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Use of Protein Mixture for Therapeutic Nutrition in Patients with Gastric Cancer during Surgical Treatment

Conflict of interest: nothing to declare.
The article is published in the author's edition.

Submitted: 21.06.2024
Accepted: 27.08.2024
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Abstract

Introduction. Gastric cancer remains one of the most common forms of malignant tumors in humans. In patients with gastric cancer during surgical treatment an important role belongs to the elimination of protein-energy deficiency.

Purpose. Comparison of laboratory test results in patients with gastric cancer who received a protein mixture during surgery.

Materials and methods. Clinical outcomes were investigated in 95 patients Including 52 main group patients who received therapeutic nutrition and 43 comparison group who received only standard medical nutrition.

Results. Upon admission of patients, the level of total protein, albumin and transferrin in both study groups was the same. From the 1-st day after surgery until discharge, total protein levels in the main group were higher than in the comparison group. When examining patients after one month treatment a difference was noted in the levels of total protein, albumin and transferrin. Total protein in the main group was 3.5 g/l, albumin was 3.8 g/l, transferrin was 0.4 g/l higher than in the comparison group.

Conclusion. The use of protein composite mixture in medical nutrition for patients with gastric cancer during surgical treatment, amount of protein, transferrin and albumin were increased.

Keywords: gastric cancer, protein-energy malnutrition, therapeutic nutrition, protein mixture



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Применение белковой смеси для лечебного питания у пациентов с раком желудка

Конфликт интересов: не заявлен.

Статья опубликована в авторской редакции.

Подана: 21.06.2024

Принята: 27.08.2024

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Резюме

Введение. Рак желудка остается одной из самой распространенных форм злокачественных опухолей человека. При хирургическом лечении у пациентов с раком желудка важная роль принадлежит устранению белково-энергетической недостаточности.

Цель. Сравнение результатов лабораторных исследований у пациентов с раком желудка, получавших белковую смесь во время хирургического лечения.

Материалы и методы. Клинические результаты изучены у 95 пациентов, в том числе 52 лиц основной группы, получавших лечебное питание, и 43 пациентов, получавших только стандартное питание.

Результаты. При поступлении пациентов уровень общего белка, альбумина и трансферрина в обеих группах был одинаковым. С 1-го дня после операции и до выписки уровень общего белка в основной группе был выше, чем в группе сравнения. При обследовании пациентов через месяц лечения отмечалась разница в уровнях общего белка, альбумина и трансферрина. Общий белок в основной группе составил 3,5 г/л, альбумин – 3,8 г/л, трансферрин – на 0,4 г/л выше, чем в группе сравнения.

Заключение. При использовании белково-композитной смеси в лечебном питании у пациентов с раком желудка во время хирургического лечения количество белка, трансферрина и альбумина заметно увеличилось.

Ключевые слова: рак желудка, белково-энергетическая недостаточность, лечебное питание, белковая смесь

■ INTRODUCTION

Gastric cancer is one of the most common forms of human malignant tumors [1]. Despite some successes in combined treatment methods, the surgical methods remains the gold standard for radical treatment of malignant gastric tumor [2, 3].

Patients undergoing major surgery are at high risk of malnutrition because of fasting, stress and subsequent metabolic disorders [4]. Modern methods of surgical treatment and conservative methods (chemotherapy, radiation, therapy) are becoming more and more aggressive from year to year. Radical programs require increasing doses of radiation and chemotherapy [5].

Tumor localization plays an important role in the occurrence of exhaustion And cachexia in patients with cancer in particular gastric cancer: exhaustion was established

in 68 and 75% of patients with tumor localization in the cardiac and antral regions, respectively and 18% of patients with damage to the body of the stomach. Cancer of the cardia or the antrum part of the stomach of stage 1–2 causes a greater degree of depletion than a tumor of the body of the stomach of stage 3–4 [6].

In cancer patients, there is always a discrepancy between the energy received and required, this is especially evident in hypermetabolism-hypercatabolism [7]. Hypermetabolism is regarded as a sharp increase in energy needs and is one of the leading reasons development of cachexia in cancer patients [8]. Features of nutritional support for the treatment of cancer patients are determined by specific pathophysiological mechanisms, primarily the anorexia-cachex syndrome, which often complicates the course of malignant neoplasm.

As a result of the impact of a tumor on the body, inflammatory mediators are released: tumor necrosis factor (TNF α), interleukin (IL) 1, IL-6, IL-8, IL-15, interferon-gamma (IFN- γ) leading to the development of a systemic inflammatory response [7, 9, 12].

Gastric resection significantly changes the secretory, motor-evacuation and other functions of the gastrointestinal tract.

The loss of the reservoir function and complex pyloric mechanism by the stomach the direct rapid discharge of food into the small intestine in the absence of hydrochloric acid and normal duodenal reflux lead to a decrease in the functions of the pancreas and liver, disrupt the processes of digestion and absorption and change metabolic processes and hematopoiesis redistribute the intestinal microflora, disrupt the coordinated activity. Organs and the body's compensatory mechanisms fail in new conditions after gastrectomy or gastric resection [5, 13].

