



## Nutritional Support in the Treatment of Cervical Cancer

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### Abstract

**Introduction:** Metabolic changes due to the progression of malignant neoplasms and the negative consequences of aggressive methods of its treatment lead to a decrease in food intake in patients, which contributes to the development of anorexia-cachexia syndrome in cancer patients due to complex interactions between proinflammatory cytokines and host metabolism. In addition to physical and metabolic consequences, patients treated for malignant neoplasms often suffer from psychological disorders, including depression.

**Material and Methods:** In order to evaluate the effectiveness of additional oral methods of nutritional support for cancer patients, a search and analysis of relevant data in the scientific databases PubMed and Medline were performed.

**Results:** Nutritional support has a positive effect on the outcomes of cancer treatment and reduces the incidence of complications by optimizing the balance between energy expenditure and food intake. In palliative care, nutritional support is aimed at improving the patient's quality of life by controlling symptoms such as nausea, vomiting, and pain associated with food intake.

**Keywords:** Cervical Cancer; Nutritional Status; Nutrition

### Introduction

It is well known that the development of the tumor process is often accompanied by nutritional deficiency, in which, in addition to the general metabolic effect of the tumor on the body, they prevent adequate nutrient intake. Studies conducted by the ECOG group in 2023, which included 147 oncological patients, found that the frequency of nutritional deficiency in tumor lesions of the genital organs varies from 70 to 83%. In 4 out of 20 patients, malnutrition is the direct cause of death. The development of the tumor process is associated with multiple biochemical changes in the human body, leading to significant shifts in carbohydrate, protein, lipid and mineral metabolism. This is usually due to two main reasons: a decrease in the intake of food and nutrients due to a side effect of specialized treatment and metabolic changes due to the activation of systemic disorders. Currently, nutritional support is considered one of the most important components of cancer pa-

tient treatment. This is due to the positive effect of nutritional status correction on the course of the underlying disease, tolerability of antitumor treatment, rehabilitation measures and quality of life. The most important principle of nutritional support is its continuity at all stages of patient care: outpatient, inpatient, rehabilitation. The purpose of the work is to discuss nutritional support for cancer patients with an emphasis on parenteral nutrition. Of more than 50 initially selected literature sources from various databases (Scopus, Web of Science, Russian Science Citation Index, etc.), 10 sources were left for analysis, mainly for the last 5 years, earlier publications were used while maintaining their information content for clinicians. The modern concept of parenteral nutrition involves the administration of "three in one" drugs. Parenteral nutrition should include not only macronutrients, but also micronutrients: fat- and water-soluble vitamins,  $\omega$ -3 fatty acids. It has been established that

the development of infectious complications with nutritional support is associated not with its type, but with the caloric content of the diet. The issues of additional parenteral nutrition in case of insufficient enteral nutrition are discussed. The clinician should personalize nutritional support taking into account the type of tumor process, its stage, patient characteristics and severity of nutritional disorders. During the treatment of patients with cancer, it is necessary to assess their nutritional status and, if necessary, carry out correction. The doctor must choose the optimal way to provide the patient with energy and plastic materials - oral additional nutrition, enteral nutrition, parenteral nutrition or their combination. Clinical practice shows that refusal of parenteral nutrition is accompanied by a decrease in the quality of nutritional support. The choice of the type of nutritional support is based on the indications for its implementation, which are described in detail in clinical guidelines. Following the algorithm for correcting the nutritional status depending on the stage of the cancer, the patient's condition, the type of antitumor therapy will optimize the treatment results and improve the quality of life.

#### Diagnosis of nutritional deficiency

Despite the rapid advancement of medical techniques such as diagnosis, surgery, radiotherapy and chemotherapy over the past few decades, which have increased the survival rates, the prognosis of patients with gynecological cancers remains suboptimal [1,2]. Predicting the prognosis of patients with gynecological cancers is crucial, and biomarkers can provide guidance for personalized optimized treatment. Therefore, there is an urgent need to discover and identify reliable and cost-effective biomarkers for gynecological cancers. Serum biological parameters including platelet-lymphocyte ratio [3], lymphocyte-monocyte ratio [4], neutrophil-lymphocyte ratio [5] and PNI [6] are important biomarkers of gynecological cancers. PNI, which is calculated based on lymphocytes and albumin in peripheral blood, can be used to assess nutritional status and immune response. PNI is calculated by the following formula:  $10 \times \text{albumin (g/dL)} + 0.05 \times \text{total lymphocytes (/mm}^3\text{)}$ . Buzby, *et al.* first proposed the use of PNI for risk assessment of patients undergoing gastrointestinal surgery in 1980 [7]. Initially, this index was used to assess the prognosis of cancer patients [8]. Previous studies have shown that PNI is associated with clinical pathological characteristics and survival prognosis in various cancers such as lung cancer [9], colorectal cancer [10], and hepatocellular carcinoma [11]. Many studies have also investigated the prognostic significance of PNI in patients with gynecologic malignancies, but the results are inconsistent [12,13]. Therefore, it is necessary to systematically and comprehensively study the significance of PNI in the prognosis of patients with gynecologic cancer.

