

Nutrition in the Patient with Ostomy or Enterocutaneous Fistula

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Considerations

- Presence & severity of pre-operative malnutrition.
- Feeding route (oro-gastric, small bowel, parenteral).
- Earliest post-op time to re-start feeding.
- Problems with fluid & electrolyte balance.
- Problems with absorption & digestion (length & health of bowel, enzyme activity).
- Presence with fistulas and/or strictures.
- Presence of chronic disorders (IBD, CHF, DM, cirrhosis, obesity)

Pre-Op Malnutrition

Pre-operative Malnutrition

- Up to 40% of patients requiring surgery are malnourished pre-op (Br Med J 1994;308:945)
- Surgical patients lose average of 5.4% of body weight during hospitalization.
- Surgery induces a hypermetabolic/catabolic state which may lead to protein-calorie malnutrition.
- Protein-calorie malnutrition (negative balance of 100 gm protein/10000 kcal) is associated with:
 - Increased risk of infections
 - Poor wound healing
 - Increased risk of decubitus ulcers
 - Increased risk of intestinal bacterial overgrowth.

Should we treat Pre-Op Malnutrition ?
TPN, TEN, Nothing ?

Treatment of Pre-Op Malnutrition & Feeding Route

- **Parenteral**

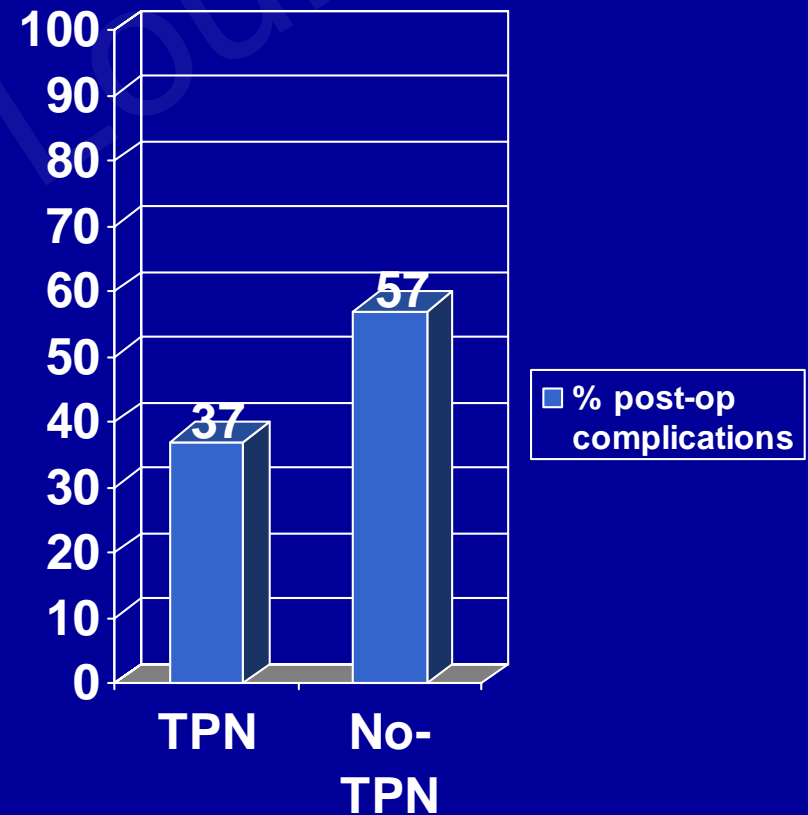
Treatment of Pre-Op Malnutrition & Feeding Route

- **Parenteral**

- **VA Co-Op study** (NEJM 1991;325:525) :
- 395 undernourished pts undergoing laparotomy or non-cardiac thoracotomy.
- TPN (7-15 d pre-op & 3 d post-op) vs no-TPN.
- Pre-op TPN:
 - Increased infections (14% vs 6%) (non-infectious & infectious complications decreased only in the **SEVERELY** malnourished).
 - Caused non-significant drop in 30-d mortality (7.3 vs 4.9%).

