

Review Article

Perioperative nutrition in colon and rectal cancer surgery

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ABSTRACT: Objective: The purpose of the present review is to outline recent findings on the indications for, and efficacy of, perioperative nutrition in patients with colon or rectal cancer.

Methods: A critical analysis was made of the randomized controlled trials and meta-analyses focused on perioperative nutrition in colon and rectal cancer surgery, including the current guidelines from the European and American professional societies.

Results: The preoperative use of immunonutrients improved postoperative outcomes in terms of infection rate and length of stay, both in well-nourished and undernourished patients. Contrasting results regarding reduction of infectious complications and bacterial translocation are reported for the preoperative use of probiotics. Postoperative artificial support is indicated only in patients who are not able to meet their caloric requirements orally within 7 days and in patients with postoperative complications impairing gastrointestinal function. In these patients, enteral feeding or a combination of enteral and parenteral feeding is indicated. In cases of prolonged gastrointestinal failure, parenteral nutrition is life-saving.

Conclusion: There are very few indications for standard postoperative artificial nutrition in colon and rectal cancer patients with a fully functioning gastrointestinal tract. Perioperative nutrition should be reserved for malnourished patients. (*Nutritional Therapy & Metabolism* 2009; 27: 83-8)

KEY WORDS: Colon, Immunonutrition, Nutrition, Postoperative outcome, Probiotics, Rectum, Surgery

INTRODUCTION

In the era of laparoscopic surgery and enhanced recovery protocol programs (fast-track surgery), there are very few indications for standard postoperative artificial nutrition in colon and rectal cancer patients with a fully functioning gastrointestinal tract, mainly due to (i) the fact that the practice of postoperative fasting along with nasogastric suction has now been abandoned (1, 2), (ii) patients eat normal food within 1 to 3 days after surgery, and (iii) the majority of patients with colon or rectal cancer have a normal nutritional status (3).

Consensus statements and guidelines from European and American professional societies have recommended that perioperative nutrition should be reserved for a subset of surgical patients – those who have an increased likelihood of developing complications after surgery, namely patients who have suffered substantial weight loss, have a very low body weight (body mass index under 18.5-22), or exhibit inflammatory activity (4-8). Unnecessary standard postoperative nutritional support is associated with either no benefit or increased surgical

morbidity (3). At the present time, however, severe malnutrition is a rare condition, due to early diagnosis; or if present, it may be an expression of metabolic aberrations that result from advanced cancer with a subsequent failure of surgical radical resection.

The aim of the present manuscript is to review the current indications for perioperative artificial nutrition in colon and rectal surgery patients according to evidence-based medicine.

PREOPERATIVE PERIOD

Standard preoperative nutritional artificial support is not indicated in routine management of well-nourished colon or rectal patients who are candidates for surgical resection, but only in severely undernourished patients (with weight loss > 15%) who cannot be adequately fed orally. These represent about 3%-5% of the whole patient population (5, 9).

In modern surgical practice, morbidity and length of stay should be considered as the principal outcome para-

meters in evaluating the benefits of nutritional support. To accomplish good outcomes in these areas, different strategies can be used even in well-nourished patients with colon or rectal disease. The use of noninvasive forms of nutritional support such as oral mixtures (immunonutrients or oral preoperative carbohydrate loading) should represent the first choice, because of their cost-effectiveness and the fact that they do not require hospitalization. Their use in normally nourished or undernourished patients is directed not toward providing calories and nitrogen, but toward modulating the patients' response to metabolic changes induced by the surgical stress, which may in itself increase patient susceptibility to postoperative complications.