One of the main components of postoperative rehabilitation of patients who have undergone operations on the digestive organs is therapeutic nutrition, which largely satisfies the plastic and energy needs of the body, helping to reduce the incidence of complications and faster recovery. The most important task of diet therapy, both in the patient and outpatient stages of rehabilitation is considered to be the overcoming of protein, vitamin, mineral and energy deficiency [13]. Nutritional support for patients is a complex measures aimed at ensuring relatively stable trophological homeostasis.

These methods include the enrichment of ready – made meals or products with powdered nutritional mixtures [10]. When prescribing nutritional support, it is necessary to determine the degree and severity of nutritional status disorders in cancer patients as an integral indicator reflecting the adequacy of providing the body with energy, macro-micronutrients, and also allowing to assess the risk of developing concomitant nutrition dependent diseases.

For an adequate assessment of multifactorial nutritional disorders, their early diagnosis and monitoring of treatment a multi-level methodological approach is used, based on the results of screening assessment of malnutrition; assessing the patient's actual nutrition determining body composition using both traditional anthropometric and modern research methods (bioimpedancemetry).

Assessment of the patient's metabolic status using the method of indirect calorimetry; determination of resting energy levels, energy expenditure during physical and nutritional exercise, calculating the rate of oxidation of macronutrients with determination of the energy and plastic needs of the body [11].



Studies of biochemical markers of nutritional and metabolic status. The administration of nutritional support brings tangible benefits, improving the patient's adaptive capabilities [14].

■ PURPOSE OF THE STUDY

Comparison of laboratory test results in patients with gastric cancer who received a protein mixture during surgery.

■ MATERIALS AND METHODS

The work is based on data on 95 patients with malignant neoplasms of the stomach undergoing planned treatment at the Azerbaijan National Center of Oncology in the period of 2020–2023.

The criteria for inclusion of patients in the study were:

- Malignant neoplasms of the stomach, surgical interventions involving gastrectomy.
- Subtotal proximal or distal gastrectomy.
- Patients were allocated in a blind randomized manner using the method into 2 group:
- The main group included 52 patients who, along with standard therapeutic nutrition were additionally prescribed enrichment of the diet, for which a dietary food product was used - a protein mixture.
- The comparison group consisted of 43 patients who received only standard medical nutrition.

There were 33 (63.4%) men and 19 (36.5%) women in the main group.

There were 25 (58.1%) men and 18 (41.8%) women in the comparison group.

Most patients were aged from 49 to 70 years.

Of the 52 patients in the main group 25 (48.0%) had ulcerated saucer-shaped cancer. In the comparison group of 43 patients it was observed in 20 (46.51%). Ulcerated infiltrative cancer in the main group was in 20 (38.6%) of the 52 patients, in the comparison group was in 18 (41.8%) of 43 patients.

In the main group stage 2 was diagnosed in 12 (23.07%) patients, stage 3 was diagnosed in 33 (63.46%), stage 4 was diagnosed in 7 (13.47%) patients In the comparison group, stage 2 was diagnosed in 10 (23.2%), stage 3 was diagnosed in 29 (67.44%), stage 4 in 4 (9.30%) patients. The main group and the comparison group were statistically identical in terms of the stage of prevalence of gastric cancer.

Predominant damage to the lower third of the stomach was noted; in the main group in 25 (48.0%) patients, in the comparison group in 22 (51.1%) patients (Table 1).

Table 1
Analysis of the localization of the gastric cancer process

Localization of gastric cancer	Group of patients			
	Main group		Comparison group	
	abs	%	abs	%
Upper third	16	30.7%	13	30.2%
Middle third	11	21.1%	8	18.6%
Lower third	25	48.0%	22	51.1%
Total patients	52	100.0%	43	100%

Most often intestinal and diffuse types of histological tumor variants prevailed in the gastric cancer patients; intestinal type in the main group was in 25 (48.0%) patients, in the comparison group was in 20 (46.5%) patients. The diffuse type of histological variant of the tumor in the main group was in 22 (43.3%) patients, in the comparison group was in 21 (48.8%) patients.

In the main group was performed: 1. Subtotal proximal gastrectomy in 11 (21.1%) patients; 2. Subtotal distal gastrectomy in 16 (30.76%) patients; 3. Total gastrectomy in 25 (48.07%) patients.

In the comparison group was performed:

1. Subtotal proximal gastrectomy in 9 (20.9%) patients;
2. Subtotal distal gastrectomy in 12 (27.9%) patients;
3. Total gastrectomy in 22 (51.16%) patients.

Radical surgical interventions were performed with lymph node dissection at a level not lower than D2. Upon admission of patients to the hospital therapeutic dietary nutrition was prescribed-gentle version of the diet. In the main group of patients, in order to increase the nutritional and biological value of an individual dish and diet, the diet was enriched by including protein component of dishes with the chemical composition per 100 ml of product; fat – 5.9 units; proteins – 6.0 units; carbohydrates (49% kcal) – 18.2 units. In the main group of patients, the energy value was higher than in the comparison group 226.2 kcal/day ($p<0.001$).

