



Nutrition Conference

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Management of short bowel syndrome (SBS)

- Overview
- ✓ It results from extensive intestinal resection
- ✓ Significant morbidity and mortality
- ✓ Management is multidisciplinary
- ✓ Understanding of the physiological alteration is useful in management of SBS

Definition

- SBS is a malabsorption syndrome resulting from extensive small intestinal resection
- Typically residual small intestine <200cm
- Presents with chronic diarrhea, dehydration, macro and micro nutrient deficiency
- Often requiring nutritional support

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- Anatomy and physiology

Duodenum

- Bile salt emulsification of fat
- Pancreatic enzyme activity
- Amino acid absorption
- Monosaccharides absorption
- Iron absorption
- 10% of the small intestine

Jejunum

- Up to 50% of the small intestine
- Primary site of water, calcium absorption
- Folate, fat and water soluble vitamins absorption
- Free fatty acids, B₁₂ absorption
- Sodium, CHO

Ileum

- Main site for bile salt and B₁₂ absorptions
- Site of production of many GI hormones eg GLP-1 & 2
- Intrinsic factor, water and sodium reabsorption.
- 40% of the small intestine

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- What type of conditions may lead to bowel resection ?

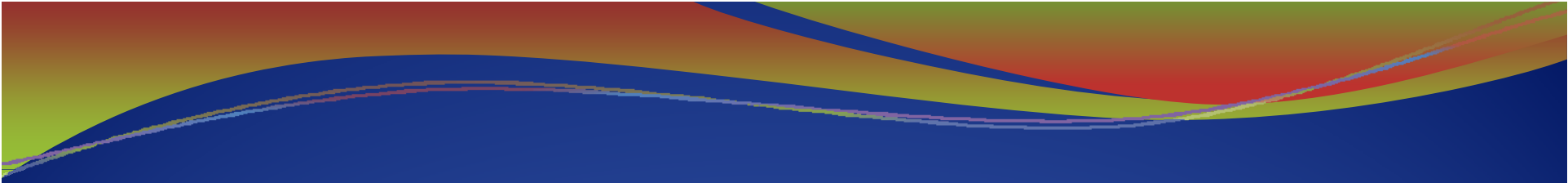
Conditions that may lead to bowel resection

- Infants
- ✓ NEC
- ✓ Congenital anomalies
- ✓ trauma

Conditions that may lead to bowel resection

- Adults
- ✓ Crohn's disease
- ✓ Mesenteric vascular events
- ✓ Radiation enteritis
- ✓ Trauma
- ✓ Adhesive obstructions

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- What are the factors that affect outcome in SBS ?

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- Length of SI left behind
 - Region of SI left behind
 - Absence or presence of the colon

Quiz 2

- The best method for establishing residual SI length post resection is
 - A. capsule endoscopy
 - B. intra operative measurement
 - C. barium swallow and follow through
 - D. enteroscopy with tattoo
 - E. food transit time
 - F. Pencil and ruler

Adaptation

- Ileum is capable of both structural and functional adaptation
- Jejunum is capable of only functional adaptation

Why is the presence of a colon important ?

- Absorption of water, electrolyte and FA
- Slows intestinal transit (enteroglucagon, neurotensin peptide YY)
- Stimulates intestinal adaptation
- Extra energy from bacterial fermentation of unabsorbed CHO
- Presence of $\frac{1}{2}$ colon = 50cm of SI

Quiz 3

- The anastomosis with the best prognosis is
 - A. end jejunostomy
 - B. Jejunio-ileo-colonic
 - C. jejunio-colonic
 - D. Jejunio-ileal
 - E. what about no anastomosis

Stages post resection

- Stage 1: weeks, large volume diarrhea
- Stage 2: 2 yrs, adaptation
- Stage 3: homeostatic

Intestinal adaptation

- Occurs in the second stage following resection
- A process of macro & microscopic changes secondary to a variety of stimuli, to enable absorption of fluids and nutrients
- Structural: increase villi length, crypt depth and enterocyte #
- Functional: brush border permeability

Quiz 4

- The following factors affect adaptation except
 - A. hyperphagia
 - B. presence of colon
 - C. presence of ileum
 - D. hormones
 - E. pancreatobiliary secretions
 - F. A and C only
 - G. Frequency of BM'S

SBS presentation

- Diarrhea
- Weight loss
- Dehydration
- Macro and micronutrient deficiency

treatment

- Multidisciplinary approach
 - ✓ Surgeons
 - ✓ Dietitians
 - ✓ Endocrinologist
 - ✓ Gastroenterologist

Role of diet and nutrition

- SBS patients absorb 50-60% of energy from food
- Dietary intake has to be increased by 50% (hyperphagic diet)
- Compliance should be monitored closely
- Hyperphagic diet is best tolerated when split into 5-6 meals daily

Role of diet and nutrition

- High CHO and low fat diet increases overall energy and absorption when the colon is present
- In patients without a colon there is no change

