Application of Nutritional Support in the Comprehensive Treatment of Gastric Cancer: A Case Report

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Abstract: Objective To relieve long-term malnutrition caused by a malignant tumor affecting the pylorus and to prolong the patient survival. Methods A patient presented with complete pyloric obstruction due to pyloric tumors, and achieved good therapeutic effects through nutritional support and effective chemotherapy. Results After about 40 days of treatment, all physiological indicators were improving. After chemotherapy, the pyloric tumor shrank and the complete obstruction was relieved. The patient was able to eat and drink normally. Conclusion Nutritional support, combined with chemotherapy, may effectively treat complete pyloric obstruction caused by advanced tumors.

Key words: Nutritional support; Gastric cancer; Pyloric obstruction; Advanced gastric cancer

Introduction

Despite its declining incidence over the last several decades, gastric cancer (GC) remains the fifth most common malignancy and the third leading cause of cancer death in both sexes worldwide \([1,2]\). GC is often asymptomatic, or may cause only nonspecific symptoms in its early stages, leading to a delayed diagnosis \([3]\).

Previous studies suggested that 40%~80% of cancer patients experience malnutrition, and that this is a major cause of cancer-related deaths \([4,5]\). Nutritional support is an important part of the comprehensive treatment for gastric cancer. Before 1990, the main goal of nutritional support was to maintain the nitrogen balance. After 1990, it was to maintain the function of cells, tissues and organs and promote the recovery of patients. Nutritional support is broadly divided into three categories by purpose: supplementary nutritional support, maintenance nutritional support, and therapeutic nutritional support \([5]\). Supplementary support is mainly used for malnutrition and excessive weight loss due to poor intake. Maintenance support is mainly used for patients with severe illnesses, extensive weight loss, and those who cannot be fed orally for a long time (more than 5 days) \([6]\). Therapeutic support is intended to provide substances that can regulate the immune function, reduce oxidative stress, maintain the gastrointestinal function and structure, reduce inflammatory responses, and improve the survival rate \([6]\). Nutritional strategies have also shifted from primarily nutritional support to more frequently nutritional therapy, as was described by the 2009 American Society of Enteral and Parenteral Nutrition (ASPEN) in their clinical guidelines \([7]\).

Insufficient nutrient absorption may cause severe weight loss, particularly in patients with advanced cancer \([8]\). The causes of the malnutrition in gastric cancer patients can be divided into systemic and local factors. Systemic factors include the increased consumption of nutrients by malignant cells and substances released by cancer cells leading to abnormal metabolism \([9]\). The local factors include the growth of tumors in the digestive tract, which affects digestion and absorption either due to a change in cell type/function or to digestive tract obstruction \([8]\). For example, pyloric obstruction may lead to complete or partial disruption of the continuity of the digestive tract, leading to a loss of digestive and absorption functions (Figure 1). In these patients, the presence of cancer is the root cause of the malnutrition. The effects cannot be reversed without tumor resection or effective tumor control. The usual solution to remove local factors is to replace and repair part of the digestive tract, for example, performing gastrojejunostomy for the treatment of pyloric obstruction caused by an unresectable carcinoma of the gastric antrum. Thus, when malnutrition is caused by local factors, it is easier to correct and the patient is more likely to respond to nutritional support. On the other hand, when malnutrition is due to systemic factors, it is usually more difficult to correct, although tumor resection can also reduce systemic factors.

We recently treated a patient with advanced GC who
presented with complete pyloric obstruction. This patient was treated with nutritional support and chemotherapy, and showed a good response to the treatment.

Figure 1 A recently treated patient with advanced GC who presented with complete pyloric obstruction. This patient was treated with nutritional support and chemotherapy, and showed a good response to the treatment.

