Nutritional Considerations in High Risk Gastrointestinal Conditions

Created by:
Dr. Doug Nguyen, MD, Assistant Clinical Professor of Medicine, University of California, Irvine Medical Center and Director of the Inflammatory Bowel Disease Program

Presented by:
Tami Gangestad, MS, RD, CNSC, LD, LN
Regional Clinical Specialist
Nestlé Health Science

Presented on September 29, 2016

Financial Support for creation of this presentation was provided by Nestlé Health Science. The views expressed herein are those of the creator and do not necessarily represent Nestlé’s views. The material herein is accurate as of the date it was presented, and is for educational purposes only and is not intended as a substitute for medical advice. Reproduction or distribution of these materials is prohibited. Copyright 2016 Nestlé. All rights reserved.

Learning Objectives

Understand the pathophysiology of nutrient absorption in the normal gastrointestinal tract

Recognize common nutritional deficiencies in high risk gastrointestinal conditions

Identify strategies to prevent nutritional deficiencies in high risk gastrointestinal conditions

Patient’s History

- Frequency of stool output
- Degree of unintentional weight loss
- Any history of prior surgery
- Excessive flatus or abdominal distension
- History of oil drops separated from stool mass
- Functional capacity
- Self-perception of nutrition and health status
- Dietary intake

The diagram on the right illustrates the normal absorptive process, showing the food moving from the stomach to the small intestine and then to the colon, with absorption occurring at various points along the way.
**Nutrition-Focused Physical Exam**
- Loss of subcutaneous fat
- Muscle wasting
- Ankle edema
- Sacral edema
- Ascites
- Functional capacity
- Micronutrient deficiencies

**Anthropometric Measures**
- Body Mass Index
- Weight and Height data
- Recent weight history
- Mid-arm circumference
- Calf circumference
- Triceps skin fold

**Severity of Illness**
- Stress factors
- Presence of acute disease
- Albumin
- Pre-albumin
- Lymphocyte count

**Testing for Malabsorption**
- Fat Malabsorption
  - Qualitative Fecal Fat
  - 72-hour Fat on 100g/fat intake
- Carbohydrate Malabsorption
  - D-xylose test
  - Breath testing (lactose)
- Protein Malabsorption
  - Fecal Alpha-1 antitrypsin

**Additional Testing**
- Measurements of specific micronutrient deficiencies
- Tests for bacterial overgrowth
- Test for pancreatic insufficiency (fecal elastase)
- Wireless capsule endoscopy
- Colonoscopy
- Cross-sectional imaging (ultrasound, CT scan)

**Case Based Review of Nutritional Challenges in Common GI Conditions**
The Crohn’s Patient

- 24 year male with 5-year history of ileocolonic Crohn’s disease on infliximab therapy
- Presents to the Emergency Department for evaluation of right lower quadrant abdominal pain
- CT scan: Right lower quadrant abscess

What additional laboratory testing or clinical information would you like to gather?

Reports weight loss of 25 pounds in the last 5 months because of abdominal pain and strict food restriction to reduce symptoms
- Subsequently underwent percutaneous drainage of abscess but is planned for surgery after his nutritional status is optimized

Macronutrient Requirements

- BMI as starting point for daily energy requirement
- Recommend protein intake is 1.2-2.0 g/kg actual weight
- If patient’s BMI >30, use ideal body weight

<table>
<thead>
<tr>
<th>BMI</th>
<th>Energy Requirement kcal/kg/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;15</td>
<td>23-45</td>
</tr>
<tr>
<td>15-19</td>
<td>31-35</td>
</tr>
<tr>
<td>20-29</td>
<td>26-30</td>
</tr>
<tr>
<td>&gt;30</td>
<td>15-25</td>
</tr>
</tbody>
</table>

Parrish C et al, Practical Gastroenterology, 2003
Nguyen CG, IBD, 2008

Pre-operative Nutritional Optimization

Nguyen DL, Digestive Disease Week, 2015

In Crohn’s patients with poor nutritional status, pre-operative nutritional optimization (oral supplementation, enteral, or parenteral) should be done to improve post-operative outcomes.

