Journal of Clinical and Nursing Research, 2024, Volume 8, Issue 5
http://ojs.bbwpublisher.com/index.php/JCNR
Online ISSN: 2208-3693
Print ISSN: 2208-3685

Effect of Early Enteral Nutrition Combined with Probiotics on the Nutritional Status of Patients with Severe Craniocerebral Injury

Huaying Guan*

Wuxi Mingde Hospital, Wuxi 214028, Jiangsu Province, China

***Corresponding author:** Huaying Guan, ghy8877@163.com

Abstract: *Objective:* To observe the effect of early enteral nutrition combined with probiotics on the nutritional status of patients with severe craniocerebral injury. *Methods:* Thirty-five patients with severe craniocerebral injury were divided into the study group (17 patients) and the control group (18 patients) according to the method of a randomized numerical table; both groups of patients started enteral nutrition via nasogastric tube within 24–48 hours after admission to the hospital, and probiotics were given in addition to the study group. Hemoglobin, total plasma protein, albumin, prealbumin, cholinesterase, fasting blood glucose, and other indexes were monitored before and early morning after enteral nutrition support, and upper arm circumference (AC), triceps skinfold thickness (TSF), and upper arm muscle circumference (AMC) were measured, and gastrointestinal response and time to first defecation of the patients were observed and compared with GCS score. *Results:* The hemoglobin, serum albumin, prealbumin, cholinesterase, and total plasma protein levels in the study group were significantly higher and fasting blood glucose levels were significantly lower than those in the control group after treatment ($P < 0.05$). The incidence of reflux and constipation in the study group was lower than that in the control group, and the time to first defecation was shorter than that in the control group ($P < 0.05$). After treatment, AC, TSF, and AMC were higher in the study group than in the control group ($P < 0.05$). GCS scores were significantly higher in both groups after treatment, but the trend was more pronounced in the study group ($P < 0.05$). *Conclusion:* Compared with simple enteral nutrition, enteral nutrition combined with probiotics can better correct metabolic disorders after heavy craniocerebral injury and improve the nutritional status of patients.

Keywords: Heavy craniocerebral injury; Early enteral nutrition; Probiotics; Nutritional status

Online publication: June 24, 2024

1. Introduction

Craniocerebral injury is often critical and serious, when the body is subjected to severe traumatic stress, it will cause intestinal flora imbalance and intestinal mucosal barrier dysfunction which easily leads to the occurrence of complications and aggravation of the development of the patient's prognosis is very unfavorable. As the clinical theory of nutritional support continues to deepen research, the application of probiotics has gradually

been emphasized, but less research has been done on its application in brain injury [1]. The purpose of this paper is to investigate the application effect of early enteral nutrition combined with probiotics.

2. Materials and methods

2.1. General information

Patients with severe craniocerebral injury, admitted between December 2022–2023, were the main cases in this study and were randomly divided into 2 groups.

Inclusion criteria: (1) Positive neurological signs were clear; (2) Glasgow score was 3-8; (3) Informed consent was obtained from the patients and their families; (4) The expected survival time was more than or equal to 7 days.

Exclusion criteria: (1) Accompanied by gastrointestinal bleeding, inter-abdominal compartment syndrome, and gastrointestinal tract injury; (2) Combined with severe organ function injury; (3) Unable to tolerate EN; (4) Combined with malignant lesions.

Among the 17 cases of the study group, there were 10 males and 7 females, with an average age of 39.21 ± 2.65 years old and an age interval of 18–60 years old; among the 18 cases of the control group, there were 10 males and 8 females, with an average age of 39.85 ± 2.11 years old and an age interval of 19–61 years old. Comparison of the above indicators (age and gender) showed no significant difference ($P > 0.05$) and can be compared.

2.2. Methods

Both groups received a series of basic treatments, such as dehydration, anti-infection, subcooling therapy, mechanical ventilation, cerebrospinal fluid drainage, and correction of water electrolytes. The enteral nutrition support was carried out within 24–48 hours in accordance with the "Guidelines for the Implementation and Evaluation of Nutritional Support Therapy for Adult Critically Ill Patients" developed by SCCM and ASPEN in 2016.