Case
A 48-year-old female (Figure 2) was hospitalized on March 18, 2018. She had been unable to eat normally for nearly 3 months and her diet decrease 50% before she was admitted to the hospital, and could only consume a liquid diet for nearly a month. She was completely unable to eat any food for nearly 2 weeks before the hospitalization. At the time of admission, the patient was suffering from severe malnutrition and obvious edema of both lower limbs. Anthropometric measurements were performed within 24 hours after admission. The patient was 161 cm in height and 41 kg in weight, with a body mass index (BMI) of 15.8 kg/m² (BMI < 16 kg/m² is considered to indicate severe malnutrition) [10]. The circumference of her upper arm was 11.6 cm, and the skin fold thickness of the triceps brachii was 5 mm. The Nutrition Risk Screening Score (NRS 2002) was 4. After admission, the patient underwent an abdominal CT examination (Figure 3), which showed gastric cancer that was accompanied by complete pyloric obstruction and extensive lymph node metastasis, with fusion of numbers 3, 6, 7, 8, 9, 11, 12 and 13. Upper gastrointestinal radiography (Figure 4) was also performed, and confirmed complete pyloric obstruction. No contrast agent was found in the distal duodenum 4 hours later. The laboratory found that the serum total protein concentration was 35.6 g/L (normal value 60-80 g/L) and the albumin concentration was 21.8 g/L (normal value 35–55 g/L). The patient's electrolyte levels were: Na⁺: 127 mmol/L; K⁺: 2.5 mmol/L; Cl⁻: 99 mmol/L; Ca²⁺: 2.21 mmol/L, Mg²⁺: 0.9 mmol/L; P: 1.13 mmol/L and Fe²⁺: 7.17 μmol/L. The patient's triglyceride (TG) level was 0.54 mmol/L and her blood glucose: 3.9 mmol/L. The rest of the laboratory values were within normal limits. Based on the patient's weight loss history, dietary surveys, low protein intake and low albumin levels, the final nutritional diagnosis was protein energy malnutrition (PEM) and hypoalbuminemia without signs of infection or liver dysfunction. The tumor marker levels were: carcinoembryonic antigen (CEA), 7.21 ng/ml; alpha fetoprotein (AFP), 8.45 ng/ml; carbohydrate antigen (CA), 199, 7.2 U/ml and CA724, 9.46 U/ml.

Figure 2 A 48-year-old patient with enteral nutrition support and intravenous parenteral nutrition support.

Figure 3 Gastric cancer in this patient was accompanied by complete pyloric obstruction with extensive lymph node metastasis, such as fusion of NO3, 11, 13, 12, 8, 6, 9, and 7.

As the treatment team discussed this case, it was noted that there were two main causes of her malnutrition: systemic factors due to the tumor and metastatic lymph nodes and local factors caused by the complete pyloric obstruction. This was causing a vicious cycle wherein the progression of gastric cancer led to malnutrition in the
patient, and malnutrition made it impossible to give effective treatments such as surgery and chemotherapy, resulting in further disease progression and malnutrition. We believed that nutritional support would be key to break this cycle. Therefore, based on the patient's condition, we provided enteral nutrition via nasal and jejunal nutrition tubes under gastroscopy, and parenteral nutrition via a central venous catheter (PICC) combined with intravenous chemotherapy (FOLFOX4) to treat the patient's disease. The first day of chemotherapy of the scheme including oxaliplatin at 85 mg/m² (100 mg/dose) + calcium folinate at 200 mg/m² (100 mg/dose) + fluorouracil 400 mg/m² (200 mg/dose). They need to be calculated according to the patient body surface area. The second day of chemotherapy of the scheme was to continue use fluorouracil 600 mg/m² (200 mg/dose) for 22 hours. The patient suffered from nausea and vomiting after chemotherapy. The leukocyte and transaminase levels remained within the normal limits.

