SHORT BOWEL SYNDROME

Definition

- Normal length of small bowel estimated as between 3-8meters
- Removal of up to ½ is generally well tolerated
- Short bowel syndrome occurs when small bowel length <200cm
- Intestinal failure-functional failure of the remnant small bowel to maintain adequate nutritional balance
- Incidence is 2 per Million per year in UK requiring long-term TPN
- Prevalence between 10,000-20,000 in US on home TPN

Etiology

Extensive intestinal resection secondary to:

- Inflammatory bowel disease (Crohn's > UC)
- Mesenteric infarction
- Radiation enteritis
- Congenital atresia, malrotation, gastroschisis and aganglionosis

3 types of resections most commonly encountered:

- limited ileal resection for Crohn's disease with cecectomy or right hemicolectomy
- extensive ileal resections with or without partial colectomy with jejunocolonic anastomosis
- extensive small intestinal resection and total colectomy with high jejunostomy

Pathophysiology

- Major consequence is loss of absorptive surface area→ malabsorption of macro/micronutrients, H2O, and electrolytes
- Degree of malabsorption determined by length of remnant small bowel and adaptive process over time
- Specific nutrient malabsorption determined by portion of resected small bowel
- Villi are taller and the crypts deeper in the jejunum than ileum. Thus, loss of part of jejunum will initially compromise nutrient absorption > loss of ileal segment of similar length
- Patients with high jejunostomy have rapid gastric emptying of liquids and rapid intestinal transit, compromising mixing of food with biliary/pancreatic secretions
- Normally- 90% of digestion/absorption is completed in first 100cm of jejunum. Patients with small bowel resection and >100cm of jejunum left are able to be on oral feedings
- 100cm of intact jejunum is required for maintaining a positive water and electrolyte balance.
- Preservation of colon with short bowel syndrome is extremely important for water/SCFA absorption
- Ca, Mg, Phos, Fe, and vitamins are predominantly absorbed in duodenum and proximal jejunum
- Vitamin B12/bile acids are restricted to ileum.

Intestinal Adaptation to Resection

- Mediated by growth factors (GLP2 and I-glutamine)
- Adaptive changes more pronounced in ileum vs. jejunum
- Ileum attains the characteristics of jejunum with taller villi and deeper crypts
- With time, there is increase in ileal diameter and length
- Results in more absorptive surface area
- Changes depend on presence of food in intestinal lumen. Animals given parenteral nutrition do not display these adaptive processes. Therefore, patients are encouraged to start PO feeds as quickly as possible post-op
- Studies have shown these changes leads to increased weight gain, decreased stool volume, less electrolyte and macro/micronutrient losses

Management

- Immediate post op period should be supported by TPN until bowel function returns
- Volume status, electrolyte imbalance monitored closely
- H2 blockers should be given to counteract transient hypergastrinemia
- Patients with limited ileocolic resections may be fed solid food. Addition of cholestyramine will ameliorate diarrhea if bile acid malabsorption is cause.
- Vitamin B12 injections for low levels
- Patients with extensive small intestine resection should be able to tolerate oral feeds if more than 100cm of jejunum is left
- Absorptive capacity of small intestine is assessed by measurement of fecal fat, volume and electrolytes
- Low fat-high carbohydrate diet is recommended
- May need to increase # of meals to offset fecal losses
- Rapid intestinal transit may be suppressed by anti-diarrheal drugs 1 hr prior to a meal
- Patients should be supplemented with multi-vitamins, Ca, Mg, Phos, Zinc

Extensive small bowel resection and colectomy

- Most severe short bowel syndrome
- In these patients, if < 100cm of jejunum is left, they will need long term TPN
- Despite the limited adaptive ability of the jejunum, 50% of patients on home parenteral nutrition are able to switch to oral intake after 1-2years

Surgical intervention

- Tapering enteroplasty, reversal of intestinal segement and colonic interposition have attempted to increase intestinal transit time.
- Recirculating loops to increase contact time and tapering and lengthening of intestinal segment to increase surface area
- Intestinal transplantation- main indication is TPN dependent SBS with progressive liver disease. 1 year graft survival is 50-60%.

Complications
Cholesterol gallstones-loss of bile acids results in hepatic bile supersaturated with cholesterol→ cholesterol stones. 44% of those with short bowel syndrome

Oxalate kidney stones- oxalate is precipitated out as calcium oxalate in intestinal lumen and lost in stool. In patients with SBS, unabsorbed fatty acids compete for calcium and oxalate is absorbed in the colon and excreted in the kidney. 24% in 2 years

Reference: Feldman: Schlesinger & Fordtran's Gastrointestinal and Liver Disease, 7th ed., 2002

Henry Lin, M.D.