Original Article

Early enteral nutrition's impact on the postoperative nutritional state and the blood immunological index values in patients undergoing radical gastric cancer surgery

Jing Wang[1]

Abstract

Background: Early Enteral Nutrition (EEN) is the most commonly used postoperative feeding method. It is more in accordance with the physiological state in order to provide complete nutrition with less complications, making it a safe and effective technique of efficiently improving visceral function. EEN is more convenient for blood glucose regulation because, on the one hand, it maintains intestinal mucosal integrity and enhances intestinal permeability, allowing glucose-dependent insulinotropic hormones to be secreted. The influence of early enteral EEN on nutrient intake and blood glucose levels in patients with stomach cancer accompanied by diabetes mellitus.

Objective: The objective of this research was to investigate the impact of early enteral nutrition on the postoperative nutritional status and blood immunological index values in patients with radical gastric cancer surgery.

Methods: In this experiment, a total of 130 patients were included in this study who underwent radical resection of gastric cancer during October 2019 to October 2020. Using the random number table method, they were divided into control group and test group. This was done to investigate the effect of early enteral nutrition on postoperative nourishing state and blood immune index levels in patients undergoing radical gastric cancer surgery, the test group received enteral nutrition emulsion TPF after surgery, while the control group received total parenteral nutrition support 24 hours following surgery.

Results: The time for patients in the test group to return to normal anus and defecation, total naso-intestinal tube drainage, and naso-intestinal tube placement were significantly reduced when compared to the control group; on the first day after surgery, Hb, Alb, PA, and surgery in the 2 groups were considerably distinct. It reduced dramatically as compared to the test group, and there was no notable change between the observation and control groups. On the 8th day of surgery, the Hb, Alb, and PA indicators in the treated groups were significantly increased as compared to the control group; on the 1st day after surgery, IgA, IgM, IgG, CD3+, CD4+, CD4+/CD8+ were considerably lower in the tested groups as compared to before surgery; on the 8th day after the surgery all the participants in the test group exceeded the levels of the control group.

Conclusion: EEN can successfully increase intestinal function restoration in patients with radical gastric cancer surgery, by improving clinical efficacy and immunological function, through the improvement of the patients' nutritional condition after surgery, and by preventing the incidence of problems. [*Ethiop. J. Health Dev.* 2022; 36(3) 00-00]

Keywords: early enteral nutrition; radical gastric cancer; nutritional status; immune indicators

Introduction

Gastric cancer is the world's third largest cause of cancer mortality, with a significant morbidity and mortality rate (1-2). As a result of the strong developmental ability of malignant tumors and the strain of preoperative diets and anesthesia, patients with stomach cancer create cachexia by increasing catabolism, resulting in a position of negative nitrogen stability in the body (3). Malnutrition not only has a detrimental influence on the healing process, but it also increases the frequency of complications in patients and leads to a higher death rate. Furthermore, a decline in immunity will result in tumor metastasis and recurrence, emphasizing the need for nutritional maintenance following gastric cancer treatments (4-6). Now, the most common postoperative feeding approaches are Total Parenteral Nutrition (TPN) and Early Enteral Nutrition (EEN). Following surgery, the former can deliver glucose, amino acids, and additional nutrients to patients. However, the intestinal micro-ecology is susceptible to diseases or bacterial translocation due to intestinal mucosal atrophy and intestinal wall barrier destruction, which not only increases the rate of enterogenous infection, but also causes systemic inflammatory reactions (7-8). The latter, on the other hand, can enhance the development and restoration of intestinal mucosal cells, retain the stability and development of intestinal mucosal flora, and stimulate the secretion and release of various related hormones, all of which contribute to the recovery of gastrointestinal peristalsis (9). Since the 1990s, several researchers have attempted to improve intestinal mucosa repair by including special nutrients such as arginine, glutamine, omega-fatty acids, nucleosides, and nucleotides into enteral nutrition formulations. With this kind of nutritional support, the patients'

[1] Nutrition Department,Suizhou Affiliated Hospital of Hubei University of Medicine, Suizhou Central Hospital of Hubei Province, Suizhou, Hubei, 441300, China. Corresponding author Email: 1203964198@qq.com

immunity has been improved, but there is no obvious advantage in the nutritional status of the patient (10). The focus of this experiment was to study the influence of EEN on postoperative dietary patterns and immunological function in patients following radical gastrectomy for gastric cancer, as well as to establish a theoretical foundation for practical application.

