Nutritional Support in Patients with Acute Cerebrovascular Accident

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Abstract

Numerous studies have shown that eating disorders in stroke patients are always accompanied by structural and functional changes in the body, which leads to violations of adaptive reserves. It is known that trophic homeostasis together with optimal oxygen supply form the basis of the vital activity of the organism and is a necessary condition for overcoming many pathological conditions. Insufficient nutrition leads to a slower recovery of patients, increases the risk of complications, lengthens the length of stay of patients in the hospital, increases mortality. Inability of adequate feeding causes the necessity of obligatory administration of nutritional support to patients in a severe condition. The article provide review of the main principles of organization nutritional support in stroke patients and ways to assess its effectiveness.

Keywords: Nutritional Support; Trophological Status; Dysphagia; Aspiration; Sip Feeding; Tube Feeding

Trophic homeostasis, which is determined by the ability of the body to obtain nutrients and their optimal absorption, is the basis of human life and is a necessary condition for overcoming many pathological conditions. In the absence of exogenously ingested nutrients, the body goes into active autocannibalism to maintain trophic homeostasis, which is accompanied by structurally functional and metabolic disorders and rapidly progressive depletion of patients [1]. In clinical practice, situations often arise when patients for one reason or another can not, do not want or should not eat food naturally. In such cases, optimal nutritional support should be an indispensable basic component of their intensive care.

Malnutrition occurs in patients with acute cerebrovascular accident (stroke) from 6.1% to 62% of cases [2]. The variety of reasons why it develops in patients can be divided into the following blocks:

1. Due to the initial condition of the patient (elderly patients with the presence of concomitant pathology).

2. Caused by a cerebrovascular accident (dysphagia, swallowing and chewing disorders, visual impairment, side effects of medications taken).

3. Psychological (apathy, depression, fear of becoming a burden).

It is important to cancel that malnutrition is not an anthropometric characteristic and there is no clear relationship with the well-known parameter of body mass index. Currently, there is an increase in the number of patients with overweight, however, they may also have nutritional deficiency. Therefore, to better understand the nature of changes in nutritional status, the term sarcopenia is introduced,

which is a depletion of muscle mass. As a result, from 8 to 35% of patients with stroke, there are signs of malnutrition at the time of the disease, while most of them are not diagnosed with nutritional status and, accordingly, no measures are taken to correct it.

According to a study by Foley., *et al.* [2] malnutrition is initially observed in 10% of patients, develops in the next two weeks in every 4th patient, and by the 4th week can be diagnosed in 45% of patients. The relationship of nutritional deficiency with treatment outcomes for patients with stroke was shown in a study by Gariballa., *et al* [3]. During hospitalization, patients who received only standard hospital nutrition without correction of nutritional status showed a statistically significant decrease in albumin from 38.3 g/l to 34.8 g/l by the 4th week of illness. This led to the rapid progression of symptoms of nutritional deficiency, which worsened the prognosis of both the disease itself in the acute period and the effectiveness of recovery in the rehabilitation period.

Nutritional support is a set of measures aimed at providing trophic homeostasis in order to optimize the structural, functional and metabolic processes of the body, as well as its adaptive reserves.

Basic principles of nutritional support:

- Timeliness of appointment - malnutrition is easier to prevent than to treat;

- The adequacy of the conduct - the introduction of nutrients should be guided not only by the actual need, but also by the ability of their absorption by the body;

- The optimality of the timing - to complete stabilization of the main indicators of trophological status and restore the possibility of adequate nutrition in a natural way.

Absolute indications for prescribing nutritional support to patients include [4,5]:

- Rapidly progressive weight loss due to an existing disease, comprising: more than 2% per week or 5% in 1 month or 10% in 3 months;

- The presence of initial signs of malnutrition in patients: body mass index < 19 kg/m^2; hypoproteinemia < 60 g/l and/or hypoalbuminemia < 30 g/l; absolute lymphopenia <1500;

- The threat of rapidly progressive malnutrition:

    - Lack of the possibility of optimal natural nutrition (they cannot, do not want, should not eat food naturally);

    - Increased requirements for nutrients due to the existing phenomena of hypermetabolism-hypercatabolism.

