

Is Fistula Management Your Cup of Tea? Or Intestinal Failure and the Rest!

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By the end of this lecture...

- Define intestinal Failure.
- Identify types of intestinal Failure.
- Know the management of each type and its implication on clinical practice.



HISTORY

- The earliest record of an enterocutaneous Fistula appears in the old Testament Book of judges Written BY Samuel Between 1043 BC and 1004 BC.
- Celsus described the first reported attempt of surgical repair of a colocutaneous fistula.
- In the 18th century John Hunter advocated a conservative approach to fistulas after he noted that fistulas occasionally close spontaneously.



Definition

- The term '*Intestinal Failure*' was originally defined by *Fleming and Remington* as 'a reduction in the functioning gut mass below the minimal amount necessary for adequate digestion and absorption of food.'

(Fleming CR and Remington M. Nutrition and the surgical patient. 1981. pp. 219– 235.)

Definition

- This definition was subsequently modified to include failure of the intestinal tract to maintain adequate *hydration and electrolyte balance* in the absence of artificial fluid and electrolyte support.

(Nightingale JMD. *Intestinal failure*; 2001. ; pp. ix–x.)



With so many causes , Intestinal Failure (IF) may have various degrees of severity and duration:

a) According to the duration, IF may be

- Acute (reversible within 6 months)
- Chronic (longer than 6 months, and even permanent);

With so many causes, IF may have various degrees of severity and duration:

b) According to the type

- *Type 1*: self-limiting IF – usually following abdominal surgery
- *Type 2*: IF in severely affected patients with extensive intestinal resections, with septic, metabolic and nutritional complications, and necessitating a multidisciplinary approach
- *Type 3*: chronic IF – patients need long-term PN.

Postoperative Ileus



A familiar history....

- Male patient a 66-year-old man, status-post colectomy
- Postop management included NPO and morphine PCA
- On POD 6, the patient is still unable to eat, has some N/V, mild abdominal distension
- Despite laxatives he has not yet passed flatus nor had a bowel movement



Postoperative ileus

- Frequent cause of type I intestinal failure
- The most common reason for delayed discharge following abdominal surgery (complications?!)
- The average duration of ileus after major abdominal surgery varies depending on what part of the digestive system affected
- Small Intestine 0 to 24 hours
- The stomach 24 to 48 hours
- The colon 48 to 72 hours