Materials and methods

General information: A total of 130 patients with gastric cancer who had radical gastrectomy between October 2019 and October 2020. Using the randomly generated table methodology, they were divided into two groups: the control group (n = 65) and the test group (n = 65). The diagnostic criteria of all patients were consistent with the appropriate criteria for the diagnosis of gastric cancer (11).

Inclusion and exclusion criteria

Inclusion criteria

Patients who adhered to the following criteria were included in this study: ① Gastroscopy and pathology were used to diagnose gastric cancer, and patients who had undergone a radical gastrectomy (complete gastrectomy, distal gastrectomy, and proximal gastrectomy) ② Normal Preoperative intestinal function; ③ No recent history of albumin and/or immunobooster administration, radiotherapy or chemotherapies; (4) Awareness of the diagnosis and treatment plan, and able to voluntarily sign for confirmation.

Exclusion criteria

Patients with the following conditions were excluded from this study: ① Patients with gastrointestinal illnesses, aberrant liver function, intestinal absorption and metabolism issues, immunological malfunction, or digestive abnormalities ; ② Patients suffering from serious nutrition concerns (BMI <18kg/m2); ③ Pregnant or breastfeeding women ; (4) Individuals with significant comorbidities, such as chronic heart failure and severe renal insufficiency; (5) Individuals who have suffered a cerebral infarct in the previous 6 months; (6) Patients who are found to have distant metastasis during surgery and cannot undergo radical surgery.

Methods

Preoperative preparation: Patients in both groups underwent the same preparation before surgery. All patients drank water and ate on an empty stomach before surgery, and took oral laxatives 24 hours before surgery until they had diarrhea 8 hours before surgery for preoperative intestinal preparation. To avoid postoperative gastrointestinal contamination, second-generation cephalosporins were given 30 minutes before surgery, and a jejunal nutrition tube was put into the lateral hole at the gastric tube. The two tubes' surfaces were covered with paraffin oil. Following catheter insertion, the patient breathes deeply and consumes properly until two catheters are put through the patient's nostril into the stomach cavity (to a depth of 50–60 cm) and gastric fluid is retrieved from the syringe. The stomach was repaired using a lanyard, and the jejunum was repaired using adhesive tape.

Postoperative treatment: Standard radical gastrectomy was performed by the same group of doctors under general anesthesia in both groups. Enteral nutrition emulsion TPF-Resin, 500ml, nutrients include protein 28g, fat 29g, carbohydrate 94g, dietary fibre 10g, several minerals and vitamins, whole energy sources 750kcal; 100mL of 0.9% NaCl was given 16 hours after surgery, and a mixed suspension containing 250mL of TPF and 500mL of 0.9% NaCl was administrated 24 hours after surgery. 3 to 4 days following surgery, a varied mixture of 500L TPF and 250L 0.9cent NaCl was administered. On the 5th day post-surgery, a major dietary solution of 1000mL TPF was administered, and on the sixth and seventh days, 1500mL TPF of complete nutrient solution was administered. If the energy supply is inadequate, intravenous infusions will be delivered intermittently from "less" to "more" by measuring an enteral nutrition tube based on the patient's post-dosing reaction (4h input, 30min interval). Before infusion, the enteral nutrient tube should be flushed with normal saline to avoid obstruction. The temperature of the nutrient solution should be controlled at about 38℃-39℃ to avoid cold stimulation causing intestinal spasm, resulting in abdominal pain and diarrhea.