Back to the Patient

- Six months after undergoing an ileocecectomy for a fibrostenotic stricture, the patient complains of:
  - Paresthesia in the hands and feet
  - Recurrent kidney stones
  - Persistent diarrhea with fat droplets

What additional laboratory testing or clinical information would you like to gather?

Patient had approximately 180cm of distal terminal ileum resected

The patient inquires about nutritional therapy to reduce his reporting symptoms.
Key Findings

- Hemoglobin: 9.8 (Normal 13-17)
- MCV: 110 (Normal 80-96)
- Vitamin B12: 178 (Normal 200-900 pg/ml)
- Methylmalonic acid: 6.2 (Normal 0.4-2 µmol/L)
- Colonoscopy at 6 months post-operatively showed active ulcerations at the ileocolonic anastomosis.

Vitamin B12 Absorption

1. Pepsin breaks down B12 from foods
2. Stomach produces R-protein and IF
3. B12-binds to R protein
4. Pancreas release enzymes to break R-B12 complex
5. B12 binds IF
6. Vitamin B12 absorbs in distal ileum

NUTRITION PEARL
In Crohn’s patients with extensive ileal resection or inflammation, consider sublingual or intramuscular injection of Vitamin B12.

Enterohepatic Circulation

>100 cm ileal resection → fatty acid diarrhea
<100 cm ileal resection → bile acid diarrhea

NUTRITION PEARL
In Crohn’s patients with >100 cm ileal resection, consider a low fat diet (20% total calories) and consider medium chain fatty acid replacement.

Recurring Kidney Stones

Fat Malabsorption

Free fatty acids in small bowel
Calcium binds free fatty acids
Increased absorption of oxalate in colon
Oxalate Stones

NUTRITION PEARL
In Crohn’s patients with >100 cm ileal resection, consider a low fat diet (20% total calories) and consider medium chain fatty acid replacement.
**Recurring Kidney Stones**

Fat Malabsorption

- Free fatty acids in small bowel
- Calcium binds free fatty acids
- Increased absorption of oxalate in colon
- Oxalate Stones

**NUTRITION PEARL**

In Crohn’s patients with recurrent calcium oxalate stones, consider high calcium, low-fat, low oxalate diet

**Half-Elemental Diet**

![Graph showing rate of recurrence over time](image)

**NUTRITION PEARL**

In Crohn’s patients with recurrent calcium oxalate stones, consider high calcium, low-fat, low oxalate diet

**Enteral Nutrition As Augmentative Therapy**

<table>
<thead>
<tr>
<th>Study/Group</th>
<th>Sites (n)</th>
<th>Patients/Enrollment</th>
<th>Events</th>
<th>Loss of Intake</th>
<th>Rate of Recurrence (MD ± SD)</th>
<th>Rate of Recurrence (MD ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN Group</td>
<td>20</td>
<td>40</td>
<td>100</td>
<td>60</td>
<td>40% (3.4 ± 0.5)</td>
<td>40% (3.4 ± 0.5)</td>
</tr>
<tr>
<td>Control</td>
<td>20</td>
<td>40</td>
<td>100</td>
<td>60</td>
<td>40% (3.4 ± 0.5)</td>
<td>40% (3.4 ± 0.5)</td>
</tr>
</tbody>
</table>

**Post-Operative Maintenance Therapy**

<table>
<thead>
<tr>
<th>Year</th>
<th>Clinical Recurrence at 1 Year</th>
<th>Endoscopic Recurrence at 1 Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>Control</td>
<td>10%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**The Gastric Bypass Patient**

