Perioperative nutritional support

Marion J O'Connor
Julie I Dehavillande

Abstract

Malnutrition is a common and often unrecognized problem which increases the risk of postoperative morbidity and mortality. To identify those at risk, all patients should be screened on admission to hospital using a validated reliable tool (e.g. the Malnutrition Universal Screening Tool, MUST). Minimal perioperative fasting, carbohydrate loading and early enteral feeding all reduce postoperative complications and enhance recovery. Refeeding syndrome needs to be diagnosed and treated prior to initiating feeding. Enteral is the preferred route of feeding as it provides nourishment directly to the gut. If parenteral nutrition (PN) is indicated then close monitoring and strict guidelines need to be followed to reduce the risk of metabolic complications and line sepsis. PN is an integral part of the management of high-output enterocutaneous fistulae (ECF). A high-output ileostomy causes malnutrition and electrolyte abnormalities. Alterations to diet and fluids alongside medical management are necessary to reduce the high-output stoma.

Keywords Carbohydrate loading; enhanced recovery after surgery (ERAS); fistulae; high-output stoma; ileus; insulin resistance; malnutrition

The adverse effects of malnutrition in surgical patients have been documented from as early as 1936.[1] Despite this, it remains a common problem with an incidence of about 50%, exacerbated by hospital stay.[2] A suboptimal dietary intake for more than 14 days is associated with a high morbidity and mortality. To prevent complications (Table 1) associated with malnutrition, nutrition screening, assessment and support must become an integral part of the multidisciplinary care of the surgical patient.

Early detection is vital, therefore all patients should be screened on admission using a validated reliable tool, for example the Malnutrition Universal Screening Tool (MUST). This should be repeated at least once a week during their hospital stay. The tool should contain locally agreed care plans that can then be instigated to prevent and/or treat malnutrition.

Marion J O'Connor ***MSc BSc(Hons) RD*** *is a Specialist Dietician/Team Leader in Intestinal Failure, Total Parenteral Nutrition and Intestinal Transplant at the Oxford University Hospitals NHS Trust, Oxford, UK. Conflicts of interest: none declared.*

Julie I Dehavillande ***BSc(Hons) RD*** *is a Dietetic Team Leader for Critical Care/Neurosciences at the John Radcliffe Hospital, Oxford University Hospitals NHS Trust, Oxford, UK. Conflicts of interest: none declared.*

Nutritional assessment

This can be difficult in practice as there is no 'gold standard' which can be applied across all patient groups. A nutritional assessment should include the criteria listed in Table 2.

Anthropometric measurements such as mid-arm circumference (MAC), triceps skinfold thickness (TSF) and mid-arm muscle circumference (MAMC) are used to measure lean body mass and body fat stores. It is generally used in long-term nutritional support as a method of monitoring changes in nutritional status.

Preoperative nutrition support

Surgical patients in particular are an at-risk group as surgery, like any injury, imposes a stress on the body. The metabolic response to this stress is characterized by a hyper-metabolism and catabolism mediated by hormones and cytokines. This is designed to mobilize tissues for defence and repair mechanisms. The magnitude and duration of this response are related to the severity of the stress.

Obese surgical patients are at greater risk as the mortality from surgery is higher in obese compared to non-obese individuals. Contributory factors are hyperglycaemia, hypertension, and precipitation of cardiovascular events. The perioperative complications of obesity result from respiratory failure, impairment in fibrinolysis, a hypercoagulable state, and decreased resistance to infection. With catabolic illness, lean body mass may waste rapidly despite the presence of excess adipose tissue.

The benefit of early detection of malnutrition and subsequent provision of nutrition support is to reduce the risk of postoperative complications. This will be achieved by minimizing negative protein balance so as to maintain muscle mass, immune and cognitive function and enhance postoperative recovery. To ensure the patient is in an optimal nutritional state, all elective surgery patients should have a nutritional assessment performed at the pre-assessment clinic. This could be as simple as a weight, height, body mass index (BMI), percentage weight loss and identification of any factors which may affect nutritional intake prior to surgery. For high-risk patients, a referral should then be made to a dietitian who will carry out a more in-depth assessment and arrange the provision of nutrition support as indicated. If possible, especially in high-risk patients, surgery should be postponed until there is an improvement in the nutritional status.