In the control group, early enteral nutrition is carried out. The gastric tube is left in the nasal feeding to carry out enteral nutrition support, and enteral nutrition solution is selected for continuous infusion, the initial drip rate is 20 mL per hour, according to the slow to fast speed, but the maximum drip rate should be controlled at 125 mL per hour, and the temperature of the nutrition solution should be controlled at 37℃ to 42℃, and the amount of residual volume in the patient's stomach should be pumped during the infusion period, and the frequency is once every 4 hours, if the amount of 150 mL or more is not enough, it will not be enough for the patient's stomach. During the infusion, the patient's gastric residue should be aspirated at a frequency of every 4 hours, and the infusion needs to be suspended if it is above 150 mL. The amount required for the first day's feeding was more than one-fourth of the total amount, i.e., 500mL per day, and then increased by one-fourth per day until the dose reached 1,500–2,000 mL per day if the patient could tolerate it.

The study group combined probiotics in addition to early enteral nutrition. 50 mL of Bouncing Beast (Inactivated) Plant Drink, produced by Bouncing Beast Biotechnology (Wuxi) Co. Ltd. (containing up to 5 billion living *Bifidobacterium lactis* in every 25 mL), was injected from the nasal feeding tube, twice a day, and used for 2 weeks consecutively.

2.3. Observation indexes

The hemoglobin, total plasma protein, albumin, prealbumin, cholinesterase, fasting blood glucose, and other indexes of the two groups after treatment were made comparisons, and the upper arm circumference (AC),

triceps skinfold thickness (TSF), and upper arm muscle circumference (AMC) were measured, and the gastrointestinal reactions and the time of the first defecation of the patients were observed.

The GCS scale was used to assess the state of consciousness of the patients in the two groups, with pre-treatment and post-treatment as the observation points, and the highest score of 15 indicated that the patient's consciousness was clear, mild impaired consciousness was in the score range of 12–14, moderate impaired consciousness in the score range of 9–11, and coma in the score range of < 8, and the scores were inversely proportional to the patients' impaired consciousness.

The venous blood of the two groups was drawn in the fasting state in the early morning for the detection of various indexes, including hemoglobin, total plasma protein, albumin, prealbumin, cholinesterase, and fasting blood glucose level.

2.4. Statistical processing

SPSS 20.0 was applied to the data obtained from the study to carry out statistics and analysis. Measurement data that conformed to the normal distribution were expressed as mean ± standard deviation (SD) and analyzed using the *t*-test. Count data were expressed as [*n* (%)] and analyzed using the χ^2 test. A *P*-value of less than 0.05 indicated a statistically significant difference.

3. Results

3.1. Comparison of changes in the level of indicators between the two groups

Table 1 shows that the indicator levels were significantly better in the study group as compared to the control group ($P < 0.05$).

Table 1. Comparison of changes in the level of various indicators before and after treatment (mean ± SD)

		Study group (n = 17)	Control group (n = 18)	t	P
Hemoglobin (g/L)	Before	104.52 ± 2.55	104.58 ± 2.58	0.069	0.945
	After	112.63 ± 3.01*	107.52 ± 2.01*	5.938	0.000
Serum albumin (g/L)	Before	36.22 ± 1.41	36.23 ± 1.42	0.042	0.967
	After	41.63 ± 2.74*	38.39 ± 2.01*	4.005	0.000
Prealbumin (mg/L)	Before	202.96 ± 3.77	202.98 ± 3.78	0.016	0.988
	After	262.63 ± 5.74*	233.52 ± 3.01*	18.945	0.000
Cholinesterase (U/L)	Before	5,168.96 ± 52.52	5,169.98 ± 52.77	0.057	0.955
	After	5,585.52 ± 55.14*	5,220.78 ± 51.32*	20.270	0.000
Fasting blood glucose (mmol/L)	Before	7.99 ± 1.92	7.92 ± 1.95	0.107	0.916
	After	5.52 ± 1.01*	6.88 ± 1.21*	3.598	0.001
Total plasma protein (g/L)	Before	55.25 ± 2.01	55.28 ± 2.02	0.044	0.965
	After	72.71 ± 3.01*	63.52 ± 3.11*	8.875	0.000

*$P < 0.05$ compared to before treatment.

3.2. Comparison of gastrointestinal reactions and time to first bowel movement between the two groups

The incidence of reflux and constipation in the study group was lower than that in the control group, and the time to first bowel movement was shorter than that in the control group ($P < 0.05$), as shown in **Table 2**.