TPN in Severely Malnourished Gastric & Colon Ca

- 90 patients
- > 10% weight loss
- TPN [10 d pre-op + 9 d post-op]
vs no-TPN
- JPEN 2000; 24:7



Treatment of Pre-Op Malnutrition & Feeding Route

- **Parenteral**

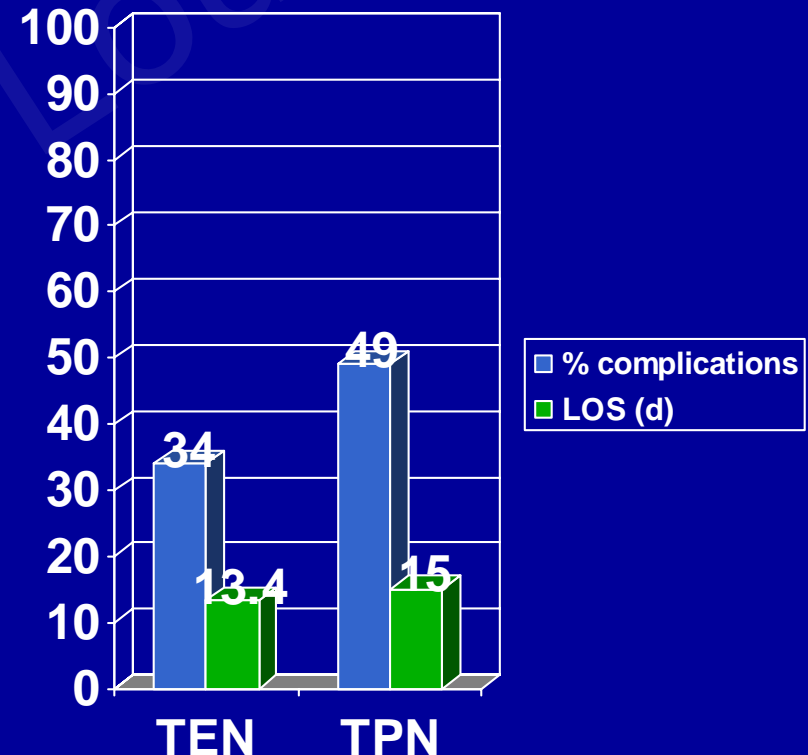
- Meta-analysis of 2211 critically ill or surgical patients show no effect of TPN in mortality nor morbidity. (JAMA 1998; 280:2013)
- In UC & Crohn's disease (Gastroenterology 2001; 121:970) :
 - TPN vs no-therapy had no effect on mortality, disease remission, nor need for surgery.
 - Bowel rest is not necessary to achieve clinical remission.