Consequences of malnutrition

- Impaired immune function/infections
- Delayed wound healing
- Increased risk of postoperative complications
- Muscle wasting and weakness which affects:
  - respiratory function/chest infections
  - cardiac function/heart failure
  - mobility/deep vein thrombosis/pulmonary embolism and pressure sores
- Apathy, depression and neglect

Table 1

Perioperative nutrition support

Once the nutritional status is optimized preoperatively, measures to reduce the stress induced by surgery and facilitate the return of function should be instigated. The Enhanced Recovery After Surgery programme (ERAS) provides guidance on how to achieve this (Table 3). The aspects of this programme that are relevant from a nutritional perspective are reduced pre- and postoperative fasting, carbohydrate loading, early mobilization and early feeding postoperatively.

Criteria for nutritional assessment

History	Identify any pre-admission factors which have led to malnutrition
	Clinical condition
	Weight (only useful in the absence of oedema or dehydration)
	Height
	Body mass index (BMI) ¼ weight/height (kg/m^2):
	• BMI <18 ¼ underweight
	• BMI 20–25 ¼ normal weight
	• BMI >30 obese
	Weight loss history
	• % weight loss ¼ usual weight − current weight/usual weight × 100
	• a weight loss of >10% in the preceding 6 months is significant
	Appetite
	Food intake history
	Gastrointestinal symptoms
	Fever
	Medical and drug history
Disease status	Temperature
	Inflammatory markers, e.g. C-reactive protein (CRP)
	Nutrient losses, e.g. wounds, fistulae, ileostomy etc
Functional assessment	Muscle strength using hand dynamometry which correlates well with outcome in surgical patients
Laboratory tests	Inflammatory markers
	Albumin – as this is an acute phase protein, it must be interpreted in conjunction with CRP
	Prealbumin
	Transthyretin
	Transferrin
	Nitrogen balance
	Vitamins, minerals and trace elements especially where deficiencies are suspected
Fluid balance	Examine for dehydration or oedema
	Monitor daily weights to record changes in fluid balance
	Measure urea, creatinine, and electrolyte levels as clinically indicated

Table 2

The multimodal approach to enhanced recovery after surgery (ERAS)

Pre-admission counselling	Avoidance of fluid and sodium overload
No bowel preparation	Warm environment
Reduced fasting times	No drains
Carbohydrate loading	Early mobilization
Mid-thoracic epidural anaesthesia	Early removal of catheters
Short-acting anaesthetic agent	Non-opiate analgesia
Short incisions	Stimulate gut motility
No nasogastric tubes for gastric drainage	Perioperative nutrition

Table 3

One of the main observations during the catabolic response to injury is the development of insulin resistance. It can result in dehydration, weight loss, fatigue, poor wound healing, increased risk of infectious complication and a reduction in lean body mass as a result of increased nitrogen losses. The magnitude, type and duration of surgery as well as perioperative blood loss are all factors which contribute to its development. It can be present for up to 10 days postoperatively.[3] The recommendations for minimizing postoperative insulin resistance are listed in Box 1.

In recent years, traditional guidelines to fast patients preoperatively have been abandoned as there is lack of evidence that it reduces the risk of aspiration. There is now a much stronger evidence base showing the benefit of allowing free fluid intake up to 2 hours before surgery. Consequently many anaesthesiology societies have changed their guidelines regarding fasting. Food is now allowed up to 6 hours before surgery and clear oral fluids or carbohydrate loading drinks up to 2 hours before surgery.

Preoperative carbohydrate loading

Carbohydrate loading ensures that the liver and muscle glycogen stores in the body are replete thus optimizing the metabolic response to surgery. It improves the postoperative recovery period by its effects on reducing insulin resistance, improving protein balance, preservation of lean body mass and muscle strength and reducing length of hospital stay. It involves the use of specially formulated carbohydrate drinks which leave the stomach rapidly as they have a low osmolality. They achieve an insulin response similar to that which is seen occurring after a normal meal. This ensures that the patient is in the 'fed' or

Factors to reduce postoperative insulin resistance

- Reduce fasting preoperatively
- Carbohydrate loading preoperatively
- Consider operative procedure, i.e. minimally invasive
- Early postoperative nutrition

Box 1