Control group: Total parenteral nutrition support was given 24 hours after surgery, with the parenteral preparation of Carvin (fat milk amino acid and glucose injection), and a peripheral intravenous injection was preferred. When the patient could not tolerate it, the patient received a peripherally inserted central catheter (PICC) for 18 to 20 hours a day, supplemented with electrolytes, vitamins, and microelements as appropriate, depending on the patient's situation. Treatment continued for 7 days with a gradual reduction of TPN intake when an oral diet was available.

Observation Indicators

All patients' body weight, arm circumference (AMC), and skin fold thickness (TSF) of the triceps brachii were measured before and after surgery. During treatment, patients were observed daily for symptoms such as nausea, vomiting, abdominal pain, abdominal distension, diarrhea, and other complications such as intestinal obstruction and intestinal recurrence. Anal exhaust defecation time, total naso-intentional drainage volume and naso-intentional tube placement time were recorded.

Laboratory indicators

On the morning of surgery and the eighth day after surgery, all patients had 3mL of bloodstream drawn from the median elbow vein. Hemoglobin (Hb) was determined by the Kurt method using an automatic blood cell analyzer (XN-9000, Sysmex). A special protein analyzer (BN, Siemens) was used to detect albumin (ALB) and prealbumin (PA) through BCG, biuret, and immunoturbidimetry. Immunoglobulin G (IgG), immunoglobulin M (IgM), and immunoglobulin A (IgA) levels were analyzed using the enzyme-linked immunosorbent assay (ELISA). Flow cytometry was used to detect CD3+, CD4+, and CD4+/CD8+ cells.

Statistical analysis

For statistical analysis, SPSS 17.0 software was used, count data was represented as [n (%)], the χ2 test was used to compare the groups, and bar charts were created using GraphPad Prism 5 software. P<0.05 denotes a substantial difference, whereas P<0.01 denotes an extremely significant difference.

Results

Assessment of basic information among the two groups: A total of 130 gastric cancer patients were included in this study. The sex, average age, tumor site, pathological phase, surgical technique, operating time, and postoperative blood loss indices were reported in Table 1, and the findings revealed that there was no statistical significance in the comparison of the indexes among the 2 groups (P > 0.05).

Table 1. **Assessment of Basic data of patients**

Project	**Test group（n=65）**	**Control group （n=65）**	**Statistic**	***P***
Gender（case）			3.29	0.0697
Male	44	53		
Female	21	12		
Average age（year）	65.4±11.6	66.7±10.4	0.6727	0.5023
Tumor location				
Heart area	7	6	0.545	0.9089
bottom of the stomach	15	14		
gastric body	21	19		
Gastric antrum	22	26		
pathological staging			0.373	0.9458
Stage I	17	16		
Stage II	23	22		
Stage III	20	23		
Stage IV	5	4		
Operation method			0.33	0.5657
Distal gastrectomy	21	18		
Total gastrectomy	44	47		
Operation time (minutes)	221.19 ±6.24	223.29 ± 6.39	1.8956	0.0603
Intraoperative blood loss（ml）	220.06 ± 8.35	222.19 ± 6.76	1.5009	0.1358

Comparison of clinical symptoms

Patients in both groups were observed within the same prescribed time, and the relevant data was statistically analyzed. There were no deaths, acute intestinal obstruction, intestinal recurrence, or other adverse events in any of the patients. Two patients in the test group and one patient in the control group had abdominal distension and pain. Figure 1 indicted that, in comparison with the control group, the time to return to normal anal exhaust defecation, total naso-intestinal drainage volume, and naso-intestinal placement time were considerably reduced in the test group, with statistically significant (P0.05).

