

ADVANCES IN IBD

Current Developments in the Treatment of Inflammatory Bowel Disease

Section Editor: Stephen B. Hanauer, MD

Overview of Total Parenteral Nutrition in Patients With Inflammatory Bowel Disease



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G&H How often does malnutrition occur in the setting of inflammatory bowel disease?

HB Malnutrition is very prevalent among patients with inflammatory bowel disease (IBD). It can occur in up to 70% of patients with active disease and up to 38% of patients in remission. Malnutrition is caused by reduced oral intake, increased metabolic demand, and gastrointestinal losses. Malnutrition and sarcopenia in patients with IBD have been associated with increased hospitalizations, disease flares, need for surgery, and postoperative complications. These outcomes highlight the need for screening this patient population for malnutrition at the time of diagnosis and thereafter on a regular basis in clinic.

G&H What is the role of diet in IBD?

HB The effect of diet on disease activity is currently being studied but is poorly understood. Epidemiologic data often implicate dietary lipids, fatty acid imbalance, and several animal proteins as potential dietary factors that could increase predisposition to IBD. The rising incidence of IBD in Western countries has supported the hypothesis that diets high in fat and low in fiber have led to an increase in IBD. Certainly, smoking, antibiotic use, and diet are potentially reversible risk factors for IBD.

Although there is no diet that can generally be recommended to promote remission in IBD patients with active disease, guidelines from the European Society of Parenteral and Enteral Nutrition (ESPEN) state that a diet rich in fruits and vegetables, high in n-3 fatty acids, and low in n-6 fatty acids is associated with a decreased risk of developing Crohn's disease or ulcerative colitis, and

is therefore recommended. There has been interest in a number of diets, including the specific carbohydrate diet, Paleolithic diet, gluten-free diet, anti-inflammatory diet, and Ayurvedic diet, as well as the low-fermentable oligosaccharide, disaccharide, monosaccharide, and polyol diet. However, randomized controlled trial data regarding the effectiveness of these experimental diets on intestinal inflammation and inducing/maintaining remission are still lacking at this time.

G&H What are the benefits of using total parenteral nutrition in patients with IBD?

HB Although total parenteral nutrition (TPN) is not recommended as first-line therapy in IBD, it allows for bowel rest while supplying adequate caloric intake and essential nutrients. TPN can help correct malnutrition and maintain homeostasis, promote wound healing in the perioperative period, prevent dehydration, and correct electrolyte imbalance. Increased nutritional status has been shown to improve bowel motility and intestinal permeability as well as reduce inflammatory reactions.

G&H What are the most common indications for TPN in patients with IBD?

HB Per ESPEN guidelines, TPN is indicated only when enteral nutrition, or oral or tube feeding, has failed or is impossible. Enteral nutrition is associated with significantly fewer complications than TPN in patients with IBD and so is used more often in this setting. TPN is indicated when a patient with IBD has intestinal failure; obstructed bowel; no possibility of having a feeding tube

placed beyond the obstruction; or that process has been tried and has failed. TPN is also indicated when there are complications such as anastomotic leaks or high-output fistulas that require complete bowel rest.

Per ESPEN guidelines, TPN should not be used in patients with ulcerative colitis unless intestinal failure has occurred. Enterocutaneous fistula repair and bowel rest with TPN have had mixed success in patients with Crohn's disease, but typically Crohn's disease patients with proximal fistulas and/or very high-output fistulas should receive nutritional support with either partial or

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exclusive TPN based on ESPEN guidelines. TPN has also been shown to be effective in patients with Crohn's disease in the pre- and postoperative periods or the perioperative period in the setting of surgical intervention. TPN should be initiated if a patient is malnourished at the time of emergency surgery or if an oral diet cannot be recommended within 7 days after the surgery.

G&H What outcomes have been reported with the use of preoperative TPN?