Treatment of Pre-Op Malnutrition & Feeding Route

- **Enteral**

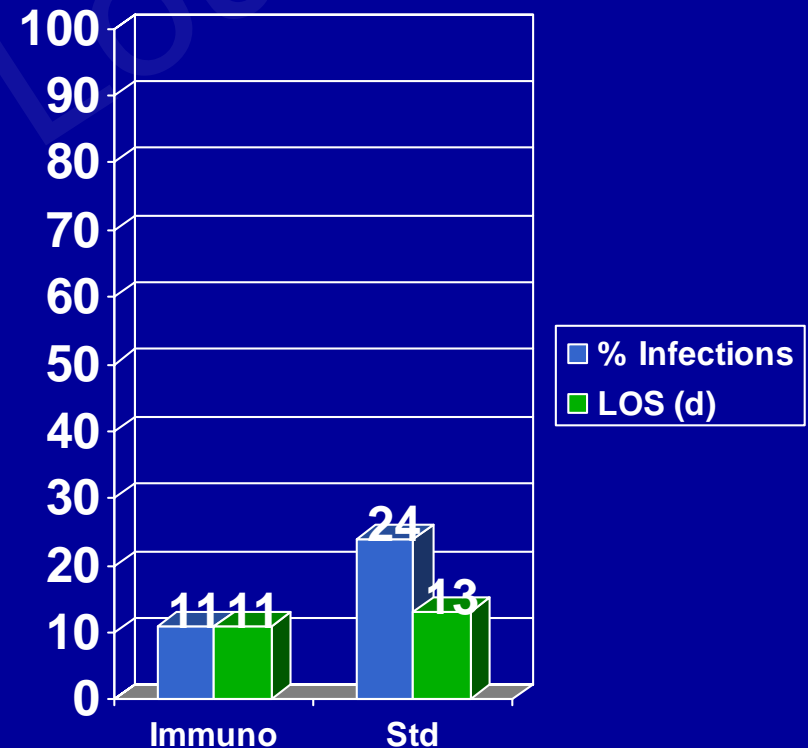
TPN vs TEN in GI Cancer

- 317 patients
- Post-op TPN vs TEN
- TEN gave more cramping & abdominal distention
- **Lancet 2001; 358:1487**



Immunonutrition TEN vs Standard TEN in GI Cancer

- 206 patients
- TEN for 7 days pre-op
- L-arginine, RNA nucleotides, & omega-3 fatty acids (Impact) vs Standard
- Arch Surg 1999; 134:428



Treatment of Pre-Op Malnutrition & Feeding Route

- **Enteral**

- Immunonutrition vs Standard TEN in 154 pts with GI cancer (5 d pre-op + 10 d post-op) by needle jejunostomy (Arch Surg 1999; 134: 428) :
 - Immunonutrition had less infections (14% vs 27%).
- In IBD, TEN with some special formulas (Modulen) improves remission rate, but is less effective than standard medical therapy. This formula is a reasonable choice for the IBD patient with malnutrition.

Treatment of Pre-Op Malnutrition & Feeding Route

- **Conclusion**

- In patients with moderate to severe malnutrition who will require ostomy due to GI cancer or IBD:
pre-operative nutrition, preferably by the enteral route, decreases morbidity and LOS.
- If TPN is the only alternative, it should be used only in patients with severe malnutrition, and in the 7-10 days pre-op period (post-op TPN increases complications) .
- Immunonutrition formula (Impact/ Crucial/ Traumacal) may be best choice for cancer patients (do not use in infected patients) .

How soon can we restart feeding ?

Earliest Time to Re-Start Feeding

- **Use of NG tube:** Cochrane Database Systematic Review of 28 RCTs for use of NGT after abdominal surgery (4198 pts) shows that no-NGT gives (Cochrane Database Syst Rev 2005 Jan 25;(1)):
 - earlier bowel function,
 - no change in rate of anastomotic leaks,
 - slight decrease in pulmonary complications, and
 - slight increase in wound infections or ventral hernia.
- Only 1.8% of patients develop acute gastric distention & 10% need NGT due to vomiting.

Earliest Time to Re-Start Feeding

Can we shorten it ?

- In colonic surgery, the pre-op ingestion of a Maltodextrin drink decreased “first flatus” time & LOS (Colorectal Dis 2006;7: 563)
- Starting clear liquids the day after colorectal resection, was well tolerated, with only 10% needing NGT (*full liquid diets are less “osmolar” and should be tolerated better*) (Ann Surg 1995; 222:73)
- Feeding per-os can be initiated as soon as gastric ileus resolves. “Sitz-Marks” markers can be given pre-op and followed by KUB; once 70% are emptied, feeding can start (Hepatogastroenterol 2005; 63:775)