Table 2. Comparison of gastrointestinal reactions and time to first bowel movement in two groups

Group	Cases (*n*)	Reflux	Constipation	Time to first bowel movement (d)
Study group	17	1	0	4.25 ± 1.85
Control group	18	5	1	6.55 ± 1.09
t / χ^2		-	4.118	4.512
P		-	0.042	0.000

3.3. Comparison of AC, TSF, and AMC indexes between the two groups

As shown in **Table 3**, AC, TSF, and AMC were higher in the study group than in the control group ($P < 0.05$).

Table 3. Comparison of AC, TSF, and AMC indicators before and after treatment (mean ± SD)

Group	AC (cm)		TSF (mm)		AMC (cm)	
	Before	After	Before	After	Before	After
Study group (*n* = 17)	1.05 ± 0.22	1.01 ± 0.03*	1.18 ± 0.41	1.03 ± 0.04*	0.96 ± 0.01	0.81 ± 0.03*
Control group (*n* = 18)	1.06 ± 0.23	0.98 ± 0.04*	1.19 ± 0.42	0.95 ± 0.06*	0.97 ± 0.02	0.72 ± 0.03*
t	0.131	2.474	0.071	4.612	1.844	8.746
P	0.896	0.019	0.944	0.000	0.074	0.000

*$P < 0.05$ compared to before treatment.

3.4. Comparison of GCS scores between the two groups

Table 4 shows that the GCS scores of both groups were significantly higher after treatment, but the trend of increase was more obvious in the study group ($P < 0.05$).

Table 4. Comparison of GCS scores before and after treatment (mean ± SD; points)

Group	Cases (*n*)	Before treatment	After treatment
Study group	17	8.22 ± 1.85	12.63 ± 2.22
Control group	18	8.23 ± 1.92	9.91 ± 1.03
t	-	0.016	4.694
P	-	0.988	0.000

4. Discussion

As a common clinical critical illness, patients with severe craniocerebral injury are often combined with different degrees of high catabolism after the injury, and their normal feeding is affected, which leads to a serious negative nitrogen balance in the body. At present, long-term parenteral nutritional support is generally chosen for this disease, although it can enhance the digestion and absorption function of the gastrointestinal mucosa of the patient, improve the malnutrition status of the body, and improve the immune function, but the prolonged use of it will cause the gastrointestinal mucosa to appear wasteful atrophy, which will lead to aggravation of malnutrition, and even the emergence of serious complications [2]. Moreover, with the continuous deepening of clinical research on enteral nutrition, it is found that early enteral nutrition support is very important, but it is found that if applied alone, it still can not lift its gastrointestinal dysfunction, leading to its

efficacy being affected [3].

In the present results, through the monitoring of various nutritional indicators, it was found that by combining early enteral nutrition with probiotic treatment, the level of cholinesterase and albumin can be effectively increased, in which cholinesterase is mainly synthesized by the human liver, which is a kind of enzyme that hydrolyzes cholinester, and the level of this indicator will decrease significantly when the body is malnourished, with a half-life of 6 to 7 days, which can be used as an indicator for assessing the human body's short-term nutritional status. It can be used as an indicator to assess the short-term nutritional status of the body. In addition, by measuring the TSF and AC of the patients, AMC is derived, and the above indicators can indirectly reflect the protein storage level in the body [4], the results show that the above indicators of the two groups are significantly reduced after treatment, but the data of the research group is more dominant, suggesting that when the patients have heavy craniocerebral injuries, there will be a serious loss of skeletal muscle proteins, and through the continuous use of probiotic treatment, it can be more important for the breakdown than synthesis of the protein. The treatment with continuous probiotics reversed the excess of catabolism over synthesis and inhibited the loss of lean body tissue. By studying the effect of the above methods on glucose metabolism, the results suggest that the fasting blood glucose level of the study group was significantly lower than that of the control group after treatment, which is due to the fact that probiotics can reduce the stress response of the body, and also inhibit gluconeogenesis, thus lowering its blood glucose level [5].