#### Indications for therapeutic nutrition and methods of nutritional support

After assessing the nutritional status using one of the assessment scales (NRS 2002, SGA, NRI), the clinician faces the question

of choosing the optimal method of introducing nutrients into the patient's body. The type of nutritional support should be selected individually, taking into account the clinical situation. All types of therapeutic nutrition by the method of nutrient delivery can be divided into oral administration of ready-made nutritional mixtures, enteral nutrition, and parenteral nutrition [14,15]. This type of nutritional support is considered more physiological compared to parenteral nutrition and should be the method of choice in this group of patients. According to the recommendations of the European Society of Clinical Nutrition and Metabolism, in patients with severe nutritional deficiency who are to undergo surgery, nutritional support should be started 8-10 days before surgery, even if it is not possible to restore body weight loss within the specified time frame [16,17]. Preference should be given to nutrient mixtures containing arginine, omega-3 fatty acids and nucleotides. Parenteral nutrition is a type of replacement therapy in which nutrients are introduced into the body, bypassing the gastrointestinal tract (usually into the vascular bed). Its main tasks should be considered restoration and maintenance of water-electrolyte balance and acid-base state, provision of the body with energy and plastic substrates, as well as vitamins, macro- and microelements. Parenteral nutrition is divided into complete and incomplete. Complete parenteral nutrition provides the entire daily the body's need for plastic and energy substrates. In general, parenteral nutrition is less physiological, more expensive and is accompanied by a higher frequency of complications [18,19]. According to the European Society of Clinical Nutrition and Metabolism, nutritional support should be initiated if the patient has malnutrition. Also, nutritional support is initiated if food intake is expected to be insufficient (less than 60% of the estimated energy expenditure) for more than 10 days.

#### Clinical studies on the use of nutritional therapy in cervical cancer

The relationship between malnutrition and unfavorable treatment outcomes has been shown in numerous studies. However, a single protocol for prescribing nutritional support for patients with cervical cancer still does not exist. Nevertheless, many studies have been published proving the benefits of prescribing nutritional therapy in the treatment of patients with cervical cancer. A study by some foreign authors showed that despite the significant proportion of patients with malnutrition among all patients who were to undergo extended extirpation with appendages for cervical cancer, the administration of preoperative nutritional therapy reduced the risk of developing postoperative complications in this group of patients. The study also showed that albumin levels correlate with patient survival. The use of parenteral nutrition as nutritional support also improves immediate treatment results, despite the known shortcomings.

### Examples of nutritional therapy protocols for cancer patients.

Nutrition therapy is a mandatory component of preoperative care of cancer patients. Nutritional support protocols have been developed and successfully applied at all stages of surgical and combined treatment of gastric cancer.

Protocols for nutritional support of cervical cancer have been poorly studied and have not yet been developed. To assess the nutritional status of a patient in everyday clinical practice, it is customary to use a whole range of somatometric and clinical-laboratory parameters. These parameters are conventionally divided into mandatory (first level) and additional (second level). Mandatory parameters include data from anthropometric, clinical and laboratory studies. These parameters can and should be used by a doctor of any specialty to determine the current nutritional status. Additional parameters are needed for a more detailed analysis of the patient's trophological state and are usually used by artificial nutritionists. These parameters allow one to determine individual constitutional indicators, such as, for example, body fat mass, muscle mass and their ratio.

Anthropometric (somatometric) parameters, the measurement of which is formally mandatory during a physical examination of a patient, include: height-weight indicators and their derivatives (body weight, height, ideal body weight and the magnitude of its deviation, body mass index), shoulder circumference and skin-fat fold thickness. Ideal body weight is calculated using the following formulas:

IBW for men = Height - 100 - (Height - 152) x 0.2.

IBW for women = Height - 100 - (Height - 152) x 0.4.

IBW is measured in kilograms, height in centimeters.

