



Early enteral immune nutrition support after radical operation for gastric cancer on promoting the recovery of gastrointestinal function and immune function

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ABSTRACT

Objective: To analyze the effect of early enteral immune nutrition support after radical operation for gastric cancer on the recovery of gastrointestinal function and immune function.

Methods: A total of 106 cases of patients received radical operation for gastric cancer in our hospital were selected as research subjects, and according to different ways of postoperative nutrition intervention, all patients were divided into observation group ($n=50$) and control group ($n=56$). Control group received conventional enteral nutrition intervention, observation group received postoperative early enteral immune nutrition support, and then differences in postoperative intestinal mucosa barrier function, gastrointestinal hormone levels, immune function levels and nutrition-related indicator values were compared between two groups.

Results: After observation group received enteral immune nutrition intervention, serum DAO, PS and D-lactate levels as well as urine L/M ratio were lower than those of control group; serum GAS, CCK, MTL and SP values of observation group after intervention were higher than those of control group, and GLU, VIP, GIP and SS values were lower than those of control group; CD4, IgG, NK cell, C₃, C₄, CH₅₀ and S-IgA levels of observation group after intervention were higher than those of control group; serum ALB, PRE, TRF and RBP levels of observation group after intervention were higher than those of control group. **Conclusion:** Early enteral immune nutrition support after radical operation for gastric cancer is conducive to the recovery of gastrointestinal function and the promotion of immune state, eventually promotes patients' postoperative overall recovery and has active clinical significance.

1. Introduction

Gastric cancer is a neoplastic disease of digestive system with high incidence, patients are in a high state of decomposition early after radical operation and accompanied with low immunity, and early nutrition intervention is needed to promote the recovery of patients. Early enteral nutrition can not only promote the recovery of gastrointestinal function, but is also with better effect of nutrition absorption, and it is the more respected clinical intervention[1]. But the conventional enteral nutrient solution is cannot restore cancer patients' immune system, and patients' prognosis is still poor. In order to effectively reduce postoperative complications and

improve patients' overall resistance, some scholars recommend that glutamine, arginine, unsaturated fatty acids and so on are added in the enteral nutrient solution in order to improve the body's immune function and negative nitrogen balance[2,3]. In the research, the effect of early enteral immune nutrition support after radical operation for gastric cancer on the recovery of gastrointestinal function and immune function was mainly analyzed, hereby reported as follows.

2. Information and methods

2.1. General information

A total of 106 cases of patients received radical operation for gastric cancer in our hospital were selected as research subjects, and their hospitalization information, test information and so on from January 2013 to August 2015 were retrospectively analyzed.

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According to different ways of postoperative nutrition intervention, all patients were divided into observation group ($n=50$) and control group ($n=56$). Observation group included 27 male cases and 23 female cases, they were 45-72 years old and the average was (60 ± 8) years; control group included 30 male cases and 26 female cases, they were 47-70 years old and the average was (61 ± 7) years. Differences in baseline information between two groups were without statistical significance, $P>0.05$.

2.2. Nutrition intervention

From the 1 d after operation, observation group received enteral nutrition intervention, calorie supply was 60 kJ/(kg d) and nitrogen supply was 0.14 g/(kg d). On the 2 d after operation, calorie 120 kJ/(kg d) and nitrogen 0.28 g/(kg d) were supplied, and meantime, vitamin and electrolyte were added. Nutrient solution was intravenously infused with constant-speed pump, and from 20 mL/h, patients' tolerance was observed and 20 mL/h was increased every 6-8 h, which was continuously infused for 7 d.

Control group received infusion of common enteral nutritional preparation Ruixian, specific methods were the same as those of observation group, and two groups received equal calories every day and continuous infusion for 7 d, too.

2.3. Observation indicators

Intestinal mucosa barrier function indicators of patients were detected, specifically including serum diamine oxidase (DAO), lipopolysaccharide (LPS), urine lactulose/ mannitol ratio (L/M) and D-lactate.

Gastrointestinal hormone indicators: gastrin (GAS), cholecystokinin (CCK), motilin (MTL), secretin family (GLU), vasoactive intestinal peptide (VIP), gastric inhibitory polypeptide (GIP), substance P (SP) and somatostatin (SS).