Causes of ileus



Multifactorial



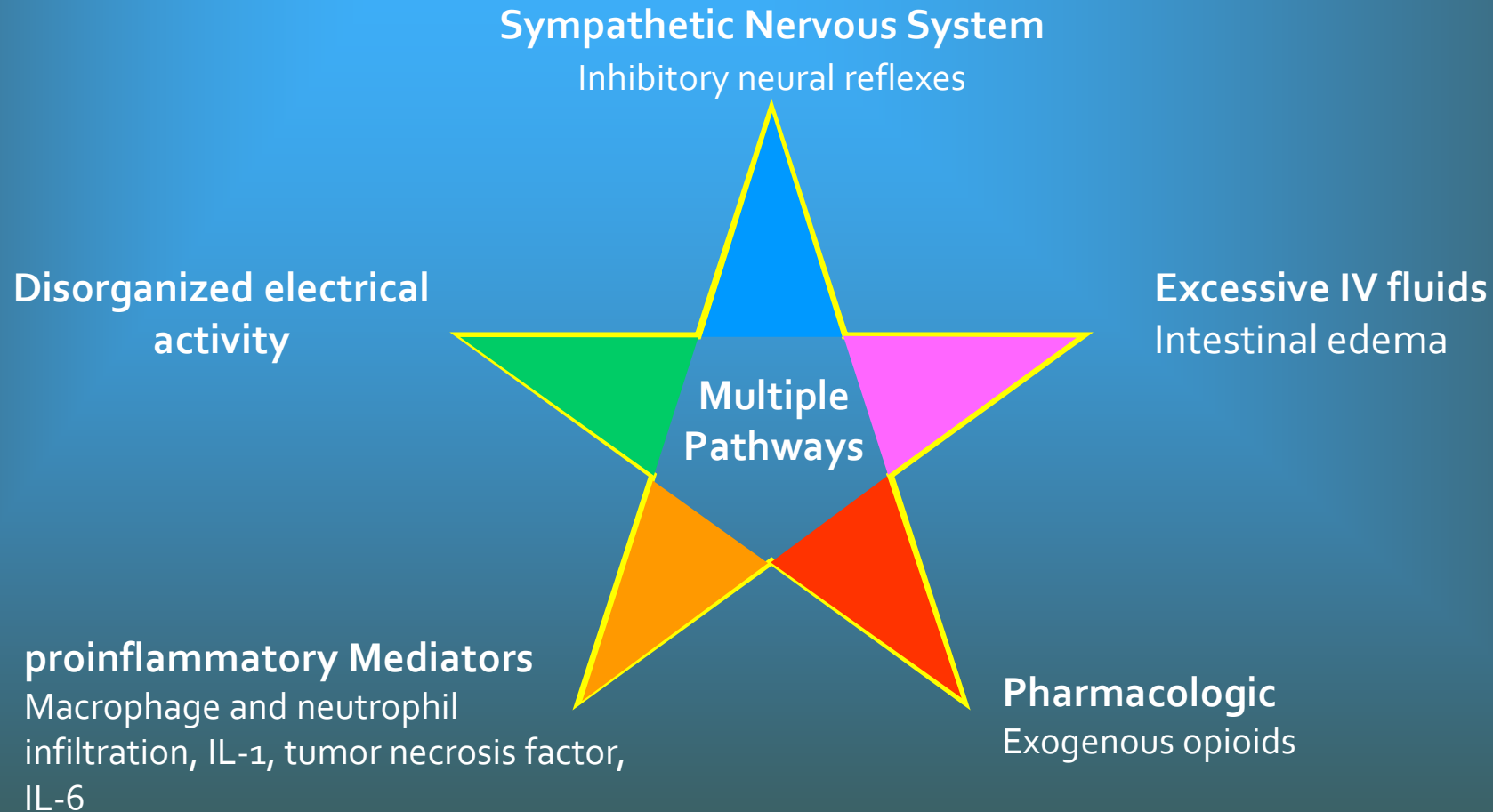
Abdominal Surgery

Critical illness states and nonabdominal surgical procedures

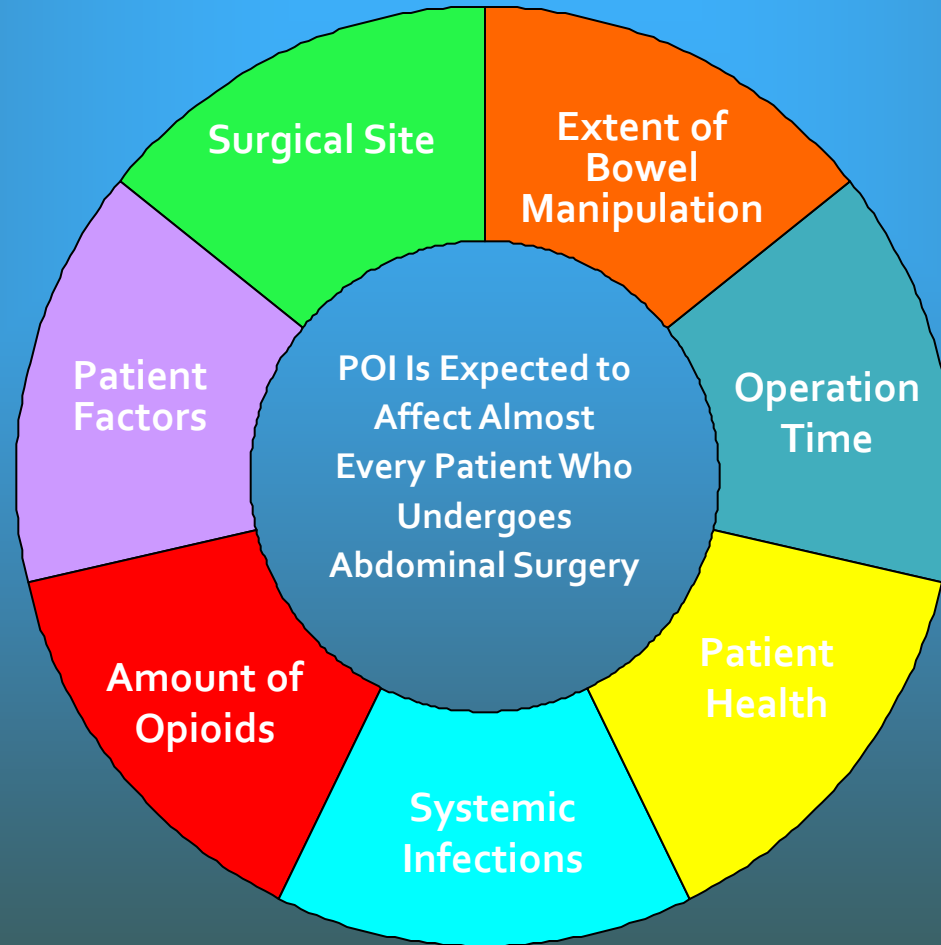
Hip surgery, retroperitoneal spinal procedures, lower limb orthopaedic and neurosurgery