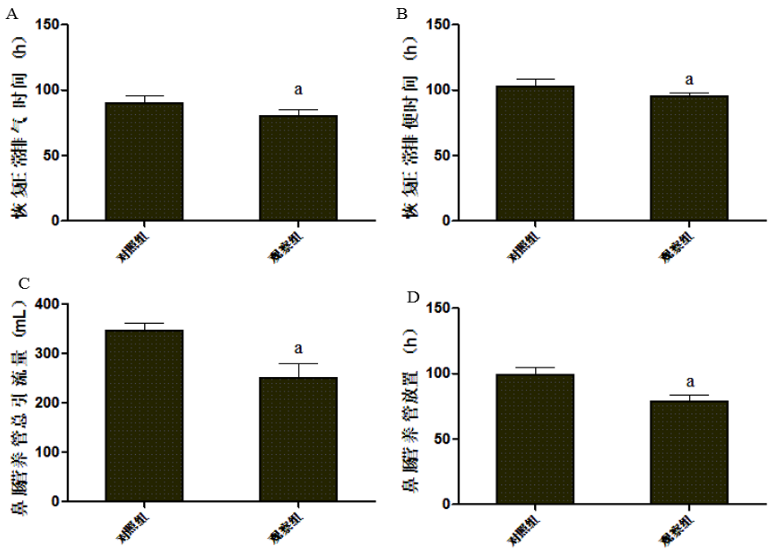

Figure 1. Assessment of surgical restoration for gastrointestinal systems among both groups

Comparison to the control group* P <0.05

3.3 Comparison of nutritional indices among the two groups

There were no noticeable variations between the two groups in preoperative nutritional indicators (body weight, AMC, TSF, HB, ALB, PA) (P>0.05). In this study, there were no noticeable variations among the two groups in preoperative nutritional indicators (body weight, AMC, TSF, HB, ALB, PA) (P>0.05). On the first postoperative day, Hb, ALb, and PA levels in the tested groups were considerably lower prior to surgery (P0.05), however there were no significant differences between the observation and control groups (P>0.05). Hb, ALb, and PA levels were considerably lower in both groups on the first postoperative day (P0.05), but there were no notable changes among the tested groups (P>0.05).

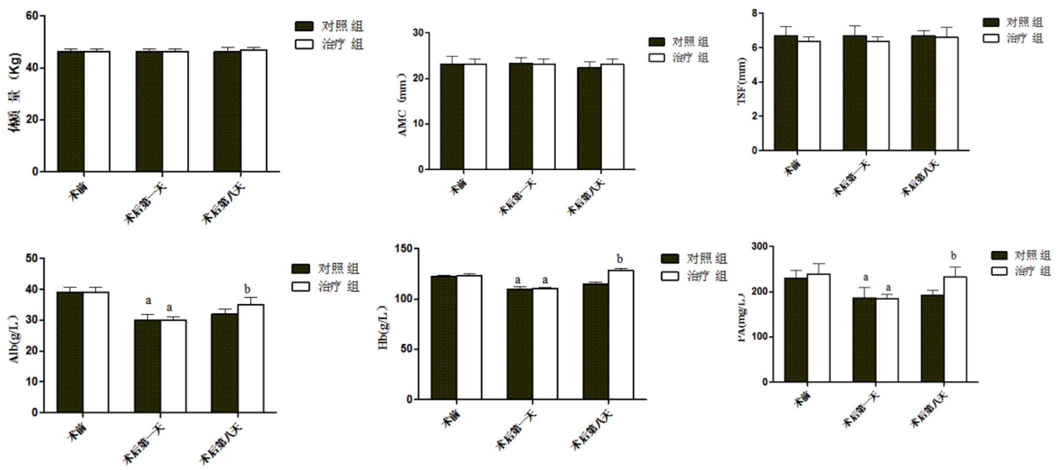

Figure 2. Assessment of nutritional indexes among the two groups

Compared with preoperative, AP <0.05; BP <0.05 was associated with the control group on the eighth day after surgery

Comparison of immune indexes among the two groups: There were no major changes between the two groups in preoperative nutritional indices (IgA, IgM, IgG, CD3+, CD4+, CD4+/CD8+) (P>0.05). On the 1st day after surgery, IgA, IgM, IgG, CD3+, CD4+, and CD4+/CD8+ levels were considerably lower in both groups (P0.05); Furthermore, on the 8th day post-surgery, the test groups' IgA, IgM, IgG, CD3+, CD4+, and CD4+/CD8+ levels were all higher than in the control group's (P0.05).

