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Nutritional treatment of patients in the perioperative period - literature review

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Abstract

There are many factors influencing the condition of surgical patients. One undoubtedly important one is the nutritional status of the patient. Over the years, many guidelines have been developed to reduce malnutrition and improve the nutritional status of surgical patients. It has been proven in numerous studies that malnutrition worsens the prognosis of patients undergoing surgery. Numerous advances in many fields of medicine, such as better conservative treatment, development of surgical techniques or new surgical instruments, have contributed to improving the prognosis of patients in the postoperative period. Inadequate nutritional status is one of the main factors negatively affecting this process . Perioperative nutritional support, as part of the ERAS (Enhanced Recovery After Surgery) protocol, has proven to be crucial in improving surgical outcomes . By introducing a nutritional assessment even before planned procedures, we can improve the patient's condition with oral supplements and immunomodulatory preparations. This can reduce the length of patient hospitalization and mortality. In this review, we will focus on the latest developments and available research on these issues.

Keywords: nutritional support, Enhanced Recovery After Surgery, oncological surgery

1. Introduction

One of the key conditions for successful surgical treatment of medical conditions is the patient's recovery. Correct management and qualification of the patient allow for the creation of favorable conditions for recovery. This area can include the nutritional status of the patient both preoperatively and postoperatively. Over the years, considerable progress has been made in understanding this issue [1],[2]. These have resulted in the production of numerous guidelines and recommendations. One of these is the ERAS (Enhanced Recovery After

Surgery) protocol introduced in 2005 . It concerned patients undergoing colorectal surgery . It contained 22 recommendations, including key recommendations for improving perioperative nutrition. Since then, the protocol has contributed to a significant reduction in complications and length of hospital stay . In this context, optimal nutritional management of surgical patients has proven to be one of the main success factors of ERAS [3] .

In this review, the most important clinical practice guidelines and current data on perioperative nutritional support will be presented, with a focus on the conditions for which there is the most scientific evidence [4],[5].

2. Materials and methods

In this paper, we review the current knowledge on the nutritional treatment of patients in the perioperative period literature review. We selected articles with an unlimited search period in several databases, including PubMed, Google Scholar, and Web of Science. We included in the review only articles written in English and with full text available. No restrictions were made based on article type.

3. Pathophysiology

Nutritional status is a well-studied factor influencing the outcome of surgical treatment. There are indications in the literature that between 40% and 50% of surgical patients suffer from malnutrition [6]. Preoperative malnutrition is associated with a higher risk of infection, poorer surgical wound healing, increased risk of pressure sores and prolonged hospital stay [7],[8],[9],[10],[11]. There are several mechanisms that may justify this process.

The first would be the specificity of the surgical treatment itself. The surgery itself is an aggressive procedure that will stimulate the development of inflammation. The effect of inflammation is to increase catabolism, the consequence of which may be sarcopenia. In addition, the procedure often leads to a temporary restriction of nutrition which will increase sarcopenia and malnutrition [7],[8].

The second mechanism is the effect of the underlying disease on the patient's body and body condition. Surgical patients are most often of advanced age. These patients often have chronic inflammation. In addition, the underlying disease and co-morbidities are involved in

increasing inflammation . A number of interleukins and cytokines such as interleukin-6 (IL-6), interleukin-1 (IL-1), tumor necrosis factor alpha (TNF-α), interleukin-2 (IL-2) and interferon alpha (IFN-α), transforming growth factor beta (TGF-β), Janus kinase/transcription activator (JAK/STAT) and the RAS pathway are responsible for the development of this process [12],[13],[14]. The development of inflammation will exacerbate insulin resistance and catabolic processes. The consequence may be sarcopenia, a decrease in muscle strength , and an increase in osteoblastic processes.