Quiz 4

- Lactose restriction should be part of management of SBS
 - A. true
 - b. false
 - C. inconclusive
 - D. ongoing research
 - E. who cares

Dietary recommendation when colon is present

- 50-60% caloric intake from complex CHO intake
- 20-30% of caloric need are from fat
- 20-30% caloric need are from protein
- Ensure adequate essential FA, MCT/LCT
- Restrict oxalate
- Avoid hyperosmolar liquids
- Soluble fiber
- ORS or hypotonic solution

Dietary recommendation when colon is absent

- 40-50% of calorie intake is complex CHO
- Adequate essential fats and LCT
- 30-40% of caloric intake- fats
- 20-30% of caloric intake from protein
- Soluble fiber
- No oxalate restriction
- ORS
- Avoid hyperosmolar solutions

Quiz 5

- The following are foods rich in oxalate except
 - A. pecans
 - B. peanuts
 - C. french fries
 - D. hazelnut mocha
 - E. Coors light
 - F. carrots

Pharmacotherapy (use of antimotility and antisecretory agents)

- H₂ receptor blocker and PPI
 - ✓ Post resection hypergastrinemia and hypersecretion
 - ✓ Caution in patients with bacterial overgrowth
- Octreotide
 - ✓ High output jejunostomies
 - ✓ Effect is short lived
 - ✓ May increase risk of cholelithiasis

Pharmacotherapy (use of antimotility and antisecretory agents)

- Loperamide
 - ✓ Higher doses, because EHC is lost in SBS
 - ✓ Most commonly used
- Diphenoxylate
 - ✓ CNS side effects
- Codeine
 - ✓ Limited by its sedating effects

Pharmacotherapy (use of antimotility and antisecretory agents)

- Tincture of opium
 - ✓ Sedating effect and potential for addiction
- Transdermal clonidine
 - ✓ Antimotility agent
 - ✓ In bowel dilation may worsen diarrhea

Quiz 6

- Which of the following are useful for treatment of diarrhea in SBS
 - A. cholestyramine
 - B. loperamide
 - C. Tinture of opium
 - D. Pancrease
 - E. dicyclomine

SIBO in SBS

- There is increased risk because of meds and anatomical changes
- May worsen malabsorption
- Diagnostic testing has limitations
- Quantitative culture is the best test
- Therapy: antibiotics, probiotics, PEG flushing

Challenges of PN

- Liver disease
- Quality of life
- invasive
- Cost
- Infection
- Venous thrombosis

Trophic factors

- Use of trophic substances to maximize absorption and adaptation:
 - ✓ Glutamine
 - ✓ Hormones (GLP-2, GH)
- Animal experiments
- Human studies

GH

- Conflicting results in human studies (byrne et al vs Zhu et al)
- Safety has been demonstrated in studies
- rHGH has been approved by the FDA for use in patients with SBS on PN

GLP-2

- Secreted in by L-cells in distal SI and proximal colon
- Stimulates epithelial proliferation
- Inhibits enterocyte apoptosis
- Inhibits gut motility
- Increases absorptive capacity
- GLP-2 analogue-teduglutide

Peptide YY

- Secreted by L-cells in the distal SI and colon
- Inhibits motility
- Might play a role in adaptation
- Analogue is available but not used in humans yet

Glutamine

- Primary energy source for enterocytes
- Prevents mucosal atrophy
- Prevents deterioration of gut permeability
- Recent studies did not show any effect

Quiz 7

- Name the animal with the longest intestine
- A. shark
- B. elephant
- C. blue whale
- D. hippo
- E. anaconda

Role of surgery

- Restore continuity
- Relieve obstruction
- Repair a fistula
- Eliminate diseased bowel
- Autologous gastrointestinal reconstruction (AGR) or surgical intestinal rehabilitation
- Intestinal transplantation

Quiz

- The first formally published case of SBT was done by
- A. Dr Farmer
- B. Dr F. Lukens
- C. Dr Lillehei
- D. Dr Starzl
- E. Dr Oz

Autologous gastrointestinal reconstruction

- Procedures that optimize function:
 - ✓ Lengthen
 - ✓ Taper
- Procedures that slow transit time
 - ✓ Reversing a segment

Small bowel transplant (SBT)

- Consider in patients with life long need for PN
- Presence of PN complications
- Patient survival are approaching that of liver transplant
- Graft survival is lower than patient survival in SBT

Predictors of successful weaning from PN

Bowel length

Presence of the colon

Presence of ileocecal valve

Absence of residual mucosal disease

Age

Nutritional status

Duration of PN

Citruline level ($<20\text{mmol/l}$)

Use of rHGH

Steps in PN weaning

- A goal should be set
- Diet, fluid intake and medications should be optimized
- Micronutrient supplementation
- Electrolytes
- Vitamins (B₁₂, folate)

Final quiz (prize)

- True or false
 - A. The taller you are the longer your intestine
 - B. The higher your BMI the longer your intestine
 - C. The intestine shortens as we grow old
 - D. females have longer SI compared to males

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- Questions and comments?