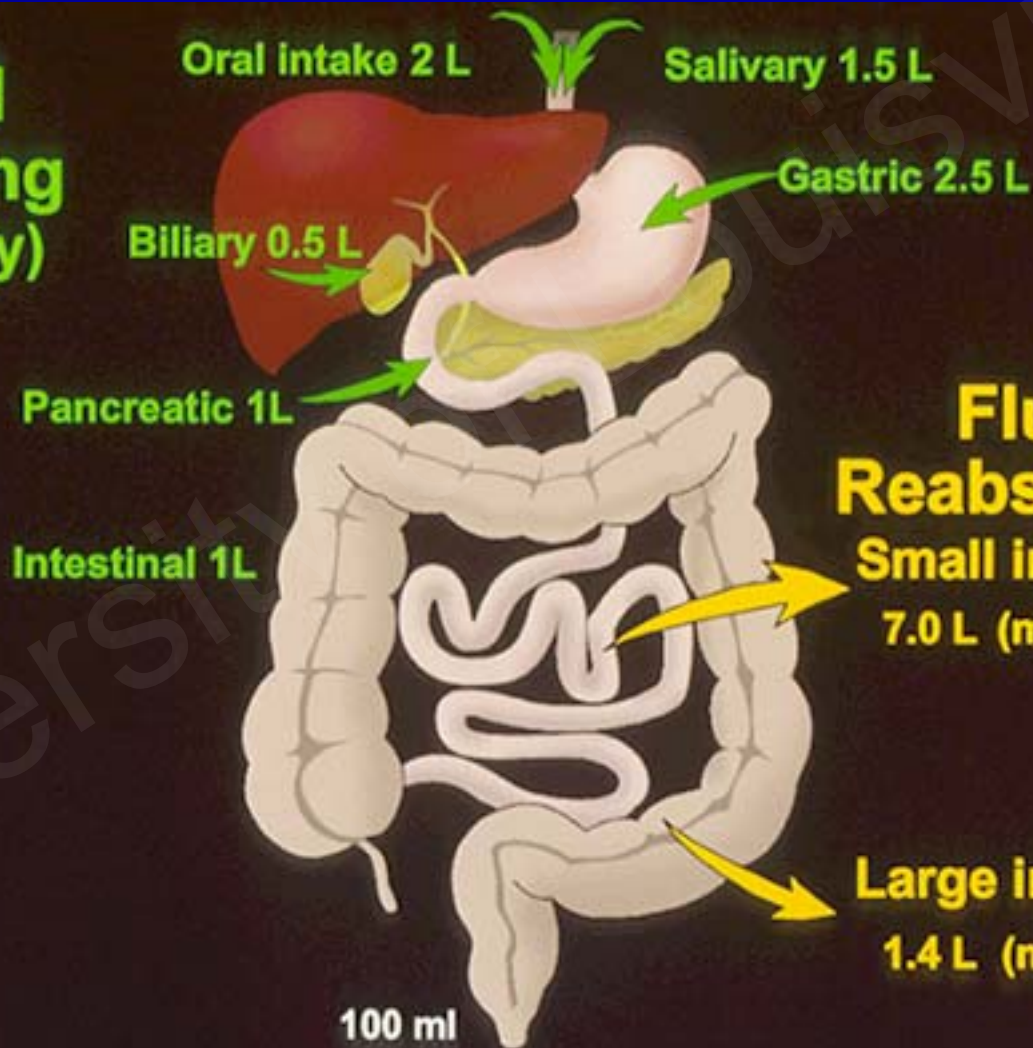
Problems with Fluid & Electrolyte Balance

Intestinal Contents

Normal Volumes and Compositions

SOURCE	Contribution	(Absorption)	Luminal Balance	Na mM/L	K mM/L	Cl mM/L	HCO ₃ mM/L
Oral	2000	0	2000				
Saliva	1500	0	3500				
Gastric	2500	0	6000				
Bile	500	0	6500				
Pancreas	1500	0	8000				
Jejunum	1000	(5500)	3500	130	6	90	30
Ileum	0	(2000)	1500	140	8	60	70
Colon	0	(1300)	200	40	90	15	30
Stool	-	-	200	40	90	15	30

Fluid Entering (per day)



Fluid Reabsorbed
Small intestine
7.0 L (max 12 L)

Large intestine
1.4 L (max 5 L)

Expected output by Ostomy-Level (while in oral diet)

- Jejunum: 3500 to 8000 mL/day
- Ileum: 1500 to 3000 mL/day
- Colon: up to 1500 mL/day

Long-Term Hydration Outcome Related to Bowel Remnant

Jejunum	Ileum	Colon	Hydration
Intact	TI Resected	Intact	Not Needed
Resected	Intact	Intact or Resected	Not Needed
60-100 cm present	Absent	Intact	ORT
60-100 cm present	Absent	Absent	ORT ; may need IV

