Nutrition Support in Gastrointestinal Disease

James S. Scolapio  Donna J. Smith
Division of Gastroenterology, University of Florida, Jacksonville, Fla., USA

Introduction

This review focuses on the nutrition support of hospitalized patients with gastrointestinal disease that require nutrition support with either total enteral nutrition (TEN) or total parenteral nutrition (TPN). When to begin nutrition support, how to deliver the formula, the type of formula and the nutritional treatment for specific gastrointestinal disease states are discussed below.

When to Provide Nutrition Support

The physician’s primary role includes taking a complete medical history and physical examination to determine how best to manage the patient’s nutritional needs including enteral access for the gastroenterologist. It is also the physician’s responsibility to be knowledgeable of the current nutrition literature and published guidelines and how these relate to the patient’s specific gastrointestinal disease process.

No single laboratory test can assess the presence or severity of malnutrition. The medical history including questions about nutrition in-
take and weight change along with a focused physical examination are probably the best tools for determining a patient’s nutrition status, i.e. normal or severely malnourished. The subjective global assessment classification score for patients has been shown to correlate with more sophisticated laboratory tests [1]. Patients are given the following scores: ‘A’ normal nutrition reserves, i.e. no weight loss history and no signs of muscle or fat wasting on physical examination; ‘B’ less than 10% weight loss over the previous 6 months with some evidence of muscle or fat wasting, and ‘C’ greater than 10% weight loss over the previous 6 months with little or no oral intake of food over the previous 2 weeks. Patients scored C usually have obvious muscle and fat wasting upon physical examination and are considered at high risk of having severe malnutrition.

In most patients who receive a score of A or B, the physician should wait 10–14 days before administering TEN or TPN. Usually, the patient’s underlying medical problem that prohibited the adequate intake of food is corrected within this time period. Patients with severe malnutrition (score C) probably derive the most benefit from either TEN or TPN [2].

The second factor for considering when to feed a patient is his/her disease severity. An example would be a patient with severe pancreatitis who is scored A or B in whom it may take over 2 weeks to regain the ability to take adequate oral nutrition; in this case, starting TEN or TPN earlier than 14 days would be appropriate and recommended. Patients scored C should have TEN or TPN started within 48 h of hospitalization.

**TPN versus TEN**

If a patient cannot ingest an adequate amount of food by mouth, then TEN (nasogastric or nasoenteric tube feeding) or TPN will be necessary [3, 4]. Percutaneous gastrostomy and percutaneous jejunostomy feeding tubes should only be considered in those patients that you suspect will require TEN for more than 4 weeks’ duration. A gastroenterologist plays a key role in providing enteral access for a patient. In patients requiring short-term nutrition support, defined as less than 30 days, nasogastric or nasoenteric placement of a 10- to 12-Fr polyurethane tube is appropriate. Smaller tubes have a higher occurrence of occlusion. Larger tubes, i.e. 16 Fr, may inhibit LES (lower esophageal sphincter) function, thereby increasing the risk of aspiration of gastric contents and may cause significant nasal irritation. In patients at risk of gastric aspiration (i.e. delayed gastric emptying, high gastric residuals, supine position) nasoenteric feeding should be used. Feeding distal to the ligament of Treitz reduces the risk of gastric regurgitation and pulmonary aspiration. Before starting the tube feeding, correct tube position should be confirmed by X-ray. Percutaneous endoscopic gastrostomy tubes should be used when patient recovery is anticipated to take more than 30 days. Contraindications to long-term placement devices may include both mechanical and ethical end of life issues. A speech/swallow pathologist should assess a patient’s swallow function before placement of a long-term device, to prevent inappropriate placement.

TPN should only be used in those patients in whom TEN is not possible. This may be the result of a mechanical intestinal obstruction, intestinal fistula, or medical illness that does not allow safe passage of a feeding tube. TPN is associated with complications including catheter sepsis and risk of hyperglycemia.

**Formula Selection**

A dietician and pharmacist can be very helpful when designing the appropriate enteral or parenteral feeding formula. If a patient is not obtaining adequate oral nutrition, then TEN or TPN formula should be calculated to provide approxi-
mately 25–30 kcal/kg/day [3]. The nutrient mix or ratio should contain approximately 30% of the total calories as lipid, protein should provide 1.0–1.5 g/kg/day, and the remaining macronutrient should be given as carbohydrate. Patients should obtain their goal rate of nutrition infusion over a 48- to 72-hour period.

Tube feeding can be infused one of three ways: bolus syringe infusion, gravity infusion or by continuous pump feeding [3]. Bolus and gravity feeding are also referred to as intermittent feeding. Small bowel feeding should be done by continuous pump delivery to reduce gastrointestinal intolerance such as abdominal cramping and diarrhea. Infusion rates greater than 120 ml/h may result in gastrointestinal bloating and diarrhea. If a patient cannot tolerate the higher infusion rate, a calorically dense formula can be used. In patients at risk of aspiration of gastric contents, using a continuous pump infusion may minimize the risk of aspiration. Feeding should be started at 20 ml per hour and advanced to the target rate over a 48-hour period. Intermittent gastric feeding involves a larger volume per feeding than controlled continuous feeding using a pump. With gravity feeding, starting with one can of formula (approx. 240 ml) administered over 1 h and advancing to the target number of feedings (4× per day) and volume (1–2 cans per feeding) is recommended. Bolus or syringe feeding is not encouraged in most hospitalized patients. Cyclic continuous feeding, i.e. 10–12 h during sleep may help stimulate appetite and oral intake during the day while supplying necessary supplemental calories. Certain medications (Dilantin®, ciprofloxacin, and Sinemet®) may bind to the formula and result in reduced absorption. Spacing of medications an hour before or after feeding is recommended. Feeding tubes should routinely be flushed with at least 20–30 ml of additional water every 4 h during continuous feeding and before and after intermittent feedings and medication delivery to prevent tube occlusion.