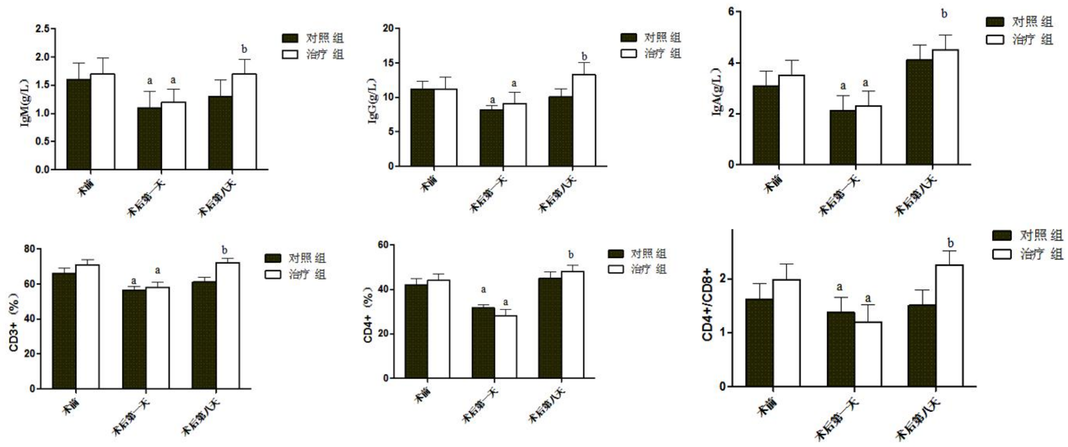

Figure 3. Comparison of immune indexes between the two groups

Compared with preoperative, AP <0.05; BP <0.05 was associated with the control group on the 8th day after surgery

Discussion

Gastric cancer is a kind of epithelial malignancy that affects the stomach and ranks second to fifth in the occurrence of cancerous tumors (12). Its diagnostic manifestations are non-specific, with preliminary indications such as upper abdominal discomfort or dull pain, loss of appetite, and malignant vomiting, and late indicators such as weight loss, fever, jaundice, and other cachexia that patients usually ignore. Presentations are non-specific, with early signs such as upper abdominal pain or dull ache, lack of appetite, and malignant vomit, and delayed signs such as weight loss, fever, hepatitis, and other cachexia that patients usually ignore. As a result, aggressive interventions must be implemented earlier in therapeutic trials.

Until recently, surgery has been the major treatment for stomach cancer. However, due to gastrointestinal hormone secretion disorders, incomplete gastro-intestinal neurotomy and comprehensive organ and tissue removal, such as digestive tract reconstruction, may result in post-operative gastric mortality and motor deficits, resulting in patients presenting with postoperative abdominal distension, abdominal pain, and dyspepsia (13). Concurrently, surgical stress, pathophysiological changes, and postoperative pressure will increase human catabolism, leading to nutritional issues and immunodeficiency (14). Nutrient deficiencies and immunodeficiency can result in inflammation, which exacerbates surgical complications, increases the recurrence rate of postoperative tumors, and has a negative influence on post-operative wellbeing.

Immunodeficiency can cause inflammation, which somewhat increases postoperative problems, and raises the recurrence rate of postoperative tumors and has a negative impact on the postoperative quality of life. Immunodeficiency and a postoperative inflammatory reaction, according to Khorgami et al. [15], may contribute to enhanced post-operative infection and tumor cell metastasis. Esteban et al. (16) observed that inflammatory and immunological status are closely related to the formation of surgical consequences in gastric cancer patients. As a result, the essential to postoperative therapy is to choose adequate dietary assistance ways to strengthen the body's immunological system and repair malnutrition in a timely manner. There are two main benefits to starting enteral feeding at a young age. To begin, it promotes intestinal peristalsis restoration by raising the height of intestinal villi, maintaining a mechanical barrier to intestinal mucosa, safeguarding the development of beneficial gut bacteria, and boosting stomach acid production. Second, encouraging early healing of wounds is advantageous to liver protein production and metabolism (17). Normal enteral diet and immunological enteral diet are currently the most prevalent techniques. Some researchers feel that conventional enteral nutrition supplementation can help patients with nutrition-related problems. Espen (European Society for Parenteral and Parenteral Nutrition) suggests immunoenteral diets (glutamine, arginine, omega-3 fatty acids, and nucleotides) for patients with upper gastrointestinal tumors to encourage lymph cell propagation and variation, thereby enhancing immunity, shortening hospitalization, and attempting to regulate postoperative contamination.