Pathogenesis of POI Is Multifactorial



There Are Numerous Risk Factors for POI



*Senagore AJ. Am J Health-Syst Pharm. 2007;64(suppl 13):S3-S7.
Senagore AJ, et al. Surgery. 2007;142:478-486.*



Preventive and Therapeutic Management Options for POI

- **Physical Options**
 - Nasogastric tube
 - Early postoperative feeding
 - Sham feeding, gum chewing
 - Early ambulation
- **Surgical Technique**
 - Laparoscopy
- **Psychological Perioperative Information**
- **Anesthesia and Analgesia**
 - Epidural
 - NSAIDs
- **Pharmacologic**
 - Prokinetic agents
 - Opioid (PAMOR) antagonists
 - Other agents
- **Perioperative Care Plan(s)**
 - Multimodal clinical pathways

PAMOR = peripherally acting μ -opioid receptor antagonist

Luckey A, et al. *Arch Surg.* 2003;138:206-214.

Person B, Wexner S. *Curr Probl Surg.* 2006;43:12-65.



Management Options for POI

Nonpharmacologic Options		
Management	Potential Mechanism	Impact on Bowel Function, Length of Stay
NG tube	Gastric/small bowel decompression	<u>Removal</u> of NG tube associated with earlier return of bowel function, reduction in pulmonary complications, shorter length of stay
Early feeding (including sham feeding)	Stimulates GI motility by eliciting reflex response and stimulating release of hormonal factors	Some studies report a reduction in POI with early feeding, meta-analyses suggest a modest (non-significant) reduction in length of stay
Early ambulation	Possible mechanical stimulation; possible stimulation of intestinal function	No effect on duration of POI; beneficial for prevention of lower extremity thromboembolism
Laparoscopic surgery	Decreased opiate requirements, decreased pain, less abdominal wall trauma, less intestinal manipulation	Earlier passage of flatus, earlier bowel movement, shortened length of stay



Management Options for POI

Pharmacologic Options		
Treatment or Prevention	Potential Mechanism	Impact on Bowel Function, Length of Stay
Epidural (thoracic) anesthesia/analgesia	Inhibits sympathetic reflex at cord level; opioid-sparing analgesia	Earlier bowel movement, reduced duration of POI compared with systemic analgesic regimens
NSAIDs	Opiate-sparing analgesia, inhibits COX-mediated prostaglandin synthesis	Earlier bowel movement, earlier ambulation, no change in length of stay compared with morphine PCA
Metoclopramide	Dopamine antagonist, cholinergic agonist, prokinetic agent	No benefit on the duration of POI
Erythromycin	Motilin receptor agonist, prokinetic effect	No benefit on the duration of POI
Laxatives	Help to induce bowel movement	Limited data from small nonrandomized study suggests benefit; additional study required
Peripherally selective mu-receptor antagonists	Block enteric mu-receptors and minimize opioid effects on GI function, without impacting CNS-mediated analgesia	Clinical trials with alvimopan demonstrated reduced time to recovery of GI function, reduced time to discharge order written compared with placebo

Person B, Wexner S. *Curr Probl Surg*. 2006;43:12-65.

Chen JY, et al. *Acta Anaesthesiol Scand*. 2005;49:546-551.

Luckey A, et al. *Arch Surg*. 2003;138:206-214.

Becker G, Blum H. *Lancet*. 2009;373(9670):1198-1206.