TEN formulas usually contain 1 kcal per milliliter of formula and approximately 44 g of protein per 1 liter of formula. Elemental and semi-elemental formulas have small-peptide proteins, which are easier to absorb, as well as less total fat compared to traditional polymeric formulas. Most of the polymeric formulas are isotonic and therefore dilution with water during infusion is not necessary. Enteral formulas contain approximately 84% free water, and the remaining daily fluid needs of the patient, which is approximately 30 ml/kg/day, are given as tube flushes using regular tap water. Typically in the hospital setting, tube feeds are administered via a 24-hour pump infusion.

Standard polymeric formulas should be used in the majority of patients [3]. Most formulas contain 1 kcal per ml of fluid, 44 g of protein per liter, and approximately 30% lipid. These formulas are lactose and gluten free. Formulas do not require dilution with water before infusion.

**Specific Gastrointestinal Disease Management**

**Acute Pancreatitis**

It had been standard practice to administer TPN to all patients with severe pancreatitis, assuming that this would rest the pancreas compared to stimulation of pancreatic enzyme secretion using enteral feeding. However, a study has questioned the wisdom of this practice [4]. In fact, acute severe pancreatitis is an example where enteral nutrition appears more favorable than TPN [4]. Although there are no data to suggest enteral nutrition improves clinical outcome (faster resolution of pancreatitis) compared to nil per os and i.v. fluids, the data would suggest enteral nutrition is associated with less infectious complications, improved inflammatory response and improved APACHE II scores compared to TPN [4]. Nasojejunal feeding, using either a polymeric formula or semi-elemental formula, administered within 48 h of hospitalization, appears beneficial compared to TPN.
**Gastroparesis**

The diagnosis of gastroparesis is based on the combination of symptoms of early satiety and delay of gastric emptying of a solid phase meal. Markedly uncontrolled glucose levels may aggravate symptoms of gastroparesis and delay gastric emptying. Glycemic control should be optimized, and medications that induce delayed gastric emptying should be stopped when possible. Oral nutrition is preferable for nutrition and hydration, using small, frequent low-fat, low-fiber meals. If patients are unable to tolerate solid foods, then homogenized or liquid meals are recommended. If oral intake is insufficient, then jejunal feeding should be pursued. Metoclopramide is the first line of prokinetic therapy and should be administered in the lowest effective dose because of potential side effects. Gastric electric stimulation may be considered for compassionate treatment in patients with refractory symptoms [5]. Completion gastrectomy should only be considered in patients with severe refractory symptoms. Acupuncture can be considered as an alternative therapy [5].

**Inflammatory Bowel Disease**

High dietary fats and meats are associated with an increased risk of inflammatory bowel disease. Among the various dietary interventions, none have shown significant clinical efficacy. A meta-analysis of 16 prospective randomized trials in Crohn’s patients reported that the frequency of clinical remission of small bowel disease after treatment with steroids was 80%, compared with 60% after treatment with an elemental or polymeric diet alone [6, 7]. Pooled data of studies comparing polymeric (standard formulas) and elemental formulas showed no advantage with elemental formulas (65 vs. 61% remission rates). Published studies do not support the concept that improved nutrition status coupled with ‘bowel rest’ improves clinical remission rate and avoids the need for colectomy in chronic ulcerative colitis and Crohn’s colitis patients. Patients with active inflammatory bowel disease may be deficient in micronutrients such as vitamin D and iron. Micronutrient levels in the blood should be checked and replaced accordingly. The use of preoperative TPN appears to only benefit those patients with severe malnutrition.

**Short Bowel Syndrome**

Short bowel syndrome and the need for TPN usually results when a patient has had a surgical resection with less than 150 cm of small intestine remaining [8]. Short bowel results from intestinal vascular events, larger resections for Crohn’s disease and other intestinal disorders such as volvulus and adhesive disease. TPN is usually required until intestinal adaptation occurs. The type of oral diet given to a patient with short bowel syndrome depends on whether part of the colon is remaining. Those patients with a colonic remnant benefit from a high complex carbohydrate diet low in fat. Likewise, patients should be placed on a low-oxalate diet. Those patients without a colonic remnant do not require a specific diet and are encouraged to eat small frequent meals throughout the day. Antidiarrheal medications are also helpful in slowing gastrointestinal transit, thus promoting fluid and nutrient absorption. Trophic factors including growth hormone and glucagon-like peptide-2 (GLP-2) have been FDA approved in a select group of patients with short bowel syndrome. Intestinal transplant is also a treatment option in a select group of patients with short bowel syndrome. This would include those patients with pending end-stage liver disease from TPN, loss of venous access and recurrent catheter infections.

**Conclusions**

- Following the recommendations of peer-reviewed published guidelines is recommended in treating patients with gastrointestinal disease who require nutritional support.
• TPN or TEN should only be used in those patients who cannot obtain adequate oral nutrition and hydration.
• Although nutrition support is usually begun on day 10 of inadequate oral nutrition, patients with severe acute pancreatitis appear to benefit when TEN is started within 48 h of hospital admission.
• Patients with IBD and SBS may have significant micronutrient deficiencies, and replacement is usually recommended.
• Newer therapies for gastroparesis include electrical stimulation (pacemaker) and acupuncture. Novel trophic factors including glucagon-like peptide-2 have been approved for the nutritional treatment of short bowel syndrome.

References