Immune function indicators: serum CD4, IgG, NK cell, complement C₃, C₄, total complement activity (CH₅₀) and secretory immunoglobulin A (S-IgA).

Nutrition-related indicators: serum albumin (ALB), prealbumin (PRE), transferrin (TRF) and retinol-binding protein (RBP).

2.4. Statistical methods

Data obtained in the research was analyzed by SPSS 23.0 software, measurement data was in terms of Mean \pm SD. Comparison between two groups was by t test and $P<0.05$ was set as the standard of statistical significance in differences.

Table 3

Comparison of serum immune function levels between two groups after treatment.

Groups	CD4 (%)	IgG (g/L)	NK cell (%)	C ₃	C ₄	CH ₅₀	S-IgA (g/L)
Observation	32.16 \pm 3.05	12.74 \pm 1.38	16.78 \pm 1.45	0.96 \pm 0.08	0.24 \pm 0.02	52.18 \pm 4.86	3.12 \pm 0.29
Control	27.57 \pm 2.45	10.03 \pm 0.98	10.74 \pm 0.98	0.73 \pm 0.07	0.16 \pm 0.01	45.36 \pm 4.09	1.87 \pm 0.14
t	6.495	5.284	8.232	5.283	5.837	8.343	6.482
P	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

Table 2

Comparison of serum gastrointestinal hormone levels between two groups after treatment.

Group	GAS (μ mol/L)	CCK (pg/mL)	MTL (pg/mL)	GLU (ng/L)	VIP (pg/mL)	GIP (pg/mL)	SP (pg/mL)	SS (pg/mL)
Observation	101.47 \pm 9.34	16.17 \pm 1.05	342.83 \pm 30.77	165.48 \pm 14.37	42.81 \pm 3.89	134.82 \pm 12.56	62.28 \pm 5.98	13.39 \pm 1.56
Control	78.55 \pm 6.09	12.89 \pm 1.45	253.69 \pm 23.59	217.39 \pm 20.56	53.26 \pm 4.98	159.76 \pm 14.85	51.54 \pm 4.88	18.26 \pm 1.27
t	8.384	6.483	9.384	8.375	7.323	6.953	7.294	6.093
P	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

3. Results

3.1. Intestinal mucosa barrier function

Intestinal mucosa barrier function injury is the leading cause of postoperative decline of gastrointestinal function in patients, and levels of many factors in body fluid can directly reflect intestinal mucosa barrier function. The following indicators were detected in the research, and it was found that after observation group received enteral immune nutrition intervention, serum DAO, PS and D-lactate levels as well as urine L/M ratio were lower than those of control group ($P<0.05$), shown in Table 1.

Table 1

Comparison of intestinal mucosa barrier function indicators between two groups after treatment.

Groups	DAO (kU/L)	LPS (EU/mL)	Urine L/M	D- lactate (μ g/mL)
Observation	2.93 \pm 0.25	1.37 \pm 0.12	0.09 \pm 0.01	5.43 \pm 0.47
Control	4.76 \pm 0.43	3.15 \pm 0.28	0.16 \pm 0.02	8.17 \pm 0.76
t	6.493	7.124	5.498	7.243
P	<0.05	<0.05	<0.05	<0.05

3.2. Gastrointestinal hormone levels

Surgical trauma will cause abnormal gastrointestinal hormone levels in patients and further lead to obstacle of recovery of gastrointestinal function, poor nutrition absorption and slow body recovery. There are a wide variety of gastrointestinal hormones, which will change differently after trauma and also reflect body's gastrointestinal function state. The levels of serum gastrointestinal hormones were detected in the research, and it was found that serum GAS, CCK, MTL and SP values of observation group after intervention were higher than those of control group, and GLU, VIP, GIP and SS values were lower than those of control group ($P<0.05$), shown in Table 2.