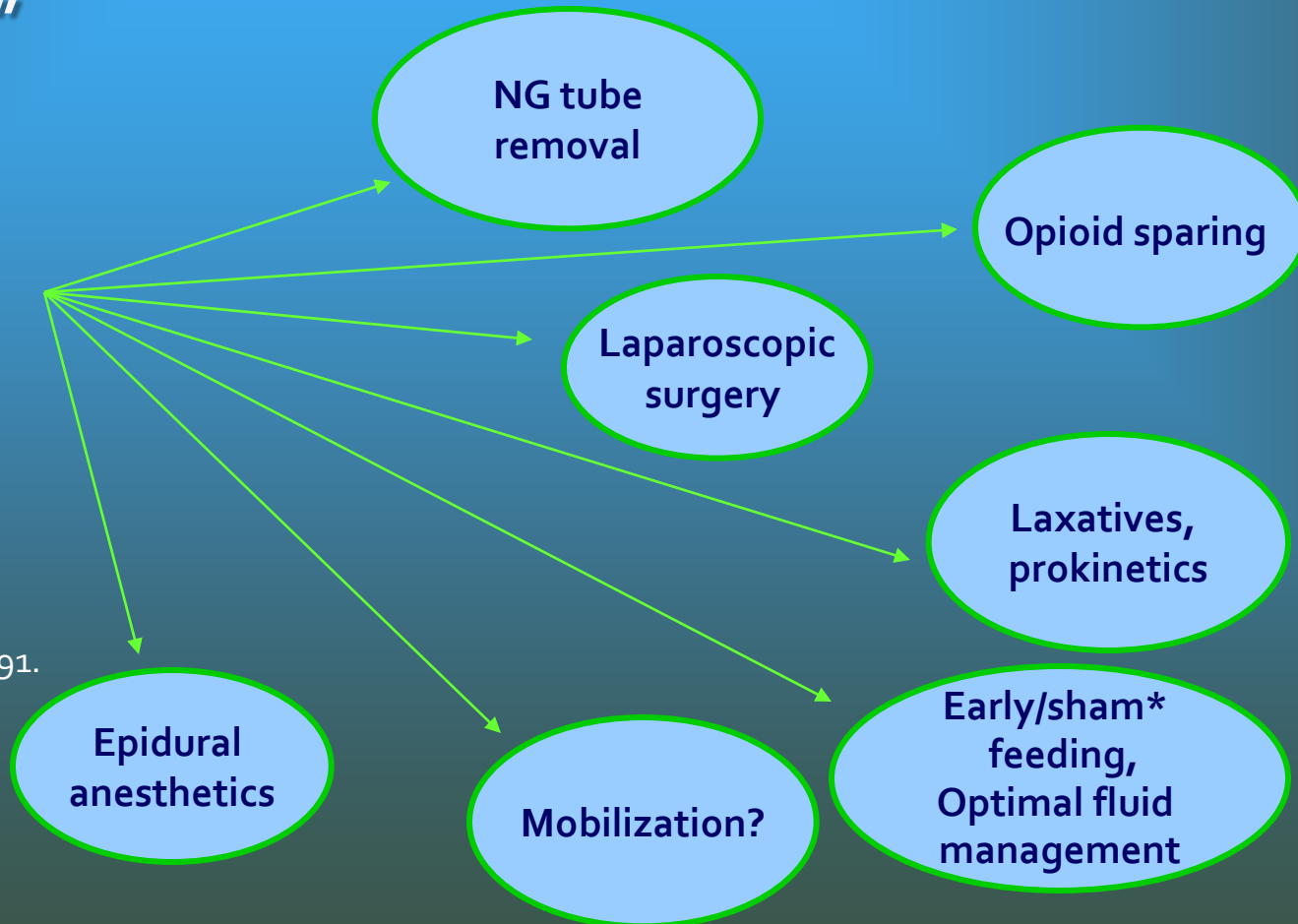
POI: Peripheral Opioid Antagonism

- Most patients require opioids
- Opioids inhibit GI propulsive motility and secretion; the GI effects of opioids are mediated primarily by μ -opioid receptors within the bowel
- Naloxone and naltrexone reduce opioid bowel dysfunction but can reverse analgesia in higher doses
- An ideal POI treatment is a peripheral opioid receptor antagonist that reverses GI side effects without compromising postoperative analgesia
 - Alvimopan
 - Methylnaltrexone



What Is “Fast-Track Recovery”?

- “An interdisciplinary multimodal concept to accelerate postoperative convalescence and reduce general morbidity (including POI) by simultaneously applying several interventions”
- What are the appropriate choices in constructing fast-track, multimodal protocols?



*such as gum chewing

Mattei P, Rombeau J. *World J Surg.* 2006;30:1382-1391.
Person B, Wexner S. *Curr Probl Surg.* 2006;43:6-65.