- 30 year old female with morbid obesity status-post Roux-en-Y gastric bypass 12 weeks ago
- Lost 40 pounds to date
- Poor oral intake with nausea/vomiting at home
- Admitted for altered mental status and hypotension

**NUTRITION PEARL**

In Crohn’s patients, half-elemental diet and enteral nutrition supplementation can be considered to augment response to medical therapy and reduces disease recurrence

**What additional laboratory testing or clinical information would you like to gather?**
Roux-en-Y Gastric Bypass

Estimated up to 30% bariatric candidates have thiamine deficiency pre-operatively
Significant thiamine deficiency occurs in 1% as early complication in post-RYGB
Given presentation of Wernicke Encephalopathy, needs parenteral supplementation

Wernicke Encephalopathy

Back to the Patient

Patient was briefly placed on parenteral nutrition
Upper endoscopy showed marginal ulcer
Twenty four hours after initiation of parenteral nutrition, the patient developed severe electrolyte disturbances

Refeeding Syndrome

[Check Potassium, Calcium, Phosphate, Magnesium]
[Administer Thiamine, Vitamin B complex, MVI+ minerals]
[Start feeding 5kcal/kg/day, slowly increase over 4-7 days]
[Rehydrate and correct electrolytes]

Management of Refeeding Syndrome

Adapted from guidelines of NICE for Refeeding Syndrome

[Monitor Potassium, Calcium, Phosphate, and Magnesium x 2 weeks]

In post-RYGB significant nausea/vomiting and rapid weight loss, early recognition and treatment of refeeding syndrome will decrease mortality

Protein Deficiency

Most common seen in post-RYGB
At 2 year—13% patients
At 10 year—28% patients
Most common if Roux limb >150cm
Recommended protein intake is 1.2-2.5 g/kg/day IBW

NUTRITION PEARL

In post-RYGB patients, protein deficiency is common and regular assessment of adequate protein intake is necessary to prevent sarcopenia
Labs to Monitor
- Complete blood count
- Electrolytes
- Glucose
- Iron studies, ferritin
- Vitamin B12
- Aminotransferases, alkaline phosphatase, bilirubin
- Albumin
- Lipid profile
- 25-hydroxyvitamin D, parathyroid hormone (PTH)
- Thiamin
- Folate
- Zinc
- Copper

Mechanick JI, Obesity, 2013

Micronutrient Replacements
- Multivitamin with minerals
  - Vitamin A, Vitamin B1, Vitamin E, Vitamin K
  - Iron, folic acid, Biotin, Selenium, Zinc, Copper
- Calcium and Vitamin D
  - 1200–1500 mg (elemental calcium)/day
  - Vitamin D 800 IU/day
- Iron and ascorbic acid
  - 40–65 mg (elemental iron)/day
  - Add in ascorbic acid to improve absorption
- Vitamin B12
  - 500–1000 mcg/day if given orally
  - 1000 mcg IM once per month

Mechanick JI, Obesity, 2013

Micronutrient Replacements
- Multivitamin with minerals
  - Vitamin A, Vitamin B1, Vitamin E, Vitamin K
  - Iron, folic acid, Biotin, Selenium, Zinc, Copper
- Calcium and Vitamin D
  - 1200–1500 mg (elemental calcium)/day
  - Vitamin D 800 IU/day
- Iron and ascorbic acid
  - 40–65 mg (elemental iron)/day
  - Add in ascorbic acid to improve absorption
- Vitamin B12
  - 500–1000 mcg/day if given orally
  - 1000 mcg IM once per month

NUTRITION PEARL
In post-RYGB patients, micronutrient replacement and monitoring of micronutrient levels are important and should be re-evaluated at least every 6 months

Micronutrient Replacements
- Multivitamin with minerals
  - Vitamin A, Vitamin B1, Vitamin E, Vitamin K
  - Iron, folic acid, Biotin, Selenium, Zinc, Copper
- Calcium and Vitamin D
  - 1200–1500 mg (elemental calcium)/day
  - Vitamin D 800 IU/day
- Iron and ascorbic acid
  - 40–65 mg (elemental iron)/day
  - Add in ascorbic acid to improve absorption
- Vitamin B12
  - 500–1000 mcg/day if given orally
  - 1000 mcg IM once per month