The nutritional support algorithm consists of 5 main steps:

1. Assessment of trophological status and early diagnosis of its disorders;

2. Identification of patients with indications for the appointment of nutritional support;

3. Determination of the daily needs of patients for substrate support;

4. The choice of a rational method of nutritional support;

5. Monitoring the body's metabolic response.

Assessment of trophological status

To assess the trophological status and risk of developing nutritional deficiency, it is necessary to take into account the state of appetite, the presence of gastric (nausea, vomiting) and/or intestinal (flatulence, diarrhea) dyspepsia, dynamics of body weight during the period of the disease, the presence of fever, as well as the type and duration of drug treatment.

There are a large number of methods for assessing nutritional status: both multicomponent, with the assessment of laboratory and anthropometric indicators, and screening, allowing without the use of complex algorithms, to identify patients at risk. One of the simplest scales for quickly assessing the trophological status of patients is the NRS 2002 (Nutritional risk screening) scale [6]. With a total score on the NRS 2002 scale of less than 3, it is necessary to assess the severity of dysphagia.

Indications for prescribing nutritional support

Assessment of the severity of dysphagia

- Swallowing disorder (dysphagia) is one of the most formidable complications of a stroke. The development of dysphagia leads to a high risk of medical complications (aspiration pneumonia), increases the risk of sudden death. Therefore, the assessment and correction of swallowing disorders is important for the prevention of aspiration pneumonia, asphyxia and also allows you to determine the nutritional strategy and provide compensation for the patient's energy needs, maintain the body's water balance [1].

- During feeding, the following signs appearing during drinking and eating indicate a high probability of dysphagia:

    - Coughing or coughing before, during, or after a sip;

    - Changes in voice quality during or after swallowing, for example, "wet" voice, "gurgling" voice, hoarseness, temporary loss of voice;

    - Labored breathing, intermittent breathing after swallowing;

    - Difficulty in chewing;

    - Salivation or inability to swallow saliva;

    - Loss of food from the mouth during eating (this may be due to the fact that the patient's lips do not close well or his tongue presses forward during the throat instead of normal movements up and back);

    - Spitting up;

    - «Blurry» speech.

Swallow rating

Swallowing assessment is carried out according to the developed standardized screening scales, which allows to determine the method of safe feeding and to avoid the development of complications.

Aspiration risk assessment

The risk of aspiration is considered high if there are 2 or more predictors listed below. The risk of aspiration is considered low if there is 1 predictor or none. The predictors are:

- Dysarthria

- Dysphonia

- Abnormal cough

- Weak or lack of gag reflex

- Cough (immediately after swallowing water)

- Voice change (within 1 minute after ingestion of water, they ask to say: "aaa").

If the risk of aspiration is low, it is necessary to decide on the choice of a method of nutritional support.

In the event that the risk of aspiration is high, then a swallow assessment test is carried out with products of various densities and volumes (nectar, liquid, pudding).

Determination of the daily requirement of patients for substrate support

Determination of the patient's needs for basic nutrients can be carried out using a large number of techniques described in the literature.

For example, indirect calorimetry is the "gold standard" for estimating energy requirements, and for estimating protein needs, the calculation of daily nitrogen losses. However, in routine clinical practice, these techniques are difficult to apply.

The calculation of the basal metabolic rate can be made using the Harris-Benedict formula.

However, existing clinical guidelines (for example, those of the European Society for Clinical Nutrition and ESPEN Metabolism) say that no universal amount of nutrition can be recommended, as therapy needs to be adjusted according to the development/course of the disease and intestinal tolerance. During the acute and initial phase of a serious illness: exceeding a dose of 20 - 25 kcal/kg body weight/ day can lead to a less favorable outcome [1].