Moreover, whether an immunoenteral diet is preferable over a standard enteral diet in terms of immunological markers is still debated (18). With the further study of gastric cancer following radical gastrectomy intestinal function, research has found support for the support of enteral nutrition nutrients through intestinal absorption and from mesenteric vein flow back to the hepatic portal vein, it is much more physical and helps with liver protein synthesis, while keeping the physiological function of the gut, by reducing the occurrence of enterogenic infections (19). Traditionally, enteral nutritional support was provided only after the recovery of gastrointestinal function (i.e. anal gas/defecation). According to recent gastrointestinal dynamics research, postoperative gastrointestinal paralysis is restricted to the stomach and colon, and small intestine peristalsis and intake can recover to normal within a few hours following surgery. EEN has been proven to aid gastrointestinal functional restoration and maintain intestinal mucosal barrier function (20).

In addition, EEN can also promote the body's protein metabolism, correct malnutrition, and improve the body's immunity. This study collected data from patients undergoing radical therapy for stomach cancer, who were assigned spontaneously to one of two groups. TPF enteral nutrition emulsion were provided by the team. After surgery, the controls were the usage of complete parenteral nourishment aid, the examination of earlier enteral nourishment in patients with stomach cancer, radical postoperative nutritional state, and the influence of blood in patients with immunological index level. In terms of sex, mean age, tumor site, pathologic phase, surgical methodology, operating hours, and intra-operative blood loss indices, there were no significant variations among the two groups, indicating that the objects were equivalent.

Visceral proteins, include albumin, prealbumin and total protein, which are the most important nutritional indicators. Malnutrition exists in patients due to the consumption of tumors and the release of toxins in tumors (21). Furthermore, the half-life of pre-albumin is brief and has high specificity, which might represent a patient's nutritional condition and prognosis (21). The findings of this study revealed that there were no variations in body weight, AMC, or TSF among the two groups of patients before and after surgery. Hb, Alb, and PA levels were significantly reduced in both groups on the first postoperative day (P0.05). However, no statistically notable differences were found between the observation and control groups. On the 8th postoperative day, Hb, Alb, and PA levels in the treated group were significantly greater than in the comparison group. The research hypothesized that the combination of enteral nutrition can better stimulate the metabolism of gastrin, gastric acid, hormones, and enzymes, which contribute to the restoration of gastrointestinal peristalsis and functioning and reduce patients' fasting time.

Surg stress stimulates the nervous system and the hypothalamic-pituitary-adrenal HPA axis, boosting the production of chemicals including catecholamines (norepinephrine and epinephrine), adrenocorticotropic hormone, and cortisol, thereby reducing immunological responses (22). CD3+ T cells are the core of cellular immune resistance. CD4+ cells are a type of helper T cell, and their role in coordinating immune responses has grown dramatically during the last decade. B cells primarily secrete IgA, IgG, and IgM to play humoral immunity (23). T and B cells round out the body's immunological monitoring, indicating immune activity and disease development. On the first day following surgery, both groups had significantly decreased levels of immune cells. Furthermore, these levels in the research group were all greater on day 8 postoperatively than in the control group. This indicated that EEN may reduce the frequency of issues by enhancing the development of cells and humoral resistance, especially in early recovery humoral immunity, perhaps by decreasing pro-inflammatory cytokines (IL-2, IL-4, and IL-10) and upregulating anti-inflammatory cytokines. Immune modulators are used to decrease inflammation and modify immunity.

In conclusion, EEN may dramatically improve the restoration of intestinal performance in patients with radical gastrectomy, by improving clinical efficacy and immunity, by improving the patients' postoperative nutritional condition, and minimizing the frequency of problems, resulting in a clinical recommendation for the use of EEN.

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