Fast-Track Example (Colectomy)

Day	Standard	Fast-Track
Pre-operative	Consent, epidural (local anesthetic [LA] with opioid)	Consent and educate, anti-emetic, anxiolytic, epidural (LA with opioid)
Day of surgery	Admit to SICU*, NG out with order, i.v. fluids to body weight, continuous epidural or PCA, anti-emetic, nothing by mouth, sitting	Admit to floor post PACU, NG out with extubation, limit i.v. fluid, continuous epidural (limit systemic opioids), NSAID, laxative, mobilize to chair, short walk, soft foods
POD 1	Admit to floor, epidural or PCA, clear oral liquids and i.v. fluids, out of bed, remove drains and Foley	Transition to oral opioids or NSAIDs (limit epidural and systemic opioids), regular diet, mobilize > 8 hr, walk twice daily, remove drains and Foley
POD 2	Epidural or PCA, laxative, mashed food, out of bed	Remove epidural, plan discharge
POD 3	Transition to oral opioids (limit epidural and systemic opioids), out of bed	Oral opioids or NSAIDs, fully mobilize, discharge
POD 8	Extract staples, discharge pending orders	Outpatient clinic, extract staples

*Not all centers admit patients to the SICU under standard care

Raue W, et al. *Surg Endosc*. 2004;18:1463-1468.

