

SHORT BOWEL SYNDROME AND THE USE OF TOTAL PARENTERAL NUTRITION (TPN)

Short Bowel Syndrome:

Defined

- SBS is a condition where malabsorption occurs after extensive resection of the small bowel and there is <200 cm of bowel remaining
- Clinical Features:
 - Chronic diarrhea
 - Dehydration
 - Electrolyte abnormalities and malnutrition (caused by malabsorption of fluid, electrolytes, and nutrients) (1,2,3)

Causes

- Adults
 - Crohn's Disease
 - Mesenteric Ischemia
 - Cancer therapy complications (eg. Radiation enteritis)
- Children
 - Congenital
 - Necrotizing Enterocolitis
 - Intestinal Volvulus (1)

Bowel Adaptation

- Reports in adults suggest that a minimum of 50-70 cm of small intestine is needed if the colon is intact or 100-150 cm of small bowel if the colon is lost, to avoid chronic supplemental nutrition. (4)
- *Mechanisms:*
 - Begins within 24 hours after surgery
 - May take 1-2 years for completion
 - Ultimately, remaining bowel becomes efficient in nutrient absorption
 - Factors that play a role in the ability to adapt:
 - Presence or absence of the colon ileocecal valve
 - Length of remaining bowel
 - Patient age
 - Comorbid conditions (4)

Complications:

- Loss Of Nutrients: Magnesium, Zinc, Copper, Selenium
- Deficiency of Vitamin B-12 as well as fat-soluble vitamins A, D, E, and K
- Iron and Calcium Deficiency
- Bacterial Overgrowth if Ileocecal Valve is lost
- Cholelithiasis (1)

Medical/Dietary Management:

- Depends on section of bowel resected and presence or absence of colon.
- In general therapy includes:
 - Oral rehydration solutions
 - electrolyte and vitamin monitoring/replacement
 - fluid management
 - H2 blockers/PPI's 1st 6 months
 - diarrhea control
 - low oxalate diet with calcium supplementation
 - weaning of TPN if possible
 - re-anastomosis if possible.

Surgical Management:

- The goal, which is similar to the goal for medical therapy, is to increase absorption by either slowing intestinal transit or increasing intestinal surface area.
 - Slow Transit
 - segmental reversal of the small bowel
 - colonic interposition
 - construction of valves
 - Increase Surface Area
 - longitudinal intestinal lengthening and tailoring procedure
- Intestinal Transplantation
 - approximately 500 performed to date
 - performed as small bowel only transplants, or with liver or multivisceral additions
 - indications are life-threatening complications attributable to intestinal failure or long-term TPN. (1)
 - Transplant Survival Results (UNOS) for Small Bowel Transplant Only
 - 1 year- 79% Patient survival
 - 2 year- 62% Patient survival
 - 5 year- 50% Patient survival

