



Application of enteral nutrition during perichemotherapy of acute non-lymphocytic leukemia

Min Zhao^{a#}, Xin-Guo Li^{b#*}, Yuan-Yuan Ma^{a#}, Yi Liu^a, Li-Xin Wang^a, Jian-Liang Shen^{a*}
and Zhi-Ming Zhu^{a*}

^aNavy General Hospital, Beijing, People's Republic of China

^bCollege of Biochemical Engineering, Beijing Union University, Beijing, People's Republic of China

[#]Equal contributors *Corresponding author

ABSTRACT

To investigate gastrointestinal tolerance and nutritional status of patients with acute non lymphocytic leukemia by enteral nutrition support during chemotherapy. 64 cases with acute non lymphocytic leukemia were collected by the inclusion and exclusion criteria, were randomly divided into enteral nutrition group and control group. Patients with nutritional risk were given enteral nutrition support during chemotherapy and its effect was evaluated. Leukemia patients won a gastrointestinal tolerance to enteral nutrition during chemotherapy. Serum albumin was significantly higher than its original level and control group by enteral nutrition support ($P < 0.05$). Enteral nutrition was beneficial to patients with leukemia during chemotherapy. Different solutions were adapted for different stages.

Key words: Enteral nutrition; Leukemia; Perichemotherapy

INTRODUCTION

Malnutrition in malignancy patient is an important debilitating and life-threatening characteristic, up to 80% tumor patients will have nutrition deficiency and 20% patients will die of malnutrition rather than malignant tumor^[1]. Leukemia is a malignancy with higher consumption of nutrient, which is easily accompanied with nutrition deficiency, especially in perichemotherapy. The leukemia patients shall receive standard nutrition support therapy. For the patient with intestinal dysfunction, the enteral nutrition support therapy is applied to provide tumor patients with the required energy and nutrients, which facilitate the synthesis of protein, reduce muscle attenuation, increase the utilization efficiency of nutrient and the tolerance to chemotherapy, accelerate recovery from the disease, improve the life quality of patients and prolong the survival time of patients.

EXPERIMENTAL SECTION

Subjects

According to the inclusion and exclusion criteria, 64 patients with acute non-lymphocytic leukemia was included, with the age range of 15–40 years and an average age of 32.8 ± 5.1 years, the male/female ratio was 1/0.28, and the average BMI was 20.1 ± 2.7 . These patients were randomized into two groups, i.e. enteral nutrition support group and control group, each with 32 patients. The control group hadn't enteral nutrition support, while had common hospital diets. There were no statistically significant differences ($P > 0.05$) between the two groups with regard to gender, age, disease type, condition and chemotherapy protocol, thus, the randomization complied with the inclusion criteria: 14-45 years old, had clinical, blood and bone marrow diagnosis evidences; exclusion criteria: acute disease exacerbation; chronic diseases such as concomitant with diabetes, hypertension, liver and kidney dysfunction; concomitant with serious allergy and other immune system diseases; pregnant or lactating patients; within half a year

after surgery; end-stage of leukemia.

Method

The nutrition risk for patients with acute non-lymphocytic leukemia was assessed in day 3 after chemotherapy by perspective study. Standard nutrition support would be provided to the included patients with established nutrition risk (NRS2002 \geq 3) during the next chemotherapy course. The patients should have high protein and high energy intake 3 days before and 1 week after chemotherapy with oral Enteral Nutritional Powder (TP) 40g, tid, as supplementation or taken during diet. The nutrition support protocol of "allowable intake inadequacy" of relatively lower energy (80% of required energy) should consist of oral Enteral Nutritional Powder (TP) 30g, bid, as supplementation. The prealbumin before perichemotherapy enteral nutrition support ending and the related indicators at 2 weeks after enteral nutrition support ending, such as hemoglobin, red blood cells, albumin, total protein, body mass index (BMI) and prealbumin change were used as the efficacy-assessing indicators for enteral nutrition support.