3.3. Immune function levels

Patients are generally manifested as immunosuppressive state after radical operation for gastric cancer, and in addition to poor gastrointestinal function, it is also closely related to the lack of immune support substances in enteral nutrients. The levels of humoral and cellular immunity-related indicators in patients after intervention were detected in the research, and results showed that CD4, IgG, NK cell, C₃, C₄, CH₅₀ and S-IgA levels of observation group after intervention were higher than those of control group ($P<0.05$), shown in Table 3.

3.4. Nutrition-related indicators

After radical operation for gastric cancer, patients' gastrointestinal function is damaged, the absorption of nutrients, especially protein decreases, and what's more, postoperative body's protein decomposition increases, which makes patients' overall protein level in negative balance. Postoperative early nutrition intervention is expected to balance protein metabolism, monitoring of serum nutrition-related protein levels in patients can objectively reflect body's improvement of nutritional status, and specific results were as follows: serum ALB, PRE, TRF and RBP levels of observation group after intervention were higher than those of control group ($P < 0.05$), shown in Table 4.

Table 4

Comparison of nutrition-related indicator values between two groups after treatment (g/L).

Groups	ALB (g/L)	PRE (g/L)	TRF (g/L)	RBP (mg/L)
Observation	34.18±3.09	0.28±0.02	2.07±0.18	38.29±3.17
Control	28.17±2.65	0.16±0.01	1.51±0.13	24.76±2.13
<i>t</i>	7.483	5.204	6.283	8.394
<i>P</i>	<0.05	<0.05	<0.05	<0.05

4. Discussion

Gastric cancer is a typical digestive tract tumor, both disease consumption and surgical trauma can lead to postoperative protein energy malnutrition in patients, and at the same time, they are accompanied with different degrees of immunosuppression. The positive effect of postoperative early enteral nutrition support has been recognized, but the effect is not ideal in gastrointestinal cancer patients[4]. Study believes that traditional enteral nutrition support can't relieve body's high state of decomposition after digestive tract tumor surgery and the resulting immune dysfunction, so the immune nutrition concept is put forward. Immune nutrition means that on the basis of standard enteral nutrition, substances conducive to the recovery of immune system function are added, and the commonly used include glutamine, arginine, etc.[5]. In the research, postoperative early enteral immune nutrition support was applied to observation group, and gastrointestinal function, immune function, nutritional status and other aspects were studied.

Serum diamine oxidase (DAO) is an intracellular enzyme in upper villi of the small intestinal mucosa that plays a role in the metabolism of a variety of amine, DAO is highly active, and it can reflect the integrity and damage of intestinal mechanical barrier. Lipopolysaccharide (LPS) is composed of lipid and polysaccharide composite, which is the cell wall composition of gram-negative bacteria and has toxic effects on the host. In cases of intestinal bacteria death, LPS is largely released and absorbed into the blood, which can cause fever and microcirculation disorder[6,7]. Urine lactulose/mannitol ratio (L/M) is an objective and accurate indicator to reflect the intestinal mucosal permeability, increased ratio indicates increased intestinal permeability and damaged intestinal barrier function. D-lactate is the metabolite of indigenous intestinal

bacteria, normally only a small part enters into the blood, and when the intestinal mucosa barrier is damaged and permeability increases, a lot of D-lactate enters into the blood, which is characterized by sharp increase of its level in the blood, and the increase of D-lactate level is directly proportional to the damage of intestinal mucosa barrier[8]. Results of above research showed that serum DAO, PS and D-lactate levels as well as urine L/M ratio of observation group after intervention were lower, indicating that postoperative early enteral immune nutrition intervention helped to promote the recovery of intestinal mucosa barrier function, and was the basis of intestinal nutrition absorption and recovery of immune function.