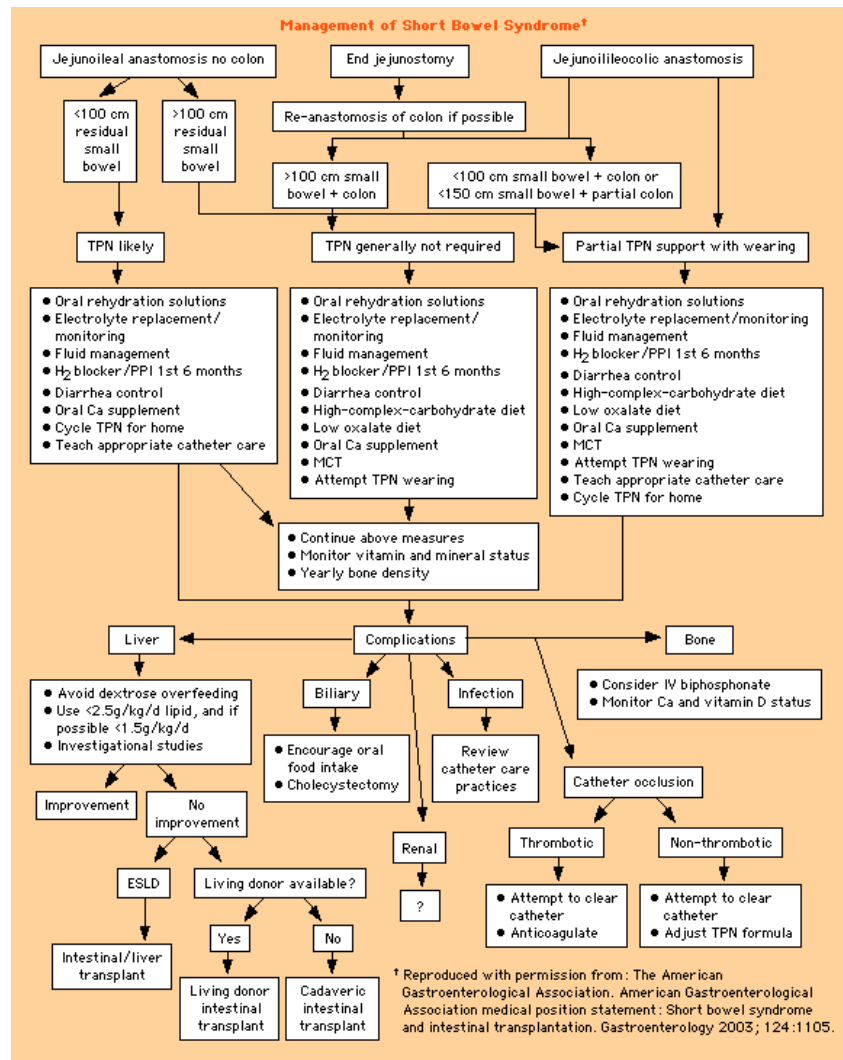
Total Parenteral Nutrition (TPN):

- TPN fulfills caloric needs as well as other nutrients to the patient that would not otherwise be available by the enteral route.(4)
- Many formulas exist and most take into account:
 - Resting Energy Expenditure (REE)
 - Age of Patient to receive TPN
 - Increase in metabolic activity associated with a particular disease
- The formulas are hypertonic
 - Must be administered through a central line catheter (high flow system)
 - Allows rapid dilution and does not cause harm to the vein (thrombosis, extravasation) (3)
- Basic Composition of TPN formulas:
 - Volume- Adults- average of 1500ml/d plus 20 ml/kg for every kg above 20 kg of weight

- Caloric Recommendation- 25-30 kcal/kg/day
 - Carbohydrates-
 - Supplied as Dextrose;
 - Start at 10% and increase by 5% each day to a final concentration of 20-25%.
Over that % will exceed the body's endogenous insulin secretion.
 - Protein:
 - Supplied in the form of amino acids
 - should be supplied at 1.0-1.5 grams/kg per day (based upon ideal body weight of the patient)
 - Fats:
 - Comprise 20-30% of TPN solution
 - Prevents essential fatty acid deficiency.
 - More expensive than dextrose, but it decreases insulin needs, CO₂ production, and osmotic load.
 - Many other vitamins, minerals, and trace elements (determined on a patient by patient basis to restore and maintain normal blood concentrations) (4)
- Complications of Long Term TPN
 - Hepatic Complications
 - Biliary Complications
 - Catheter Related Infections
 - Catheter Occlusions
 - D-Lactic Acidosis
 - Small-Bowel Bacterial Overgrowth (2)
 - *Overall Prognosis for patients requiring permanent home TPN.*
 - Scopolio, Flemming, and Kelly at the Mayo Clinic
 - Overall survival: 60% at 5 years
 - 5-year survival based on primary disease:
 - IBD- 92%
 - Ischemic Bowel- 60%
 - Radiation Enteritis- 48%
 - Cancer-38%
 - 5-year survival based on age:
 - <40: 80%
 - 40-60: 62%
 - >60: 30%
 - Concluded that survival on TPN best predicted on the basis of the primary disease and the age at initiation of TPN. Most deaths during treatment with TPN are as a result of the primary disease. Death due to TPN alone is rare and usually caused by catheter sepsis or liver failure.(5)

References:

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