HB The administration of TPN preoperatively may reduce overall postoperative complications such as anastomotic leaks, wound healing, and septic complications in malnourished patients with Crohn's disease. Cohort studies have shown a reduction in postoperative morbidity in patients with Crohn's disease who receive TPN for at least 5 days. At Northwestern Medicine, my colleagues and I typically use TPN for 7 days preoperatively in patients with malnutrition who are undergoing elective surgery.

There are protocols for enhanced recovery after surgery, which aim to accelerate postsurgical recovery and thus reduce the length of TPN needed. The goals of these protocols are to avoid long periods of preoperative fasting, reestablish oral feeding as early as possible after surgery, integrate nutrition into the overall management of the patient, establish metabolic control with blood glucose and electrolytes, reduce factors that exacerbate stress-

related metabolism or impairment of the gastrointestinal function, and promote early mobilization to facilitate protein synthesis and muscle function.

G&H How does the TPN used for patients with IBD compare with the formula used for other patients?

HB Typically, the TPN only differs in terms of protein requirements, which are increased in patients with active IBD compared with the general population. The latter typically needs 1 g/kg/day of protein, whereas patients with active inflammation can require up to 1.2 to 1.5 g/kg/day of protein. In postsurgical patients who have fistulas or who have wound healing that needs to be accelerated, those requirements can sometimes increase to 2.0 to 2.5 g/kg/day. A multidisciplinary team of physicians, dietitians, and pharmacists can help determine the nutritional requirements of patients on a case-by-case basis. Each TPN formula should be tailored specifically to the patient and his or her particular electrolyte or nutritional requirements.

G&H Are different formulas available for patients with IBD who have allergies?

HB Yes. TPN is primarily composed of dextrose (the form of carbohydrate used), amino acids (the protein used), and fats in addition to an admixture of electrolytes, vitamins, and minerals. The most common allergies involve egg, which is a component of the fat emulsion. Egg allergy can be mitigated by changing the fat emulsion to one with a mixture of soybean oil, medium-chain triglycerides, olive oil, and fish oil. Patients can also occasionally have an allergy to a preservative within the multivitamin in TPN.

TPN is initiated within a hospitalized setting over the span of at least 5 to 7 days for a patient planning to go home on it. Physicians can typically determine whether the patient is having an allergic response by monitoring the patient closely. Determining what is causing the allergic response, and if it is related to the TPN at all, may require the help of allergy/immunology colleagues and exposing the patient to either the multivitamin or the lipid formulation separately. That is why TPN should only be initiated in a hospitalized setting.

G&H What are the possible complications or risks with using short- or long-term TPN in patients with IBD?

HB Some of the risks of TPN are associated with the fact that it is provided through central venous access because

of the high osmolarity of the compound. Unfortunately, this can lead to venous access issues such as bleeding, vascular injury, pneumothorax arrhythmia, and even air embolism. Long-term use of venous access can also lead to central line–associated thrombosis or blood clots. Another risk of central venous access involves infections, also known as central line–associated bloodstream infections (CLABSIs), which can carry a mortality rate of up to 15% when resulting in sepsis.

One concern when TPN is first initiated is refeeding syndrome, a potentially fatal condition that can result from rapid changes in fluids and electrolytes when malnourished patients are given oral, enteral, or parenteral feedings. Patients with ongoing electrolyte losses from diarrhea, vomiting, or fistulas are at increased risk for

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refeeding syndrome. This condition is defined primarily by manifestations of severe hypophosphatemia that can result in respiratory failure, cardiovascular collapse, rhabdomyolysis, seizures, and delirium. However, hypokalemia, hypomagnesemia, and Wernicke encephalopathy from thiamine deficiency can also occur in this setting.

Other risks of long-term TPN use include electrolyte derangements, vitamin and mineral deficiencies (particularly essential fatty acid deficiencies), and sometimes even TPN-induced hepatic dysfunction or hepatic steatosis. Thus, patients need to be monitored closely while using TPN, and these conditions should be corrected as soon as they are identified.

G&H How can clinicians prevent or reduce these complications or risks?