ORT = Oral Rehydration Therapy

IV = Intravenous fluids

Long-Term Hydration Outcome Related to Bowel Remnant

Jejunum	Ileum	Colon	Hydration
30-60 cm present	Absent	Intact	IV; ORT may be possible
30-60 cm present	Absent	Absent	IV
< 30 cm present	Absent	Intact or Absent	IV

ORT = Oral Rehydration Therapy

IV = Intravenous fluids

Adult Oral Rehydration Therapy (ORT) Solutions

- Needed if all SB remnant is 30-100 cm jejunum.
- Ideally should have close to 90 mEq/L of sodium, 20 mEq/L of K, and 40 gm/L of carbohydrate (sugar or rice)
 - WHO: Water 1 liter + $\frac{3}{4}$ tsp salt + $\frac{1}{2}$ tsp baking soda + 1 cup orange juice + 4 Tbs of sugar.
 - Ceralyte-70 1 liter + $\frac{1}{4}$ tsp salt
 - Pedialyte 1 liter + $\frac{1}{2}$ tsp salt + 1 Tbs sugar
 - Gatorade 3 glasses + 1 glass orange juice + $\frac{1}{2}$ tsp salt + $\frac{1}{2}$ tsp baking soda

$\frac{1}{2}$ tsp salt = 22 Zesta crackers

$\frac{1}{2}$ tsp baking soda = 15 Zesta crackers

Problems with Absorption & Digestion

Problems with Absorption & Digestion

- **Loss of colon**
 - decreases fluid & electrolyte absorption, and prevents rescue absorption of the SCFA not absorbed by the small bowel.
 - accelerates gastric emptying.
- **Loss of IC valve**
 - accelerates SB transit, and allows bacterial overgrowth, which worsens fat, B₁₂ & bile salt absorption.
- **Loss of ≥ 60 cm of TI**
 - will cause B₁₂ deficiency.
- **Loss of 30 to 100 cm of TI**
 - will cause bile salt malabsorption and cholerheic (colorrheic) secretory diarrhea but no fat maldigestion (liver compensation).

Problems with Absorption & Digestion

- **Loss of more than 100 cm ileum**
 - causes bile salt deficiency with fat maldigestion & malabsorption.
 - if colon is present, colonic oxalate absorption is increased by fatty acid diarrhea, causing kidney stones.
- **Loss of ileum**
 - causes loss of “compensatory gastric emptying delay” that occurs when unabsorbed lipids reach the ileum; maldigestion & diarrhea worsen.
 - if all SB remnant is < 100 cm jejunum, will need ORT or IV fluids.
- **Short bowel syndrome**
 - causes gastric hypersecretion & acid-pH mediated inactivation of pancreatic enzymes: more diarrhea & maldigestion.

Management of Absorption & Digestion Problems

Management of Absorption & Digestion Problems

- **Poor fluid & electrolyte absorption**
 - Decrease saliva volume: belladonna
 - Slow down bowel transit: paregoric, other opiates, or loperamide.
 - Liquid drug preparations will be absorbed better; be sure they do not have sorbitol.
 - Avoid hyperosmolar feeding formulas, sodas & juices. Prefer formulas with 40% of calories as fat, low in simple carbohydrates, & with fiber, given as continuous feeding or q 2h feeding.
 - If patient has only 30-100 cm jejunum and no ileum: give ORT to support hydration.