The nutritional status of the patient started to improve after a week on parenteral nutrition, but we continued to provide parenteral nutrition support. At that time, the patient was given chemotherapy. One week after initiating chemotherapy, the patient’s tumor size was reduced and the obstruction was partially relieved. At that time, total parenteral nutrition was discontinued, and enteral nutrition (EN) was adopted to help eliminate the local factors causing malnutrition, as well as to avoid the complications caused by total parenteral nutrition [11]. The patient's main diet was liquid soft food, with a daily energy intake of 1,512 kcal, including 64 g of protein. In addition, in order to meet the energy needs of the patient, she was provided with oral nutritional supplements (ONS), which comprised a whole protein enteral nutrition powder three times a day, for a total of 110 grams (providing 500 kcal). The ONS was well tolerated. After a week of additional enteral nutritional support, the patient's laboratory tests were performed again. The laboratory found that the serum total protein concentration was 40.6 g/L (normal value 60~80 g/L) and the albumin concentration was 29.8 g/L (normal value 35~55 g/L). We continued to provide the patient with chemotherapy as second cycle. The tumor further shrank and the patient's pylorus was completely relieved from the tumor obstruction. The patient was able to transition to an oral diet. The effective implementation of chemotherapy controlled the growth of the cancer, reducing its metabolic effects and thus treating the systemic factors causing her malnutrition. After a series of effective treatments over the course of 40 days, the overall condition of the patient was greatly improved (Figure 5). Her body weight had increased to 48 kg, and her BMI was 18.5 kg/m² (the normal BMI range is 18.5~23.0 kg/m²). The circumference of her upper arm was 15.6 cm, and the skin fold thickness of the triceps brachii was 8 mm. Gastrointestinal angiography (Figure 6) indicated that the pyloric obstruction was relieved, and the contrast agent entered the distal duodenum through the pylorus. Abdominal CT examination (Figure 7) confirmed that the tumor was smaller (Figure 7b) and the pyloric obstruction was relieved (Figure 7d). The laboratory found that the serum total protein concentration was 46.6 g/L.
(normal value 60–80 g/L) and the albumin concentration was 35.8 g/L (normal value 35–55 g/L). The patient's electrolyte levels were: Na⁺: 138 mmol/L; K⁺: 3.9 mmol/L; Cl⁻: 106 mmol/L; Ca²⁺: 2.25 mmol/L, Mg²⁺: 1.1 mmol/L; P: 1.25 mmol/L; Fe²⁺: 9.97 μmol/L. The patient's TG level was 0.89 mmol/L and her blood glucose was 5.8 mmol/L. The tumor marker levels were as follows: CEA, 5.23 ng/ml; AFP, 6.78 ng/ml; CA19-9, 4.56 U/ml and CA72-4, 6.76 U/ml.

Figure 5 The patient's physical condition improved.

Figure 6 Gastrointestinal angiography of the patient indicated relief of pyloric obstruction, through which contrast agents entered the distal duodenum.

Discussion

The major threat to life posed by cancer does not come from the cells themselves, but from the effects of cancer cells on the corresponding organ function. The infiltration and metastasis of gastric cancer will seriously affect the digestion and absorption function of the stomach itself and threaten the survival time of the body. Providing nutritional support to patients can help repair, maintain and replace the digestion and absorption function, which can reduce the effects of the cancer cells and thus prolong the life of patients. In the case of advanced gastric cancer, nutritional support (palliative support) can prolong the survival time and improve the quality of life for the patient.

Figure 7 Abdominal CT examination of the patient showed that the tumor was smaller and the pyloric obstruction was relieved compared with before and after treatment. a, Tumours of the stomach before treatment; b, Tumours of the stomach after treatment; c, Complete pyloric obstruction prior to treatment; d, The pyloric obstruction improved after treatment.

Effective treatment could not be carried out in our present case upon admission because the patient was severely malnourished. Reasonable nutritional support created the conditions that allowed for the effective treatment of gastric cancer. The patient had an unresectable cancer of the gastric antrum. The continuity of the patient's digestive tract was interrupted, and the digestive and absorption dysfunction were local factors leading to malnutrition that threatened her life. After admission, the patient was given nutritional support via the placement of a nasointestinal tube, reducing the local factors, and prolonging the patient's life.

The incidence of gastrointestinal cancers is on the rise, and malnutrition in patients with these tumors is common, and is often the direct cause of death. Nutritional support is an indispensable auxiliary means to implement effective treatment via chemotherapy, radiotherapy or surgery, which would not be possible in severely malnourished patients. Therefore, nutritional support should be used as a part of conventional anti-cancer therapy.

Conflict of interest

The authors disclose no conflict.

Funding

This work was supported by the National Natural Science Foundation of China (81870458), the Yunnan Engineering Technology Center of Digestive Disease (2018DH006), the Yunling Scholar (YLXL20170002), the Education Department of Yunnan Province...
References


Ethics
The study protocol was submitted to the institution’s research ethics committee for approval.