Protein consumption in the main group was higher than in the comparison group by 15.4 g/day ($p<0.001$). Fat consumption in the main group was higher than comparison group by 10.6 g/day ($p<0.001$).

Carbohydrate consumption between patients in the main group and comparison group, in the postoperative period was statistically the same, the data are presented in table 3.

Table 2
Assessment of the actual nutrition of patients before surgery

Index	Group of patients	
	Main (n=52)	Comparison (n=43)
Energy value, kcal/day	2480.1±10.2	2253.8±10.4
Protein intake, g/day	100.8±0.7	82.5±0.6
Fat consumption, g/day	87.4±0.6	75.8±0.4
Carbohydrate consumption, g/day	329.5±3.9	300.7±3.7

Table 3
Assessment of the actual nutrition of patients postoperative period

Index	Group of patients	
	Main (n=52)	Comparison (n=43)
Energy value, kcal/day	2450.3±9.4	2285.2±10.1
Protein intake, g/day	99.7±0.8	88.6±0.7
Fat consumption, g/day	87.1±0.6	78.6±0.4
Carbohydrate consumption g/day	325.1±4.1	320.3±4.5

Biochemical parameters of laboratory tests were assessed in the studied patients and also body composition indicators. The biochemical methods were carried out before surgery, on the 1st, 3rd, 5th day after surgery.

Biochemical studies necessary to assess the protein state (total protein, albumin, transferrin) were performed on a Sapphire-400 analyzer (Japan) using DiaSys reagent (Germany).

Studies of body composition indicators (content of fat mass, muscle mass, bone mass) of patients were carried out using the bioimpedansometry method. The study was carried out on an empty stomach or no earlier than 2 hours after a meal.

The results obtained were subjected to statistical processing. Statistical processing of the study results was carried out using the SPSS Statistic 17.0 program.

■ RESULTS

Upon admission of patients, the level of total protein, albumin, and transferrin in both study groups was the same (table 4). From the 1st day after surgery until discharge, total protein levels in the main Group were higher than in the comparison group. On the 1st day – by 3,3g/l ($p<0.001$), on the 3rd day by 4.2 g/l ($p<0.001$), on the 5th day by 5.2g/l ($p<0.001$), with discharge – by 6.3 g/l (0.001).

The albumin level in the main group was higher than in the comparison group, On the 1st day after surgery by 2.7g/l ($p<0.001$), on the 3rd day – by 3.7 g/l ($p<0.001$), on the 5th day by 4.6 g/l ($p<0.001$), at the discharge by 5.9 g/l ($p<0.001$). The level of transferrin in the main group become higher than in the comparison group, on the 3rd day after surgery by 0.4g/l ($p<0.001$) and remained higher until discharge. On the 5th day by 0.3 g/l ($p<0.005$), at discharge by 0.4g/l.

Body mass and fat mass indices in patients of the main group and the comparison group during the entire observation period were statistically the same (table) There was no difference in muscle and bone mass, total fluid between patients in the main group and the comparison group upon admission. At discharge in the main group of patients, indicators of muscle mass, bone mass were higher than in the comparison group, respectively significantly at 2.6 kg, 0.4 kg.

When examining patients 1 month after treatment, a difference was noted in the levels of total protein, albumin and transferrin. Total protein in the main group was 3.5 g/l higher than in the comparison group, albumin by 3.8 g/l, transferring – by 0.4 g/l (table 4).

1 month after treatment, the difference in total fluid and muscle mass remained unchanged. Muscle mass in the main group was 3 kg higher than in the comparison group (table 5).

Table 4
Dynamics of changes in protein metabolism in patients with gastric cancer

index	Group of patients							
	On admission		On the 1st day surgery		On the 5th day after surgery		Upon discharge	
	Main	Comparison	Main	Comparison	Main	Comparison	Main	Comparison
Total protein, g/l	78.7±0.7	77.8±0.6	66.8±0.8	61.7±0.7	67.8±0.8	61.6±0.7	74.7±0.7	66.7±0.5
Albumin g/l	44.3±0.4	43.3±0.3	35.5±0.5	30.3±0.6	38.7±0.5	30.9±0.7	41.5±0.3	35.2±0.2
Transferrin g/l	2.6±0.2	2.5±0.2	2.1±0.1	1.7±0.1	2.1±0.2	1.7±0.1	2.4±0.1	1.8±0.2

Table 5
Anthropometric and body composition indicators in patients with gastric cancer

Index	Group of patients			
	On admission		Upon discharge	
	Main group (n=52)	Comparison group (n=43)	Main group (n=52)	Comparison group (n=43)
Fat mass, kg	25.9±0.6	25.3±0.6	25.2±0.5	24.7±0.5
Muscle mass, kg	21.4±0.7	20.4±0.7	18.1±0.7	17.5±0.6
Bone mass, kg	25.7±0.5	24.5±0.2	24.3±0.7	22.3±0.1

■ CONCLUSION

The use of a protein composite mixture in medical nutrition for patients with gastric cancer during surgical treatment in the amount of subtotal proximal or distal resection stomach and gastrectomy increases the visceral protein, transferrin and albumin.

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