The body's defense response to inflammation is the secretion of anti-inflammatory factors. interleukin-4 (IL-4), interleukin-10 (IL-10) and interleukin-13 (IL-13), inducing a stress response of the hypothalamic-pituitary-adrenal axis, which in turn induces an increase in cortisol synthesis, which secondarily and as undesirable side-effects causes bone resorption, lipolysis, protein catabolism, gluconeogenesis and immune dysfunction. Depending on the system it acts on, ultimately causing fragility and sarcopenia [12],[15].

The simultaneous presence of inflammatory and anti-inflammatory processes has adverse effects on metabolism, bone density, muscle mass and strength, exercise capacity, cardiovascular system, cognitive function and emotional state. Ultimately, this leads to the development of a frailty phenotype, which often coexists with other geriatric conditions. All these mechanisms significantly increase the risks associated with surgical procedures and worsen their outcomes [12],[16].

The impact of the underlying disease on the nutritional status of the body should not be overlooked. Intestinal obstruction, malabsorption and the psychological state of the patient are among the numerous causes of malnutrition in surgical patients.

4. Current recommendations

Some of the current most important guidelines include the Enhanced Recovery After Surgery Protocol (ERAS) and the European Society for Parenteral and Enteral Nutrition (ESPEN) guidelines. It is not the object of this paper to discuss current guidelines; however, for the purpose of discussing the topic of this paper, some of the recommendations will be cited [17],[18],[19].

5. Oncological surgery

Cancer is one of the pathologies in which the role of perioperative nutritional support appears to be best studied. Due to the increased catabolism resulting from the underlying disease , cancer patients are at particular risk of malnutrition. Such a condition will impinge on the choice of treatment [20],[21] . Severe malnutrition is an independent risk factor for increased postoperative morbidity and mortality and is associated with longer hospital stays and higher treatment costs . In addition, the patient's perioperative status may be crucial in assessing the risk of postoperative metastasis [22].

Correct identification of patients suitable for nutritional support appears to be crucial. Studies suggest that nutritional support is most beneficial for patients with moderate to severe malnutrition or those who will not be able to feed adequately for at least 7-14 days after surgery [23]. In these patients, a reduction in the incidence of infection and surgical complications is observed. In contrast, in well-nourished patients, the use of parenteral nutrition may increase the risk of infection [24].

Regarding the type of nutritional support, ESPEN recommends that oncology patients follow ERAS guidelines, prioritizing enteral nutrition, which improves nitrogen balance and promotes weight gain in cancer patients [25] . Although parenteral nutrition also has benefits, the associated weight gain is mainly due to an increase in fat content. In addition, it is associated with a higher risk of infection, surgical complications and higher costs in cancer patients. Although PN has not been shown to be superior to enteral feeding, there are studies suggesting that it is more beneficial than fluid therapy alone, especially in patients where enteral feeding is not possible [26],[27],[28].

ESPEN guidelines and other authors recommend immunonutrition in patients undergoing major gastrointestinal surgery, regardless of their baseline nutritional status. Studies confirm that their use in malnourished patients reduces hospitalization time and the incidence of infectious complications and anastomotic leaks [25],[29],[30].

The topic of perioperative nutritional support in cancer patients seems to have been particularly well studied in the context of gastrointestinal cancers. The current guidelines can also be applied to gastrointestinal procedures in patients who are not cancer patients [31].

Patients with oesophageal cancer often suffer from high levels of malnutrition due to impaired food intake. In the postoperative period, due to the nature of the operation, there are often infectious complications, fistula formation and anastomotic dissection. In esophageal cancer, poorer treatment outcome and recurrence rates appear to be correlated with loss of body weight and muscle and skeletal mass. In contrast, the use of artificial nutrition is associated with fewer postoperative complications [32],[33]. Early introduction of oral nutrition has a proven safety record. Unfortunately, the current level of knowledge is not sufficient to indicate adequate nutritional support [34],[35].