Studies have shown that pathogenic bacteria and beneficial bacteria in the intestinal tract will appear competitive adhesion to intestinal epithelial cells, and the production of beneficial bacteria can reduce the damage to the intestinal epithelial cells caused by pathogenic bacteria, compared with normal people, the number of *Escherichia coli* in patients with severe craniocerebral injury increased significantly, while the number of Lactobacillus and Bifidobacterium decreased significantly, through the provision of supplementation of exogenous probiotic bacteria, which can regulate the balance of the intestinal flora of human beings. By supplementing exogenous probiotics, the balance of human intestinal flora can be regulated, and beneficial intestinal bacteria can be increased, which can inhibit the propagation of pathogenic bacteria, thus playing the purpose of safeguarding the intestinal barrier function [6]. By combining probiotics with early enteral nutrition support, the structural and functional integrity of the intestinal mucosa can be maintained, and the secretion of immunoglobulin by intestinal cells can be promoted, thus stimulating the secretion of gastrointestinal hormones and pepsin, and ensuring the immune and barrier functions of the intestines. In addition, through the joint application of the above two methods, it can reduce the gastrointestinal reaction of patients, promote early defecation and gastrointestinal peristalsis, improve the blood supply of the gastrointestinal tract of patients, reduce the probability of complications such as constipation, reflux, and diarrhea, promote the early repair of patients' trauma, and also facilitate the recovery of patient's neurological function [7]. Bouncing Beast probiotics after oral intake can directly supplement the intestinal probiotic flora and be directly cultivated, thereby forming a barrier on the surface of the human intestinal mucosa, not only to promote the imbalance of the intestinal micro-ecological environment is improved, but also to restore the number and type of dysbiosis of the intestinal flora, to avoid the emergence of endotoxin and intestinal bacterial translocation, to accelerate intestinal peristalsis, the intestinal mucosal barrier function also has a certain protective effect, but also to make the permeability of the intestinal mucosa. The permeability of the intestinal mucosa can be reduced to prevent intestinal failure and promote the absorption of gastrointestinal nutrients, thereby improving the nutritional status of the body. In addition, probiotics can inhibit the local inflammatory response of the intestinal mucosa, so that the intestinal mucosal defense function can be strengthened, at the same time, it can also be stimulated by the local immunity of the intestinal tract, and increase the content of intestinal sIgA, which can promote the

enhancement of immune function, and have a positive impact on the patient's condition [8,9].

In conclusion, without conflict of interest, this study confirms that early enteral nutrition combined with probiotics can effectively improve the nutritional status of patients, which is worth further promotion and investigation.

Disclosure statement

The author declares no conflict of interest.

References

[1] Zhang J, Chen X, Shao H, 2023, Effects of Adding Probiotics Combined with Enteral Nutrition on Coagulation Function, Gastrointestinal Function and Inflammatory Factors in Patients with Acute Traumatic Craniocerebral Injury. Zhejiang Medicine, 45(11): 1182–1185.

[2] Zhang D, Wang H, Yu L, 2023, Effect of Glutamine Combined with Short Peptide Enteral Nutrition Intervention on Rehabilitation Effect and Immune Function in Patients with Severe Craniocerebral Injury. International Journal of Immunology, 46(6): 617–622.

[3] Liao L, Gao Y, He Q, et al., 2023, Effects of Different Enteral Nutrition Modalities on Metabolism and Prognosis of Patients with Severe Craniocerebral Injury. Chinese Journal of Integrative Emergency Medicine, 30(3): 343–347.

[4] Zhu L, Cai J, 2022, Study on the Application Effect of Postural Guidance Combined with Enteral Nutrition Intervention in Patients with Craniocerebral Injury and Its Influence on Nutritional Status. Shanxi Medical Journal, 51(9): 1071–1073.

[5] Luo S, Feng E, Pan X, et al., 2023, Effect of Sequential Enteral Nutrition Combined with Probiotics in Patients with Severe Craniocerebral Injury. Journal of Bengbu Medical College, 48(5): 687–690 + 695.

[6] Xia C, 2022, Effect of Ultra-Early Enteral Nutrition Support Nursing on Nutritional Status and Rehabilitation Process of Patients with Severe Craniocerebral Injury. Chinese Journal of Modern Nursing, 28(12): 1663–1666.

[7] Zheng Y, Li J, Gao Y, et al., 2022, Effects of Different Timing of Nutritional Support on Nutritional Status, Immune Function and Clinical Prognosis of Patients with Severe Craniocerebral Injury. Chongqing Medicine, 51(10): 1691–1695.

[8] Guo W, Qin H, Teng J, et al., 2022, Summary of Best Evidence for Enteral Nutritional Support in Adults with Severe Craniocerebral Injury. Chinese Family Medicine, 25(15): 1825–1832.

[9] Hong D, Wu X, 2023, Effect of Early Subcooled Hemofiltration Combined with Enteral Nutrition in the Postoperative Treatment of Patients with Severe Craniocerebral Injury. Chinese Journal of Practical Neurological Diseases, 26(10): 1232–1238.