Mechanick JI, Obesity, 2013

Short Bowel Syndrome
- 58 year old male with a history of coronary artery disease and diabetes
- Six months ago, had acute superior mesenteric artery embolism with resulting 300 cm of distal small bowel and ileocecal valve resection.
- Presents to the clinic for further nutritional management

What additional laboratory testing or clinical information would you like to gather?

Short Bowel Syndrome
- Stage 1
  - Immediate after resection
  - Initial use of total parenteral nutrition (TPN)
  - Trial of oral intake and titrate as tolerated
- Stage 2
  - Intestinal adaptation process takes place
  - Increase oral intake
  - Wean TPN
- Stage 3
  - Maximal intestinal adaptation
  - Process can take months to years
  - Wean TPN

Sundaram A et al, J Clin Gastroenterol, 2002
**Initial Determination of Intestinal Function**
- Length of the intestinal resection
- Presence of the ileum and ileocecal valve
- Presence of all or part of the colon
- Continuity versus incontinuity of the intestines

**Management of Diarrhea**

<table>
<thead>
<tr>
<th>Increased Intestinal Motility</th>
<th>Gastric Hypersecretion</th>
<th>Intestinal Bacterial Overgrowth</th>
<th>Steatorrhea</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Loperamide</td>
<td>• Proton pump inhibitors</td>
<td>• Antibiotics</td>
<td>• Pancreatic Enzyme replacement</td>
</tr>
<tr>
<td>• Diphenoxylate</td>
<td>• H2 blockers</td>
<td>• Probiotics</td>
<td>• Bile acid replacement</td>
</tr>
<tr>
<td>• Codeine</td>
<td>• Octreotide</td>
<td>• Reduce anti-motility or acid reducing agents</td>
<td></td>
</tr>
<tr>
<td>• Tincture of opium</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Composition of Total Parenteral Nutrition**
- 20-30% Fat
- At least 1.5 - 2.5g/kg/day protein
- Daily Calories
  - 30 kcal/kg/day
- Carbohydrates
  - Make Up Remaining Calories
- Vitamins, Minerals, Trace Elements

- Sturm A et al, Scand J Gastroenterol, 1997
- ASPEN 2016 Critical Care Guidelines

**Oral Diets: Practical Advice**
- Once diarrhea less than 2L/day and electrolytes stable, consider oral and enteral nutrition
- Six small solid meals per day during adaptation phase
- Nasogastric tube at night to supplement 1000kcal can be considered
- Elemental vs. Semi-elemental vs. Polymeric Formulas

**In patients with short bowel syndrome, once diarrhea and electrolyte requirements have been stabilized to an output of 2L/day, consider oral and enteral supplementation to promote intestinal adaptation**
**Peptide-Based Formulas**

- May be better tolerated than elemental\(^1\)
- Reaches feeds faster in group with peptide-based formula vs. elemental formula (3 month vs. 5 month)
- More efficient nutrient assimilation\(^2\)
  - Mean ostomy output 39cc/kg/day peptide group vs 49cc/kg/day elemental group
  - Trace elements > excretion of copper and sulfur in elemental group

1. Kowalski Clinical Nutrition Week, 2005
2. Murray ND et al, JPNEN, 1988

**Conclusion**

In patients with short bowel syndrome, consider the use of peptide-based formulas supplementation to enhance caloric intake and improve nutrient assimilation.

**Other Pharmacologic Therapies**

- Glutamine
- Growth Hormone
- Teduglutide (glucagon like peptide-2 analog)
- Epidermal Growth factor

Sundaram et al, J Clin Gastro, 2002

**Thank you !**

Q & A