Management of Absorption & Digestion Problems

- **Hypersecretion**

- Control gastric secretion with liquid PPI or H2 blocker
- Cholestyramine for ileal loss of 30-100 cm: prevents cholerheic (colorrheic) diarrhea; must use lowest effective dose to avoid bile salt depletion; not needed if colon is absent.
- Clonidine (alfa-2 adrenergic receptor agonist) 0.2 mg BID or 0.3 mg patch decreases small bowel secretion (JPEN 2004;28:265 JPEN 2006;30:487)

Management of Absorption & Digestion Problems

- **Hypersecretion**

- Zn supplements: Zn is lost at 12 mg/kg stool by jejunostomy or 17 mg/kg stool from ileum or colon. Zn deficiency due to diarrhea may worsen fluid loss and delay fistula healing; Zn is a K channel blocker of adenosine 3',5'-cyclic monophosphate-mediated chlorine secretion (*Gastroenterol* 2006;130:2201)
- Decrease pancreatic secretion with octreotide 100-200 mcg SQ q 8h (but worsens maldigestion, and could decrease enteroglucagon release needed to induce intestinal mucosal hyperplasia)

Management of Absorption & Digestion Problems

- **Loss of ≥ 60 cm of TI:** B₁₂ replacement by injection or transnasal (Nasocobal)
- **> 100 cm ileum loss, with colon present:** causes fatty acid diarrhea; give Calcium with food to decrease colonic oxalate absorption & prevent kidney stones.
- **30-100 cm TI loss, with colon present:** causes Bile salt malabsorption/choleraic diarrhea; Cholestyramine
- **Bacterial overgrowth:** cycles of rifaximin, metronidazol, or quinolone.
 - **Experimental:**
 - Glutamine + growth hormone,
 - Glucagon-like peptide-2 (Teduglutide),
 - Hepatocyte growth factor,
 - IL-11,
 - Epidermal growth factor

Long-Term Nutrition Outcome Related to Bowel Remnant

Jejunum	Ileum	Colon	Diet & Vitamins
Intact	TI Resected	Intact	Regular; B ₁₂
Resected	Intact	Intact or Resected	Regular or low fat
60-100 cm present	Absent	Intact	Diet as tolerated; B ₁₂ , Ca, Cholestyramine
60-100 cm present	Absent	Absent	High Na Diet as tolerated; B ₁₂

Long-Term Nutrition Outcome Related to Bowel Remnant

Jejunum	Ileum	Colon	Nutrition
30-60 cm present	Absent	Intact	PN usually needed
30-60 cm present	Absent	Absent	TPN
< 30 cm present	Absent	Intact or Absent	TPN

Management of Fistula

Management of Fistula

- Correct fluid & electrolyte balance
- Treat sepsis
- Drain fluid collections.
- Treat malnutrition (No Immunonutrition in septic patient)
- Control fistula output
- Treat bowel strictures distal to fistula
- In septic abdomen, may need “proximal loop jejunostomy” (ideally 80-100 cm distal to duodeno-jejunal flexure) (Ann Surg 2004;240:825, Br J Surg 2006;93:1247)

Management of Fistula

- When feasible, wedge resection of fistula with re-anastomosis is preferred to oversewing (Ann Surg 2004;240:825)
- High-pressure vacuum/ Vacuum-Assisted Closure may be a useful adjunct (Gynecol Oncol 2001;80:413, Dig Surg 2004;21:401, Surgery 2006;140:570)
- When TPN is required, changes in hydration should be treated with fluids independent of TPN.

TEN in Patients with Enteric Fistula

- **1.** If bowel stricture is present, feed beyond point of stricture, or correct stricture.
- **2.** If multiple fistulas are present, feed beyond most distal stricture.
- **3.** When possible, use naso-enteric tube, jejunostomy, or PEG/J to deliver nutrition beyond fistula tract.
- **4.** If most-distal fistula is beyond reach of PEG/J or N-J: place feeding tube through the most distal fistula. Avoid tubes with “balloon” or “large head” which can partially obstruct the lumen.
- **5.** If “point of feeding” is very distal, manage bowel as in “short bowel” to improve absorption.

Presence of Chronic Disorders

- In cirrhosis or heart failure, minimize Na in diet & fluids (80 mEq/day + ostomy/fistula losses).
Avoid TPN in cirrhosis.
- In Diabetes Mellitus, avoid hyperglycemia (do not overfeed, use enteral diabetic formula, ADA diet, insulin in TPN)
- Obesity: moderate caloric restriction (500 kcal deficit/day)
- IBD: if in tube feeds, consider Modulen; replace Zn & B₁₂ as appropriate