Statistical analysis

The measurements were represented as $\bar{x}\pm s$ the statistical analysis of data was performed with Statistics software SPSS 16.0 and ANOVA.

RESULTS

Evaluation of the efficacy of enteral nutrition support

For the leukemia patient with a NRS2002 \geq 3, the high protein and high energy intake 3 days before and 1 week after chemotherapy was well tolerated. Low dose and low frequency of additional oral diet was provided as nutrition supplementation during chemotherapy. The gastrointestinal tract was well tolerated without symptoms of serious vomiting and diarrhea, the enteral nutrition support was successfully conducted.

In the enteral nutrition support group, the levels of serum prealbumin immediately after chemotherapy and 3 weeks later were significantly higher than that before chemotherapy, the level at 3 weeks after chemotherapy was significantly higher than that at the end of chemotherapy, the difference in the levels immediately after chemotherapy and 3 weeks later were significant compared with that of the control group ($P<0.05$), and the difference in the level before chemotherapy was not significant compared with that of the control group ($P<0.05$). The level of serum prealbumin increased 3 weeks after chemotherapy, and the difference was not significant compared with that before chemotherapy ($P<0.05$).

Table 1: The effect of enteral nutrition on prealbumin in perichemotherapy leukemia patients

	Before chemotherapy	After chemotherapy	3 weeks after chemotherapy
Nutrition support group(n = 32)	166 \pm 35	187 \pm 43*	205 \pm 38**
Control group(n = 32)	170 \pm 39	153 \pm 54*	169 \pm 44

Compared with that before chemotherapy, * $P<0.05$; Compared with control group, ** $P<0.05$

The changes of related indicators after enteral nutrition support

After enteral nutrition support, the levels of prealbumin and hemoglobin were significantly higher than that before support and was statistically significant compared with control group ($P>0.05$), the differences in red blood cell, total protein and BMI were not significant before and after enteral nutrition support ($P>0.05$). The level of albumin after chemotherapy in control group was significantly lower than that before chemotherapy ($P<0.05$), the differences in each nutrition-related indicator in nutrition support group were not significantly compared with control group before chemotherapy ($P>0.05$).

Table 2: Nutrition-related indicators in perichemotherapy leukemia patients before and after enteral nutrition support

	Before chemotherapy		3 weeks after chemotherapy	
	Control group	Nutrition support group	Control group	Nutrition support group
Hemoglobin (g/L)	83.8 \pm 16.8	82.2 \pm 15.5	80.2 \pm 17.9	89.0 \pm 13.7*
Red blood cell (10^{12} /L)	2.69 \pm 0.59	2.73 \pm 0.85	2.70 \pm 0.69	2.80 \pm 0.79
Albumin (g/L)	32.4 \pm 5.5	33.2 \pm 6.9	30.8 \pm 7.4*	36.2 \pm 5.4*
Total protein (g/L)	58 \pm 9.5	59 \pm 10.7	56 \pm 11.3	61 \pm 11.2
Body mass index (BMI)	20.2 \pm 3.1	20.1 \pm 3.7	20.0 \pm 4.0	20.4 \pm 3.3

Before and after chemotherapy in control group, * $P<0.05$; before and after chemotherapy in nutrition support group, * $P<0.05$; nutrition support group versus control group after chemotherapy, ** $P<0.05$

DISCUSSION

Main options for clinical treatment of leukemia include transplantation, chemotherapy, biological therapy and other comprehensive methods, each therapy will affect the nutrition status in patient to some extent^[2,3]. Clinical study found that tumor patients with good nutrition status had significantly higher survival rates than patients with malnutrition, thus, nutrition therapy had been an indispensable part in treatment option for tumor patients^[4]. While the leukemia patients received anti-tumor chemotherapy agents, normal tissue cells, such as gastrointestinal epithelial cells, were very sensitive to these chemotherapy agents, and the patients tended to have inflammation and ulcer; these chemotherapy agents could also stimulate the triggering region of chemical sensors, induce nausea and vomiting, and affect the intake and absorption of nutrients in patients to various extent, accelerate the nutrition deficiency, and even discontinue the chemotherapy, some patients had cachexia, which would impact the treatment efficacy and prognosis. For the enteral or parenteral nutrition therapy in the patients with chemotherapy, malnutrition should be reversed or prevented. As an easy-to-use, safe and economic treatment, enteral nutrition support could reduce the nutrition deficiency in perichemotherapy patients, improve the tolerance to chemotherapy in patients, aid a recovery to health.^[5-7]