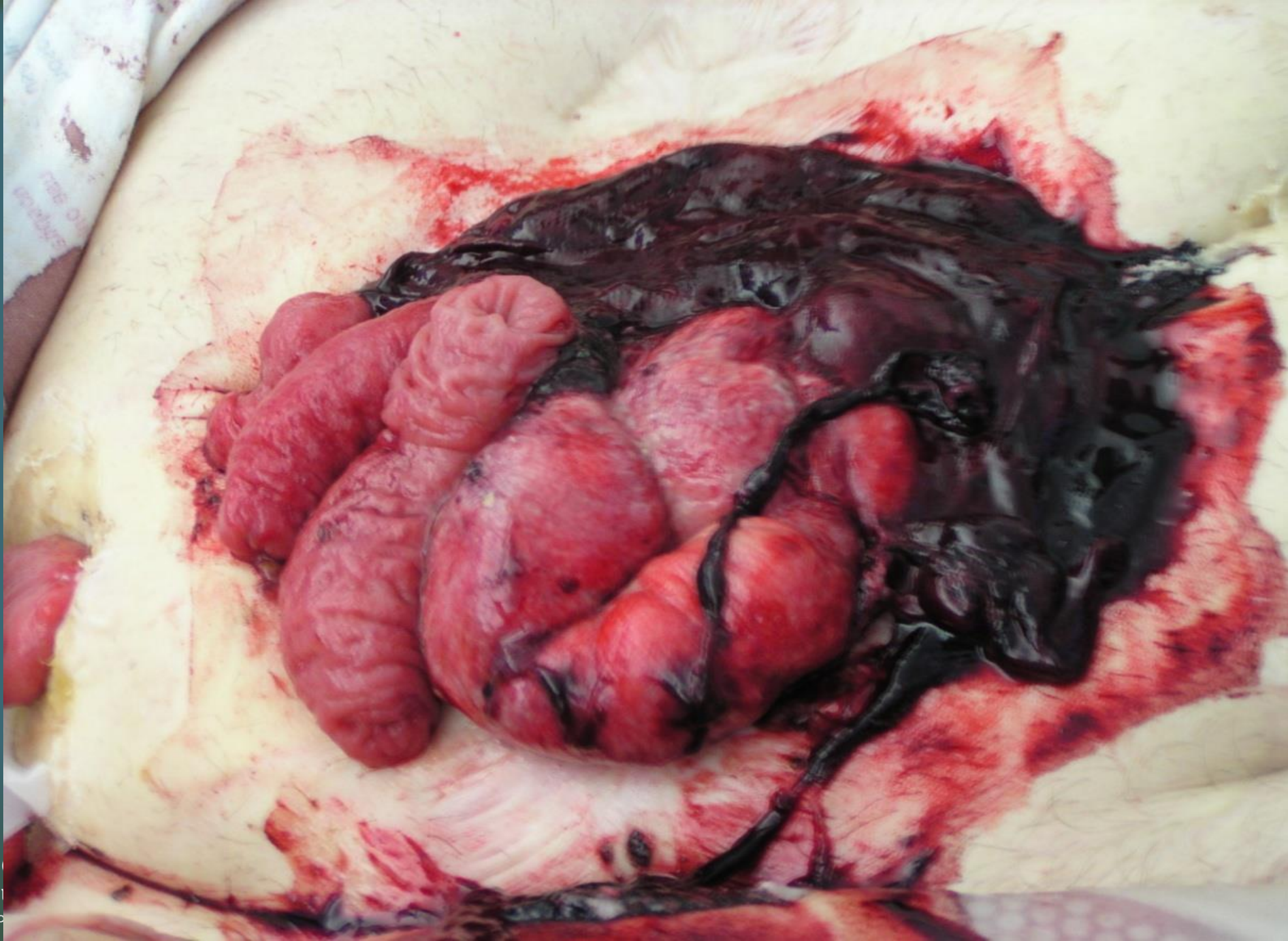
SICU = surgical intensive care unit

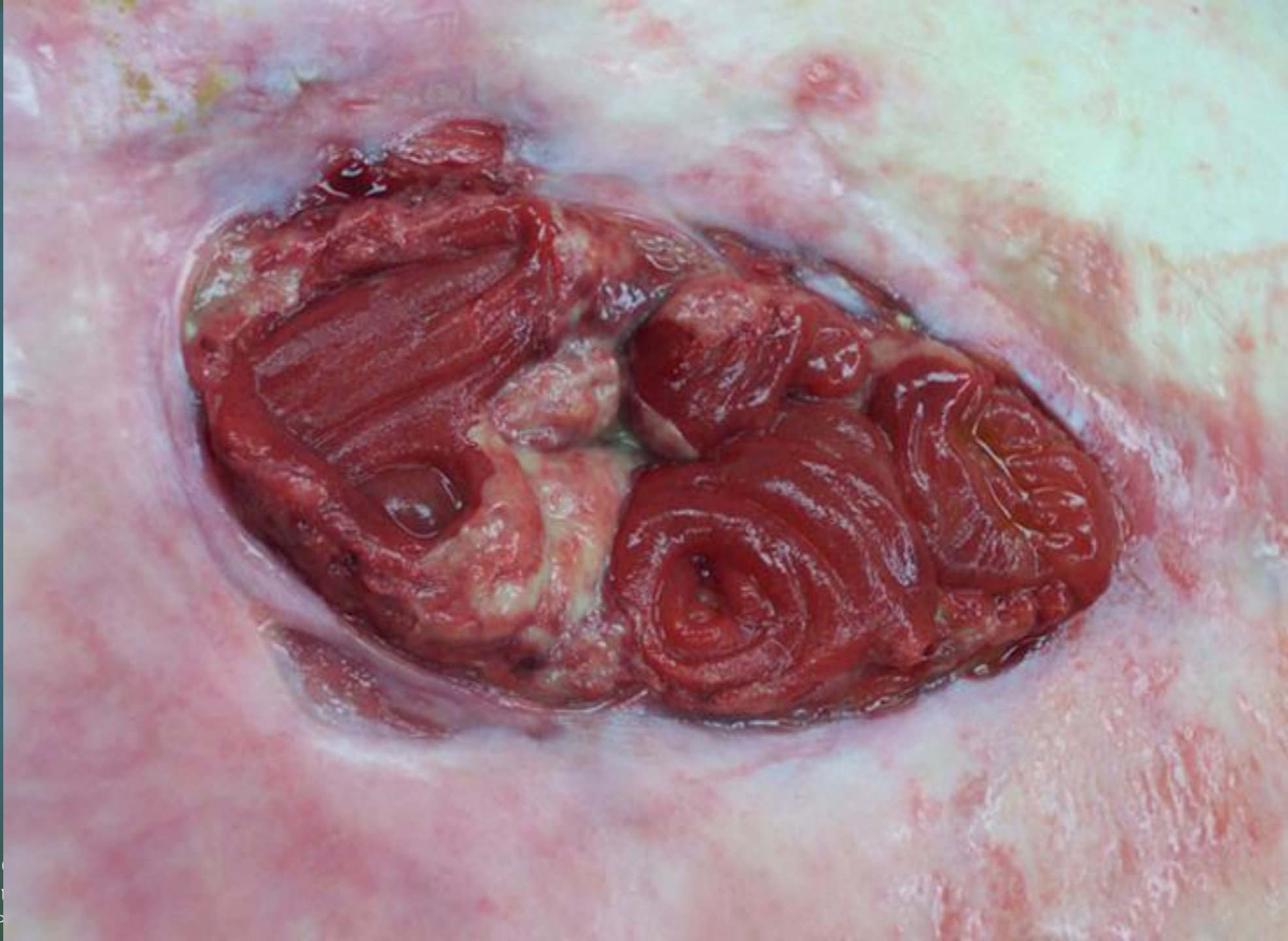
PACU = postanesthetic care unit

On the other hand....!