Deviation of actual body weight (ABW) from ideal weight is calculated using the formula:

Decrease in weight from ideal (%) =  $100 \times (1 - ABM/IBW)$ .

In addition, a number of indices can theoretically be used to determine normal body weight: Broca's index, Breitman's index, Bernhard's index, Davenport's index, Oder's index, Noorden's index, Tatonya's index. However, the body mass index is most often used in clinical practice for an approximate assessment of nutritional status. This indicator was developed by Adolphe Quetelet in 1869 and is calculated using the formula:

BMI =  $m/h^2$ , where m is weight in kg, h is height in meters

In addition to height and weight indicators, the skin fold thickness method can be used for anthropometric assessment of nutritional status. This method determines the thickness of the skin fold at the level of the 3rd rib (normally 1.0-1.5 cm) and in the paraumbilical region on the side of the rectus abdominis muscle (normally

1.5-2.0 cm). The thickness of the skin and fat fold above the triceps is measured in millimeters using a caliper. The shoulder circumference is measured in centimeters at the level of the middle third (midway between the tip of the acromial process of the scapula and the olecranon process of the ulna) of the non-working, relaxed arm. Assessment of nutritional deficiencies by anthropometric parameters is carried out taking into account the values given in the table.

Laboratory parameters accepted for mandatory consideration when assessing nutritional status include: total blood protein, blood albumin, blood glucose, absolute lymphocyte count, total cholesterol, blood potassium, blood sodium, daily urine creatinine, daily urine urea. Additional parameters assessed include: blood transferrin, blood lactate, blood triglycerides, magnesium, calcium, phosphorus, blood iron, creatinine-growth index.

Obviously, the use of any one anthropometric or laboratory parameter will not be an objective reflection of the patient's nutritional status. In addition, in practical activities with a known time limit, it is necessary to have the ability to quickly (bed-side, at the patient's bedside) and preferably simply assess the nutritional status. In this regard, since the late 1980s, integrated assessment systems have been actively introduced into clinical practice, allowing the combination of several parameters to determine the patient's current nutritional status. One of the simplest in application and at the same time a fairly objective assessment scale is the Nutritional Risk Index proposed in 1991. NRI is calculated using the formula:

$NRI = 1.519 \times \text{plasma albumin (g/l)} + 0.417 \times (\text{body weight 1 (kg)} / \text{body weight 2 (kg)} \times 100)$ , where body weight 1 is the body weight at the time of examination, body weight 2 is the usual body weight.

Based on the NRI value, the nutritional status of patients is classified as:

- Without nutritional deficiency (NRI > 97.5)
- Moderate nutritional deficiency (97.5 > NRI > 83.5)
- Severe nutritional deficiency (NRI < 83.5).

The European Society of Clinical Nutrition and Metabolism (ESPEN) recommends using the Nutritional Risk Screening (NRS) system to assess the nutritional status of patients. The American Society of Parenteral and Enteral Nutrition (ASPEN) recommends using the Patient Generated Subjective Global Assessment (PGSGA, more often simply referred to as SGA). The SGA scale, compared to the NRS scale, includes a significantly larger number of primary assessment indicators and its use, at a minimum, takes more time. However, from the point of view of a number of authors, it is in the SGA that the majority of factors influencing metabolism, as well as parameters reflecting changes in metabolic processes, are assessed in detail.

## Summary

Nutritional deficiency is one of the main complications of the oncological process. Cancer intoxication, disturbances of appetite and taste sensations, psychological stress, depression, nausea and vomiting after special treatment, pain syndrome, as well as factors that prevent patients from eating naturally, aggravate the existing nutritional deficiency in patients with cervical cancer. Nutrition deficiency leads to deterioration of immediate and long-term treatment results, deterioration of the effectiveness of special treatment, interruptions in antitumor treatment, therefore nutritional support should be considered as mandatory accompanying therapy in cancer patients. Modern nutritionology offers a significant selection of parenteral nutrition, which makes it possible to choose the optimal nutrition program taking into account the patient's nutritional status and the specific features of metabolic changes.

Parenteral nutrition, no matter how balanced it is, is a forced therapy prescribed when it is impossible to eat in a natural way. If nutritional deficiency or the risk of its development during treatment is detected in the patient, nutritional support should be provided at any stage of treatment - in the perioperative period, in the early stages of the disease, as well as in the case of its pronounced manifestations. The appointment of nutritional therapy improves the patient's adaptive capacity, reduces the risk of infectious complications, shortens the time of his stay in the hospital, and improves the long-term treatment results.

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