The percentage of leukemia patients with nutrition risk during chemotherapy was high; some patients did have gastrointestinal responses to various extents during chemotherapy, but still had some gastrointestinal function. These patients could increase the nutrition intake through enteral nutrition support. The enteral nutrition products with good digestion and absorption could reduce the gastrointestinal burden as compared with common diet. With the aim of avoiding the differences in various types of leukemia and increasing the compatibility, this study included 64 patients with acute non-lymphocytic leukemia, performed standard nutrition risk screening (NRS2002) immediately after chemotherapy. Based on the screening and assessment, this study identified leukemia patients with pre-existing malfunction and risk of malfunction, provided high protein and high energy intake, and provided enteral nutrition support on the basis of common diet. For the patients whose gastrointestinal function was affected by chemotherapy agents during chemotherapy, relatively lower energy support protocol with “allowable stage intake inadequacy” was provided, and the nutrition supplementation was performed by low dose and low frequency additional oral diet, no serious vomiting and diarrhea was observed and the enteral nutrition support was successfully conducted.

In normal cases, serum prealbumin was the indicator of recent nutrition status, with a half-life of approximately 2 days, and could quickly reflect the effects of nutrition support, therefore, this study used serum prealbumin as the evaluating indicator of nutrition treatment. The differences in each nutrition-related indicator between enteral nutrition support and control group before chemotherapy were not statistically significant, thus ensuring the comparability between groups. For the leukemia patients with $NRS2002 \geq 3$, the serum prealbumin increased significantly after enteral nutrition support compared with that before chemotherapy, and was also higher than that of control group, thus demonstrating the efficacy of nutrition support therapy. The levels of serum prealbumin and albumin in control group after chemotherapy were significantly lower than that before chemotherapy, the level of serum prealbumin in enteral nutrition support group at 3 weeks after chemotherapy was significantly higher than that after chemotherapy, indicating the importance of continuing enteral nutrition support after chemotherapy.

The half-life of serum prealbumin was approximately 2 weeks, the chosen enteral nutrition support for 2 weeks could not only show the effects of enteral nutrition support, but also demonstrate the effects of chemotherapy on albumin 3 weeks after chemotherapy. The levels of serum albumin and hemoglobin after enteral nutrition support were significantly higher than that before support, and were significantly higher than that of control group, suggesting that enteral nutrition support for leukemia patients during perichemotherapy could benefit the nutrition status. The most common complication in leukemia patients was infection, and nutrition deficiency was an important factor to induce infection, thus, it was very important for leukemia patients to maintain good nutrition status. In practice, the family members of patients usually had many misunderstandings on nutrition, they had paid too much attention to dietary supplements that could not provide energy and neglect the intake of regular nutrients, resulting to intake inadequacy of basic energy and protein. Therefore, nutrition instructions and standard nutrition support were very important during hospitalization.

The main aim of enteral nutrition support in leukemia patients was to correct and improve the nutrition status, provide sufficient nutrition metabolic substrate to maintain the need of normal cellular metabolism, enhance the body immune function. The improvement of nutrition status could increase the tolerance to tumor therapy in patients, reduce the toxic and side effects caused by complications and chemotherapy, result in the improving prognosis, higher life quality and extended survival. Therefore, we should take full advantage of the clinical nutrition therapy panel^[8,9], establish the schedule and protocol of enteral nutrition support on the basis of individual condition together with the clinicians.

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