- *Sometimes the situation is much worse.....*







BACKGROUND

- Enterocutaneous fistulae = abnormal connection between GI tract and skin
- Majority (>75%) develop postoperatively¹
 - Malignancy
 - IBD
 - Intra-abdominal sepsis
 - Dense adhesions
 - Open abdomen
- Remainder spontaneous²
 - IBD (esp Crohn's)
 - Radiation enteritis
 - Diverticular disease
 - Malignancy
 - Trauma
 - Intra-abdominal sepsis

1. Berry SM, Fischer JE. Classification and pathophysiology of enterocutaneous fistulas. Surg Clin North Am. 1996;76:1009-1018.
2. Hollington P, Mawdsley J, Lim W, Gabe SM, Forbes A, Windsor AJ. An 11-year experience of enterocutaneous fistula. Br J Surg. 2004;91:1646-1651.



BACKGROUND

- Complex patients with considerable morbidity and mortality
- Mortality rates dropped from ~60% in '60's¹ to less than 10%^{2,3}
- Operative mortality <5%³
- Multidisciplinary approach
- Spontaneous closure 7-70% reported^{2,3} depends on aetiology & referral pattern
- **PATIENCE! Time is everything!!**

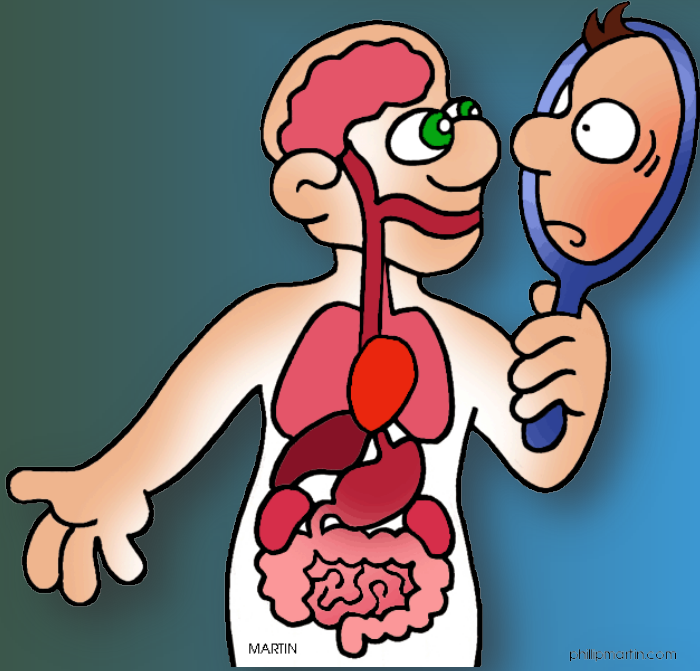
1. Edmunds LH Jr, Williams GM, Welch CE. External fistulas arising from the gastro-intestinal tract. Ann Surg 1960;152:445-471.
2. Hollington P, Mawdsley J, Lim W, Gabe SM, Forbes A, Windsor AJ. An 11-year experience of enterocutaneous fistula. Br J Surg. 2004;91:1646-1651.
3. Datta V, Engledow A, Chan S, Forbes A, Cohen CR, Windsor A. The management of enterocutaneous fistula in a regional unit in the United Kingdom: A prospective study. Dis Colon Rectum 2010;53:192-199.



CLASSIFICATION

- Site
 - Small bowel (65%)
 - Colon (30%)
 - Stomach/oesophagus (rare)
- Output
 - Low (<200 mL/24 hr)
 - Moderate (200 – 500 mL/24 hr)
 - High (>500 mL/24 hr)
- Complexity
 - Simple
 - Complex – long, multiple, associated abscess, other organ involvement (e.g. bladder, vagina)