For patients with gastric cancer, many nutritional parameters have been identified as independent prognostic factors [36]. Early initiation of oral nutrition shortened the length of hospital stay compared with delayed start, without increasing the risk of complications compared with patients receiving parenteral nutrition [37] . In addition to surgical complications, the loss of body weight and muscle mass during this period affects the toxicity of adjuvant therapy, which has implications for treatment continuation, relapse and survival [32]. In addition, there are reports that preparations rich in omega-3 (n-3) polyunsaturated fatty acids (PUFAs) significantly reduce the risk of infectious complications after surgery, as well as shortening the length of hospital stay and the duration of the systemic inflammatory response, especially in malnourished patients [38].

For colorectal cancer, nutrition on the first day after surgery has been shown to be an independent predictor of five-year survival [39]. Clinical studies have shown that the use of prebiotics before surgery improves bowel function, the immune system and nutritional status [40]. There are studies showing that the use of enteral immunonutrition leads to a shorter hospital stay and a reduction in infectious complications, while parenteral nutrition improves immune parameters and also reduces hospitalisation time [41].

Frequent malnutrition affects patients with pancreatic cancer [42]. Surgery for this cancer has a high risk of complications and is one of the highest risk [43],[44]. Malnutrition in these patients is an important factor in perioperative complications . There is an increased risk of intra-abdominal abscesses, hospital readmissions or death [44]. The approach related to the selection of nutritional support for this type of patient has changed over the years. The ERAS guidelines recommending preoperative nutritional support in patients with severe weight loss, but not recommending immunonutrition and individual consideration of postoperative

artificial nutrition, preferring the enteral route, appear to have the strongest evidence for the efficacy of nutritional support therapy [45].[46].

6. Non-oncological surgery

Cardiac surgery patients often suffer from congestive heart failure (CHF). Through a multifaceted pathophysiology, patients become malnourished. CHF leads to tissue hypoperfusion, which promotes hypoxia and chronic inflammation, causes increased catabolism, resulting in sarcopenia and loss of muscle mass [47],[48]. At the same time, patients with CHF develop insulin resistance, which further increases catabolism and reduces anabolic processes. Intestinal hypoperfusion and swelling of the intestinal walls lead to malabsorption of nutrients, which exacerbates malnutrition and weakens the clinical status of patients [47],[49].

Inadequate nutrition in patients preparing for cardiac surgery increases the risk of postoperative complications and mortality [50].

ERAS guidelines recommend preoperative nutritional screening in all patients, as well as dietary support to reduce the risk of complications. Supplementation with oral nutritional supplements before surgery, especially in patients with severe malnutrition, may improve clinical outcomes [51].

In orthopedics, there are research papers evaluating the impact of nutritional support in orthopedic patients. Most relate to spinal surgery and hip fracture. Both conditions often occur in malnourished and elderly patients. Such patients have many risk factors for developing postoperative complications [52],[53]. It appears that nutritional treatment may benefit such patients. However, there is currently too little evidence of the effectiveness of such interventions [54],[55].

There is a consensus in bariatric surgery to limit food intake before surgery . Weight loss is desirable in the preoperative and postoperative periods. However, the patient's diet should be properly balanced and provide all necessary nutrients [56]. Obese patients are often malnourished as a result of the obesity itself and such an intervention can ensure that the patient is in an adequate nutritional state before surgery. According to ERAS protocols, it is recommended to consume carbohydrate-containing fluids 2-3 hours before surgery and solid

foods up to 6 hours before induction of anesthesia, which has been found to be safe for these patients. After surgery, it is recommended to start a liquid diet with calcium, iron, vitamin and mineral supplementation after approximately 4 hours [56],[57].

7. Conclusions

Perioperative nutritional support in patients who are malnourished or at risk of malnutrition in many cases has proven efficacy in preventing complications and reducing the length of hospitalization of surgical patients. The strongest evidence relates to oncological surgery. Every patient should be assessed for nutrition. Appropriate nutritional support should be implemented as soon as possible. Unfortunately, there is a lot of uncertainty and the current level of knowledge is insufficient to produce specific guidelines for the different disease entities treated with surgery. For this reason, we believe that further research is needed in the area of perioperative nutritional support in surgical patients.

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