HB To prevent TPN-associated complications, TPN should always be initiated in a hospital setting and ideally managed by a multidisciplinary team of physicians, dietitians, pharmacists, and allied health providers such as nurses and physician assistants to monitor shifts in electrolytes and check for vitamin and mineral deficiencies before and after TPN administration. TPN should be monitored closely after patients are discharged home on it

as well. Our typical practice at Northwestern Medicine is to check laboratory test results weekly when patients are first started on TPN and then adjust the TPN formula as needed to account for electrolyte shifts and hydration status. Patients will require home health aid for weekly sterile dressing changes to the central line to help prevent CLABSIs and also protect the integrity of the central line.

G&H How long do patients with IBD typically require TPN, and are there ways to reduce the duration?

HB The duration of TPN usually depends on the initial indication for TPN. For instance, if TPN is used in an effort to optimize the patient's nutritional status in the perioperative period, then it can be used for only a short time, in the span of days or weeks, in the hospitalized setting. For patients with a high ostomy output, closure of enterocutaneous fistulas, stricturing disease that precludes adequate oral intake, or short bowel syndrome owing to extensive small bowel resections, TPN can be used for longer durations. Medicare currently defines long-term use of TPN as the administration of TPN for at least 3 months and typically covers it under the Part B component when patients are qualified.

Reducing the need for TPN in patients with IBD typically involves treating the underlying inflammatory process. This can involve a combination of medical and surgical treatment modalities to help the alimentary tract function normally again, absorb adequate nutrition, and maintain hydration so that the patient can transition from parenteral to exclusive enteral nutrition.

G&H Has TPN been shown to affect the microbiome of patients with IBD?

HB Many studies are currently underway with regard to the microbiome and IBD, but the effect of the microbiome on TPN is very poorly understood. During my time at Washington University, my colleagues and I looked into the features of the gut microbiome and bile acid metabolism for determining adaptation and the ability to wean off of TPN. Our work was recently published in the *American Journal of Physiology—Gastrointestinal and Liver*. In our study, patients with short bowel syndrome exhibited altered gut microbiomes with reduced gut microbial diversity compared with healthy controls. We observed differences in the microbiomes of short bowel syndrome patients with ileostomy, jejunostomy, jejunocolic anastomosis, or ileocolonic anastomosis, and compared patients who were TPN-dependent with those who had been weaned successfully off of TPN. We compared stool and serum bile acid composition and

noticed alterations in patients with short bowel syndrome compared with healthy controls. These alterations reflect adaptive changes in enterohepatic bile acid cycling. Stools from patients who were weaned from TPN were enriched in secondary bile acids, including deoxycholic acid and lithocholic acid. We were able to conclude from this study that shifts in the gut microbiome and bile acid metabolism may generate a favorable luminal environment in select patients with short bowel syndrome, promoting the ability to wean from TPN.

G&H How and when should TPN be discontinued in patients with IBD?

HB Discontinuation of TPN should be performed in a stepwise manner at the direction of the medical provider, ideally with a multidisciplinary team of physicians, dietitians, pharmacists, and allied health providers. Components such as the patient's functional status, body composition (eg, muscle mass, body fat), oral nutritional intake, fluid balance or hydration status, inflammatory state, and other surrogate laboratory markers (such as protein stores, creatinine, albumin, electrolytes, and micronutrients) should all be used to assess for the ability to start weaning from TPN.

Although the weaning process is individualized for each patient, the overall goals are the same. Patients should be able to maintain their energy and hydration requirements orally on days when they are off of TPN in order for physicians to successfully wean them off completely.

G&H Do you have any advice on how gastroenterologists can improve outcomes in this patient population?

HB As mentioned, it is important to utilize a multidisciplinary team that has experience with TPN and the capability to monitor patients closely for their electrolyte and hydration status, adjusting the formula if needed. It is also important to make sure that these patients are gaining appropriate weight and maintaining that weight and making strides to being able to do this without the support of the TPN itself. Using a multidisciplinary team approach to managing TPN is the best way to mitigate complications before or as they occur to help improve overall patient outcomes while on TPN.

Disclosures

Dr Boutté has no relevant conflicts of interest to disclose.

Suggested Reading

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