There is evidence from the literature that the administration of immunonutrients such as glutamine, omega-3 fatty acids, arginine, sulphur-containing amino acids, and ribonucleic acid fragments can modulate immune and inflammatory responses and gut perfusion/oxygenation, resulting in better outcomes, regardless of baseline nutritional status, after either conventional surgery or laparoscopic colorectal surgery (10-19). These key substrates have a pharmacological rather than a nutritional action. They can be administered in the postoperative course, but the best strategy is to give them before surgery to obtain adequate levels at the time of surgical stress when the need for modulation of the immune system is maximized (12, 14, 16, 17). A period of 5 days has been indicated as the minimum period for preoperative immunonutrition administration, while the maximum was fixed at 10 days in a 2001 consensus meeting on this topic (20). In 2 recent trials published by our group, in which colorectal patients represented almost 30% of the whole surgical population, patients were randomized to preoperative or perioperative immunonutrition or no supplementation. The results showed that preoperative supplementation was as effective as perioperative in improving outcome, and both treatments were superior to no supplementation. It was also shown that preoperative administration of a specialized diet, despite the higher cost of the formula, was cost-effective in well-nourished gastrointestinal cancer patients mainly due to the reduction in infection rate in the treated group (21, 22). Another recent paper from our institute, which included 200 colon or rectal cancer patients, reached similar conclusions (17). In fact, preoperative administration of oral arginine and omega fatty acids improves the immunometabolic response and decreases both the infection rate and postoperative length of stay. Postoperative prolongation with such supplemented formulas has no additional benefit. Moreover, in the 2 groups of patients receiving immunonutrients, a significantly better immune response, gut oxygenation, and bowel microp-

erfusion was observed. These last findings deserve major consideration, due to their possible implications for the healing of intestinal anastomoses. A decreased colon microperfusion, as assessed by intraoperative laser-Doppler, was significantly correlated with an increased anastomotic leak rate in rectal surgery (23).

With increasing evidence of the role of the patient's own intestinal microbiota in surgical infection following major surgery, another proposed preoperative prophylactic strategy is to administer probiotics. The rationale of using probiotics is linked to their ability to reduce the load of intestinal pathogens, to the inhibitory action in the production of the antiinflammatory cytokine IL-6, to the production of antiinflammatory cytokine interleukins such as IL-10, to the stimulation of nonspecific resistance to microbial pathogens by activation of macrophages, to increased systemic and mucosal IgA response, and to their modulatory effect on the immune intestinal cell population, on the intestinal epithelium in maintaining its gut barrier function and possibly reducing bacterial translocations, with potential effects in improving postoperative outcomes (24-26). However, many of these claims are based mainly on the findings of animal studies (27-29). To support these hypotheses in clinical practice as well, various randomized controlled trials (RCTs) of probiotics in major abdominal surgery, liver resection, transplantation, and acute pancreatitis surgical patients have been published in the last few years (30-35). Different species of probiotics have been administered preoperatively and/or postoperatively. Moreover, as emerged in a recent review on probiotics in surgery, prebiotics (mostly oligosaccharides), in addition to probiotic strains, have also been used in many RCTs, and the considerable heterogeneity among these studies makes the results difficult to analyze. Contrasting results have emerged from the aforementioned studies, with the major benefits in terms of reduction of postoperative infectious complications observed in patients with a high risk of postoperative infections, such as those undergoing pancreatic surgery or a liver transplant, while the majority of studies dealing with elective gastrointestinal surgery have failed to demonstrate a positive effect for probiotics (24). In particular, studies dealing with colon or rectal surgery only, have shown no positive effect of either probiotics or synbiotics on infectious complications and bacterial translocations (33, 35). Before probiotics can be implemented in daily practice to prevent infectious complications in elective general surgery or in colon and rectal surgery, further studies including large samples of patients, with adequate statistical power, would be needed to detect the effects of probiotics on morbidity and mortality.

Different preoperative strategies to minimize postin-

flammatory and immune response after surgery have been analyzed in the present review. Among these prophylactic measures, mention should be made of the preoperative use of oral mixtures of complex carbohydrates, maltodextrins in a concentration of about 12.5%, which minimize insulin resistance and attenuate loss of muscle function, alone (36) or within the context of a multimodal enhanced recovery protocol in colon and rectal surgery (37). For those patients who cannot eat or are not allowed to drink preoperatively for whatever reason, a glucose infusion at a rate of 5 mg/kg per minute will have a similar effect (39-42).

POSTOPERATIVE PERIOD

In well-nourished patients, the restoration of normal gastrointestinal function to allow adequate food intake and rapid recovery should be considered one of the primary objectives of postoperative care.