The loss of protein, which manifests itself in a decrease in skeletal muscle mass and the total nitrogen content in the body, is observed in virtually all critically ill patients. The degree of protein loss is associated with increased morbidity and mortality. The loss of muscle mass observed under clinical conditions is associated with impaired functioning of the body and adverse clinical outcomes (increased incidence of infectious complications, slowed reparative processes, increased resistance to antibiotics, difficulty in weaning from mechanical ventilation, and difficulties in verticalization of patients and decreased physical activity).

As for the protein needs, it is recommended to carry out a calculation based on the fact that against the background of the disease, the patient's protein needs increase significantly and amount to at least 1.2 g/kg body weight [7].

It must be remembered that the calculation of protein requirements in patients with overweight and obesity should be based on the recommended, and in patients with eutrophy and malnutrition, from the actual body weight. In addition, it is important to take into account the body's ability to assimilate nutrients and avoid hyperalimentation [8].

Choosing a rational method of nutritional support

When implementing nutritional support, the substrate support of patients is carried out using special methods that differ from normal natural nutrition. These methods include:

1. Sipping (from the English. - sip - drink in small sips) - oral intake of special artificially created nutrient mixtures in liquid form (partial, as an addition to the main diet, or complete - consumption of only nutrient mixtures);

2. Probe nutrition through a nasogastric or nasointestinal probe, and if necessary, prolonged artificial nutrition of patients (more than 4 - 6 weeks) through a gastro- or enterostomy;

3. Parenteral nutrition, which can be carried out through the peripheral or central veins;

4. The mixed option.

The choice of nutritional support method is determined by two factors:

1. Level of consciousness

2. The presence or absence of dysphagia.

Oral nutrition in most patients should be the method of choice. It is also worth remembering the continuity of nutritional support at all stages of treatment and rehabilitation of patients. On the first day of the patient's stay in the intensive care unit, the function of swallowing is evaluated using a three-pharyngeal test. If the patient flutters or does not swallow, it is recommended that a nasogastric tube be placed and food given the size of the main volume, calculated according to the Harris-Benedict formula.

Then, in the intensive care unit, when the patient's condition is stabilized or in the early rehabilitation ward, the patient is transferred to natural enteral nutrition with food of different consistencies (yogurt, jelly, etc.). If the nasogastric tube costs more than 30 days, a gastrostomy staging is indicated.

Currently, there are a large number of nutritional mixtures intended for both oral and tube nutrition, which differ in their chemical composition, physical properties, energy and protein content.

Advantages of modern nutritional mixtures:

*   Contain all the necessary nutrients;

*   Optimally balanced in macro- and microelement composition;

*   Have a relatively easy digestibility;

*   Provide mechanical and chemical sparing;

*   Do not contain gluten and lactose;

*   Convenient for dosing and use;

*   Allow for differential alimentation of patients depending on the clinical situation.

As we noted earlier, under conditions of metabolic stress, the protein needs of patients increase significantly [7]. The delay in the beginning of enteral nutrition in the intensive care unit clearly leads to a general calorie deficit, but, more importantly, to insufficient protein intake. To achieve protein targets in the intensive care unit, the appointment of protein-enriched enteral mixtures is necessary as early as possible.

At the same time, excessive energy intake (more than 80% of the calculated indicators) can adversely affect the results, increasing the risk of complications (hyperglycemia, excess feeding syndrome).

A recent recommendation by the American Parenteral and Enteral Nutrition Association (ASPEN) says that high-protein hypocaloric nutrition (e.g. Nutrizone Advance Protizone) may be the best strategy at the start of a critical illness to prevent overfeeding, improve insulin sensitivity, and maintain protein body homeostasis, especially in patients with high nutritional risk.

Another problem that the clinician faces is the problem of hyperglycemia and the associated iatrogenic hyperglycemia. The complications of hyperglycemia and the risks associated with it have long been studied and described [9-11]. Glucose control should be not only in patients with diabetes mellitus, but also in patients in critical conditions. It is described that in 34% of patients receiving therapeutic nutrition, there is an increase in blood glucose levels [12].

