Clinical Nutrition 36 (2017) 623–650

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

ESPEN guideline: Clinical nutrition in surgery

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ARTICLE INFO

Article history:
Received 11 February 2017
Accepted 13 February 2017

Keywords:
Surgery
ERAS
Perioperative nutrition
Enteral nutrition
Parenteral nutrition
Prehabilitation

SUMMARY

Early oral feeding is the preferred mode of nutrition for surgical patients. Avoidance of any nutritional therapy bears the risk of underfeeding during the postoperative course after major surgery. Considering that malnutrition and underfeeding are risk factors for postoperative complications, early enteral feeding is especially relevant for any surgical patient at nutritional risk, especially for those undergoing upper gastrointestinal surgery. The focus of this guideline is to cover nutritional aspects of the Enhanced Recovery After Surgery (ERAS) concept and the special nutritional needs of patients undergoing major surgery, e.g. for cancer, and of those developing severe complications despite best perioperative care. From a metabolic and nutritional point of view, the key aspects of perioperative care include:

- integration of nutrition into the overall management of the patient
- avoidance of long periods of preoperative fasting
- re-establishment of oral feeding as early as possible after surgery
- start of nutritional therapy early, as soon as a nutritional risk becomes apparent
- metabolic control e.g. of blood glucose
- reduction of factors which exacerbate stress-related catabolism or impair gastrointestinal function
- minimized time on paralytic agents for ventilator management in the postoperative period
- early mobilisation to facilitate protein synthesis and muscle function

The guideline presents 37 recommendations for clinical practice.

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http://dx.doi.org/10.1016/j.clnu.2017.02.013
0261-5614/

Important abbreviations and terms

BM	biomedical endpoints
EN	enteral nutrition (enteral tube feeding)
ERAS	enhanced recovery after surgery
ESPEN	European Society for Clinical Nutrition and Metabolism
HE	health care economy endpoint
IE	integration of classical and patient-reported endpoints
ONS	oral nutritional supplements
PN	parenteral nutrition
QL	quality of life
TF	tube feeding
Normal food/normal nutrition	normal diet as offered by the catering system of a hospital including special diets
Perioperative nutrition	period starting prior to surgery from hospital admission until discharge after surgery

1. Preliminary remarks – Principles of metabolic and nutritional care

In order to make proper plans for the nutritional support of patients undergoing surgery, it is essential to understand the basic changes in metabolism that occur as a result of injury, and that a compromised nutritional status is a risk factor for postoperative complications. Starvation during metabolic stress from any type of injury differs from fasting under physiological conditions [1]. Surgery itself leads to inflammation corresponding with the extent of the surgical trauma, and leads to a metabolic stress response. To achieve appropriate healing and functional recovery ("*restitutio ad integrum*") a metabolic response is necessary, but this requires nutritional therapy especially when the patient is malnourished and the stress/inflammatory response is prolonged. The negative effect of long term caloric and protein deficits on outcome for critically ill surgical patients has been shown again recently [2]. The success of surgery does not depend exclusively on technical surgical skills, but also on metabolic interventional therapy, taking into account the ability of the patient to carry a metabolic load and to provide appropriate nutritional support. In patients with cancer, management during the perioperative period may be crucial for long-term outcome [3,4].

Surgery, like any injury, elicits a series of reactions including release of stress hormones and inflammatory mediators, i.e. cytokines. The cytokine response to infection and injury, the so-called "Systemic Inflammatory Response Syndrome", has a major impact on metabolism. The syndrome causes catabolism of glycogen, fat and protein with release of glucose, free fatty acids and amino acids into the circulation, so that substrates are diverted from their normal purpose of maintaining peripheral protein (especially muscle) mass, to the tasks of healing and immune response [5,6]. The consequence of protein catabolism is the loss of muscle tissue which is a short and long-term burden for functional recovery which is considered the most important target [7]. In order to spare protein stores, lipolysis, lipid oxidation, and decreased glucose oxidation are important survival mechanisms [8]. Nutritional therapy may provide the energy for optimal healing and recovery, but in the immediate postoperative phase may only minimally counteract muscle catabolism, or not at all. To restore peripheral protein mass the body needs to deal with the surgical trauma and possible infection adequately. Nutritional support/intake and physical exercise are prerequisites to rebuild peripheral protein mass/body cell mass.

Patients undergoing surgery may suffer from chronic low-grade inflammation as in cancer, diabetes, renal and hepatic failure [9]. Other non-nutritional metabolic factors interfering with an adequate immune response have to be taken into account and, whenever possible, corrected or ameliorated before surgery. These are diminished cardio-respiratory organ function, anaemia, acute and chronic intoxications (e.g. alcohol, recreational drugs), medical treatment with anti-inflammatory and cytotoxic drugs.

The surgeon has to balance the extent of surgery according to nutritional state, inflammatory activity and anticipated host response. Severe pre-existing inflammation and sepsis influence healing negatively (wounds, anastomoses, immune function, etc.) but also decrease the benefit of nutritional therapy. Severely malnourished patients may exhibit an adynamic form of sepsis with hypothermia, leukopenia, somnolence, impaired wound healing and pus production, altogether leading to slow deterioration and mortality. In this situation nutritional therapy will not maintain or build up muscle mass but may restore an adequate stress response, promoting the chances of recovery. Awareness for the impaired inflammatory stress response means limiting the extent of the surgical trauma and may lead to uneventful recovery.

Severely compromised patients should receive perioperative nutritional therapy of longer duration or when acute intervention is required, surgery should be limited or minimally invasive interventional techniques should be preferred to relieve infection/ischaemia.

In order to optimize the mildly malnourished patient short-term (7–10 days) nutritional conditioning has to be considered. In severely malnourished patients longer periods of nutritional conditioning are necessary and this should be combined with resistance exercise. In the truly infected patient immediately dealing with the focus of sepsis ("source control") should have priority and no major surgery should be performed (risky anastomoses, extensive dissections etc.). Definitive surgery should be performed at a later stage when sepsis has been treated adequately.

In elective surgery it has been shown that measures to reduce the stress of surgery can minimize catabolism and support anabolism throughout surgical treatment and allow patients to recover substantially better and faster, even after major surgical operations. Such programmes for Fast Track surgery [10] later developed into Enhanced Recovery after Surgery (ERAS). A series of components that combine to minimize stress and to facilitate the return of function have been described: these include preoperative preparation and medication, fluid balance, anaesthesia and postoperative analgesia, pre- and postoperative nutrition, and mobilization [5,11–13]. The ERAS programmes have now become a standard in perioperative management that has been adopted in many countries across several surgical specialties. They were developed in colonic operations [11,14–17] and are now being applied to all major operations. ERAS programmes have been also successful in promoting rapid "functional" recovery after gastrectomy [18], pancreatic resections [19,20], pelvic surgery [21,22], hysterectomy [23], gynaecologic oncology [24]. In times of limitations in health care economy ERAS is also a reasonable contribution for the purpose of saving resources [25]. ERAS protocols have been also shown to be safe and beneficial in the elderly [26]. High adherence to ERAS protocols may be associated with improved 5-year cancer specific survival after major colorectal surgery [4].