of patients with lung cancer chemotherapy. Compared with the two groups, the rate of decrease in white blood cell count, chemotherapy compliance, and incidence of nausea and vomiting after chemotherapy were better in the treatment group than in the control group. It shows that enteral nutrition and nutritional support can reduce the incidence of adverse reactions in lung cancer patients and increase compliance with chemotherapy.

In this study, only a few patients experienced adverse reactions during the treatment of enteral nutrition, such as mild swelling and diarrhea, which were all relieved after treatment, and no

serious complications occurred, suggesting that enteral nutrition is safe and feasible. With the development of medicine and the continuous improvement of clinical nutrition awareness, enteral nutrition treatment has become more and more important in the clinic and has become an important part of comprehensive clinical treatment. Enteral nutrition support therapy has the advantages of simplicity, safety, and economy. In the case of adverse reactions to chemotherapy in patients with lung cancer, enteral nutrition support treatment should be given as soon as the gastrointestinal tract is functional.

Enteral nutrition treatment is now more and more valued clinically and has become an important part of comprehensive clinical treatment. Enteral nutrition support therapy has the advantages of simplicity, safety, and economy. The application effect is more significant, the incidence of complications is lower, it is easier for patients to accept, the compliance is higher, and it has more promotion significance.

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