To improve glycemic control, especially with nutritional support, three strategies can be used:

1. Use of diabetes-specific mixtures

2. The use of mixtures enriched with dietary fiber

3. The use of hypocaloric (15 kcal/kg/day) feeding strategies with a high protein content (1.7 g/kg/day).

It has been proven that high-protein hypocaloric feeding can help increase glucose control (lower risk of hypoglycemia/hyperglycemia), reduce the need for additional insulin, and improve nitrogen balance in intensive care patients.

The main indications for the use of standard polymer blends with dietary fiber are:

• Long-term (more than 7 - 10 days) enteral nutrition;

• Prolonged (more than 10 days) antibiotic therapy;

• Diarrhea (mixtures with a high content of soluble dietary fiber);

• Constipation on the background of the conducted probe nutrition (mixture with a high content of insoluble dietary fiber).

If, when conducting probe nutrition, we can be sure that the patient received an adequate amount of nutrients, then when transferring patients to independent oral nutrition, there is a high risk that the patient will not be able to fill his needs in an adequate amount.

In order to assess how much food a patient eats, Professor L Sobotka [13] developed the so-called «Plate method», the essence of which is that the patient is asked to note how much food he managed to eat during the day. Then a calculation is made and a deficit is calculated between the amount of protein and energy calculated for this patient and what the patient really managed to eat. The nutrient deficiency should then be filled with additional enteral nutrition.

For those patients who can be fed orally for ease of use in all conditions, including on an outpatient basis, special liquid ready-to-use sterile polymer mixtures are created in mini-packs (125 - 200 ml) with the attached straw. Due to the high osmolarity, such mixtures should be consumed slowly through a straw for 20 - 30 minutes, which avoids the development of osmotic diarrhea. If long-term administration of oral sipping is necessary, it is optimal to use mixtures containing dietary fiber. There are also special jelly-like mixtures of varying degrees of viscosity intended for oral nutrition in patients with dysphagia.

Monitoring the metabolic response of the body

Assessment of the effectiveness of nutritional support should be carried out by the attending physician once every 5 - 7 days with monitoring of the following parameters: dynamics of body weight, total serum protein, blood albumin and lymphocytes in peripheral blood.

A progressive decrease in body weight, total protein, albumin and the number of lymphocytes requires a correction of the nutritional program.

Dysphagia is assessed routinely once every 5-7 days or immediately when the clinical manifestations of aspiration appear or progress.

Results

From 2012 to 2019, inclusively, in the Voronezh Regional Clinical Hospital No. 1 BUH in the neurological department for patients with acute cerebrovascular accident for all patients entering the intensive care unit (4077 patients in total), the trophological status is assessed on the first day on a scale NRS 2002. With a total score of NRS 2002 less than 3, the severity of dysphagia is determined. If the rating on the NRS 2002 scale is not less than 3 points, then the criteria for nutritional deficiency are evaluated. Also, on the first day the patient is in the hospital, swallowing is assessed, for this purpose developed standardized screening scales are used to determine the method of safe feeding and avoid the development of complications. In the case of a low risk of aspiration, the question of choosing a method of nutritional support is being decided. In case of a high risk of aspiration, a swallow test is performed with products of different densities and volumes. When the method of nutritional support is determined, the value of the basal metabolism is calculated according to the Harris-Benedict formula or the average indicators of the volume of substrate support of patients are used depending on the severity of the condition. Our use of the indicated algorithm of nutritional support in patients with acute cerebrovascular accident made it possible to almost completely avoid such a complication of stroke as aspiration pneumonia - a decrease of 23% compared to 2010-2012. The correct tactic for selecting the type of thickening allows the restoration of swallowing function in 86% of 1,059 patients.

Since nutritional support is one of the most important factors in the treatment and rehabilitation of patients with cerebrovascular accident, the introduction of this algorithm allowed us to reduce mortality from 18% in 2010 to 14.9% in 2019.

Conclusion

Thus, at present, there is every opportunity for timely differential nutritional support, which becomes the key to reducing mortality and early successful rehabilitation of patients who have had a stroke.

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