Except for gastrointestinal symptoms, gastric cancer is also manifested as significant abnormality of many serum gastrointestinal hormones, and the fluctuation of gastrin family, secretin family and other gastrointestinal hormone levels is more obvious. Gastrointestinal hormone levels can not only reflect surgical trauma, but can also reflect the recovery and overall nutritional status of gastrointestinal function[9]. Gastrin (GAS), cholecystokinin (CCK) and motilin (MTL) belong to gastrin family. GAS is also known as gastrin, the main effect is to promote the contraction of esophagus and stomach sphincter, stimulate the secretion of gastric acid and pancreatic juice, and it can promote gastric motility and gastrointestinal epithelial growth. CCK can stimulate the gallbladder contraction and excite the pancreatic enzyme secretion, and also has excitatory effect on gastrointestinal smooth muscle. MTL is secreted by Mo cells, and after secretion, it acts on motilin neurons in the enteric nervous system and has obvious promoting effect on the gastric motility and gastric electrical activity[10]. Secretin (GLU) can stimulate the pancreas to secrete pancreatic juice, and has inhibitory effect on gastric acid secretion and gastrointestinal activities. Vasoactive intestinal peptide (VIP) is neurotransmitter that promotes target cells to synthesize NO so as to make smooth muscle relaxation and can inhibit gastric juice secretion and digestive tract smooth muscle contraction. Gastric inhibitory polypeptide (GIP) is produced by small intestine mucosa K cells, and its physiological function is to inhibit gastric acid and pepsin secretion and restrain gastric motility and emptying. Substance P (SP) is widely distributed in the fine nerve fibers and can significantly enhance bowel movement and gallbladder contraction. Somatostatin (SS) is a kind of cyclic 14-peptide hormone that has wide inhibition on the gastrointestinal tract and can inhibit the secretion of a variety of gastrointestinal and pancreatic hormones and restrain gastric motility and bowel movement[11]. Results of above research showed that GAS, CCK, MTL and SP values of observation group after intervention were higher while GLU, VIP, GIP and SS values were lower, indicating that postoperative early enteral immune nutrition intervention could optimize gastrointestinal hormone secretion, promote gastric motility and bowel movement, and accelerate the recovery of gastrointestinal function.

Gastric cancer itself and surgical trauma will lead to postoperative immunosuppression in patients, and inhibition of gastrointestinal function after surgery will further aggravate patient's immune function decline, eventually forming a vicious circle. On the basis of

conventional standard enteral nutrition formula, early postoperative enteral immune nutrition support adds glutamine, arginine, nucleotide and other materials beneficial to the maintenance and recovery of immune system function, in the hope of accelerating the recovery of immune function and then leading to the overall recovery of gastrointestinal function[12,13]. CD4, IgG, NK cells, complement C₃ and C₄ are the marker indicators of cellular and humoral immune function, and their levels will directly reflect the overall immune status of patients. Total complement activity (CH₅₀) mainly reflect complement mainly reflects the comprehensive level of 9 complement components, and in cases of malnutrition in the body and insufficient protein synthesis, CH₅₀ level is greatly reduced. Secretory immunoglobulin A (S-IgA) plays a key role in intestinal mucosal immunity, is the main immunoglobulin of intestinal mucosa, and has resistance effect on various endogenous pathogenic microorganisms. The research results showed that serum albumin (ALB) of observation group after treatment played an important role in maintaining blood colloid osmotic pressure, and its reduction was closely related to complications, mortality rate and so on in patients. Molecular weight of prealbumin (PRE) is 54 000, it is displayed on the front of albumin in electrophoresis separation, and so it can more sensitively reflect protein malnutrition than albumin[14]. Transferrin (TRF) is mainly synthesized in the liver, and mainly acts on hemoglobin survival and iron metabolism. TRF content increases in person with iron deficiency and long-term blood loss, and its concentration decreases in patients with chronic infections, enteritis and so on. Retinol-binding protein (RBP) is the vitamin transporter in the blood that is widely distributed in body fluids such as blood, cerebrospinal fluid and urine early, and its level can significantly change in early injury of liver and kidney function. In cases of vitamin A deficiency, hypoalbuminemia and malabsorption syndrome, RBP level drops[15]. Results of above research showed that serum ALB, PRE, TRF and RBP levels of observation group after treatment were higher, indicating that postoperative early enteral immune nutrition support could effectively promote gastrointestinal protein absorption and improve overall nutritional status.

To sum up, it is concluded as follows: early enteral immune nutrition support after radical operation for gastric cancer is conducive to the recovery of gastrointestinal function and the promotion of immune state, eventually promotes patients' postoperative overall recovery and is worth popularization in clinical practice in the future.

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