In recent years, the postoperative care of patients who have undergone colon or rectal surgery has been substantially changed. A meta-analysis including 11 RCTs, 5 of which were focused on colon surgery only, showed no benefit in patients fasting after any type of elective gastrointestinal surgery including colon surgery. Early feeding reduced both the risk of any type of infection and the mean length of stay in hospital, and it was not associated with an increased risk of dehiscence of the gastrointestinal anastomosis (43). The advent of laparoscopic surgery, with evidence that patients could be routinely and safely fed within 48 hours after surgery regardless of clinical documentation of bowel activity, has made a significant contribution to the changes in postoperative care in colorectal surgery (44-48). Moreover, in recent years, evidence has emerged that many of the perioperative routine practices have a major impact on how well nutritional support is tolerated by postoperative patients. These changes in perioperative practices involve multiple components that combine to minimize stress and to facilitate the return of bowel function. They include preoperative preparation and medication with avoidance of intestinal washout and routine nasogastric suction, not having patients fast overnight before elective surgery, short surgical incisions, optimization of fluid balance with avoidance of perioperative fluid overload, tailored anaesthesia and postoperative analgesia regimens, perioperative nutrition, and early mobilization (49). All of these measures, which have mainly been applied in colon and rectal surgery, are part of what is termed "fast-track" or enhanced recovery protocol after surgery. A reduction in the duration of paralytic ileus, an enhanced oral nutrition, and a shortened length of stay

are the major consequences of the adoption of the multimodal approach (50-55). Recently, the use of mu opioid antagonist (alvimopan) has been also indicated as a valid method to accelerate the return of gastrointestinal function after surgery and subsequent hospital discharge, after both conventional colon resection and enhanced recovery protocols, as shown by a number of RCTs and meta-analyses (56-58).

These findings have recently been stressed by Kehlet (53), and confirmed by Wind and coworkers in a recent systematic review on this topic including more than 500 patients (54). These results are maximized if the team is experienced with the program, as reported by Delaney et al, who found that fast-track patients treated by an experienced fast-track surgeon spent significantly less time in hospital than fast-track patients who were treated by a surgeon less experienced with the program (51).

According to the modern surgical principles mentioned above, at present there is an indication for postoperative artificial nutrition only in colon or rectal patients who are not able meet their caloric requirements within 7 to 10 days after surgery (4-8). Because of the worldwide increasing diffusion of enhanced recovery protocols, which allow the majority of patients to return to oral feeding very quickly, the numbers of these patients are progressively declining. Postoperative artificial nutrition is also indicated in patients with postoperative complications impairing gastrointestinal function for at least 7 days. In these patients, enteral feeding or a combination of enteral and parenteral feeding should be considered as the first choice (8). Studies including trauma or gastrointestinal surgery patients, in fact, showed that patients fed enterally rather than parenterally in the postoperative period had a significantly better outcome with a reduction of postoperative morbidity and hospitalization (9, 59-61). In these patients, a full range of vitamins and trace elements should be supplemented on a daily base. The enteral route should be referred to parenteral nutrition, except for in patients with the following contraindications: intestinal obstruction or ileus, small bowel fistulas with high output, impaired splanchnic perfusion, or intestinal ischemia (55). In complicated colon or rectal cancer patients with prolonged gastrointestinal failure, parenteral nutrition is life-saving (8).

In malnourished patients with a normal functional gastrointestinal tract, there is a rationale for the use of oral nutritional supplements (ONSs) in the postoperative period (55, 62-64). These products are easy to administer, comparatively cheap, and free from complications (64-67). ONSs should be continued at home in addition to normal food, as was concluded in a recent consensus review on clinical care for patients undergoing colonic

resection (55). The timing of maintaining ONS depends on individual circumstances and varies between 2 weeks and 4 months (64-67). Eight weeks has been proposed as the period for the prescription of ONS, in terms of recovery of nutritional status, protein economy, and quality of life (63).

CONCLUSION

In modern surgical practice, colon and rectal cancer patients should be managed with the enhanced recovery protocol and thereby should be able to eat normal food within 1-3 days after surgery. Thus, little room is left for

routine perioperative artificial nutrition, which should be reserved for malnourished patients or patients who cannot be adequately fed orally.

Conflict of interest: none declared.

Financial support: none.

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Received: February 4, 2009

Accepted: February 26, 2009