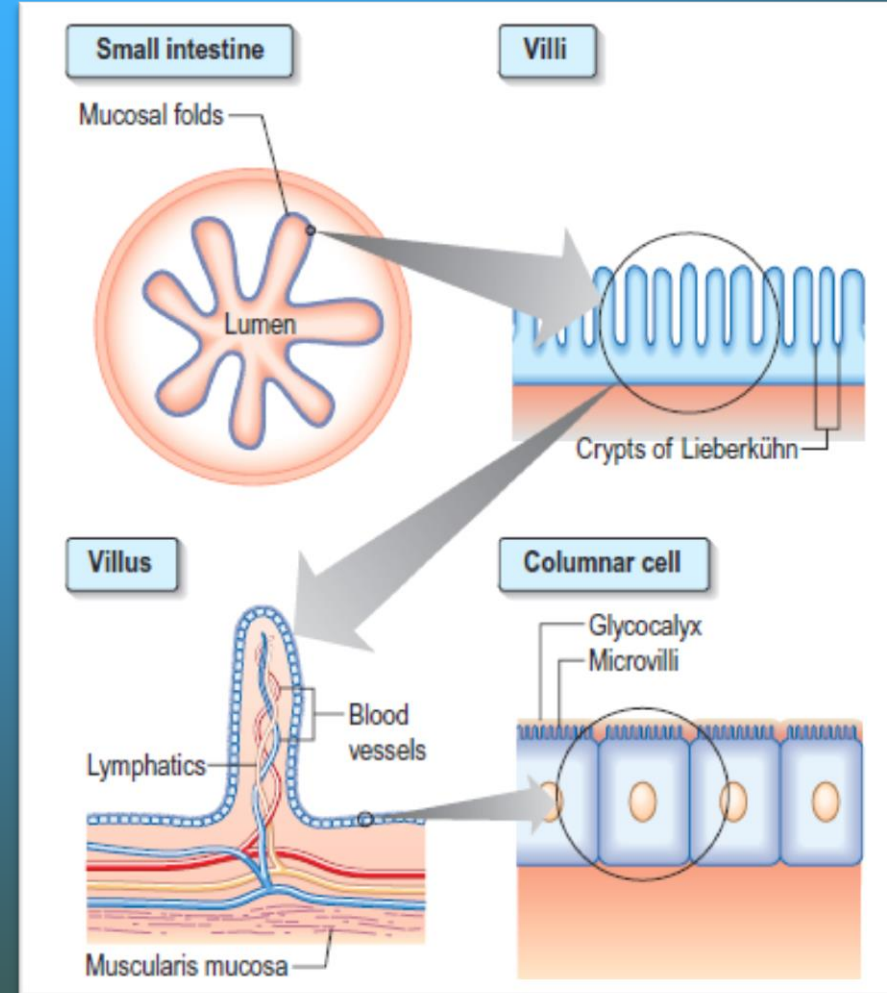


Physiological Background



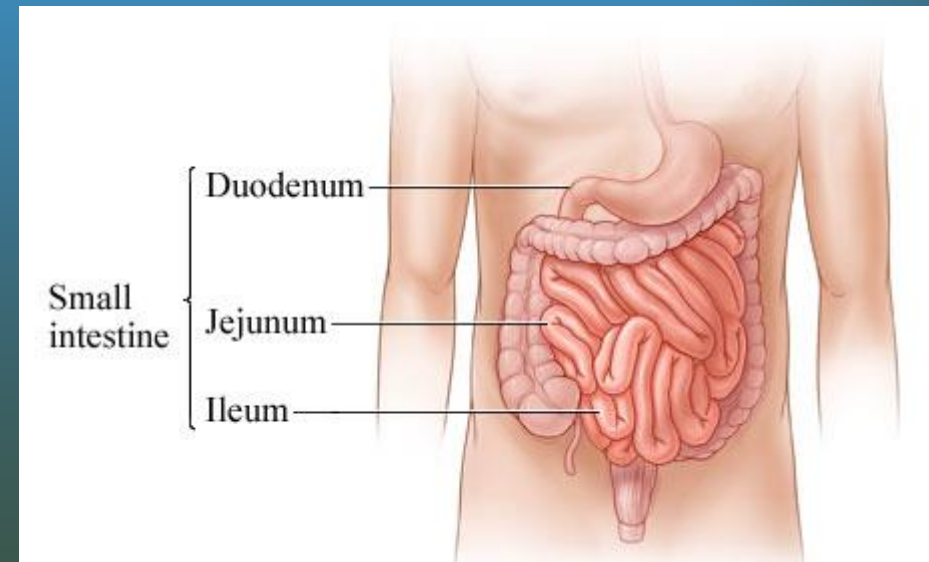
Small intestine

- 5-7 meters long.
- The mucosal surfaces have finger-like projections called *villi* that increase 20-fold the surface area for absorption.
- On the epithelial surface there is a brush border of *microvilli* to further enhance absorption.

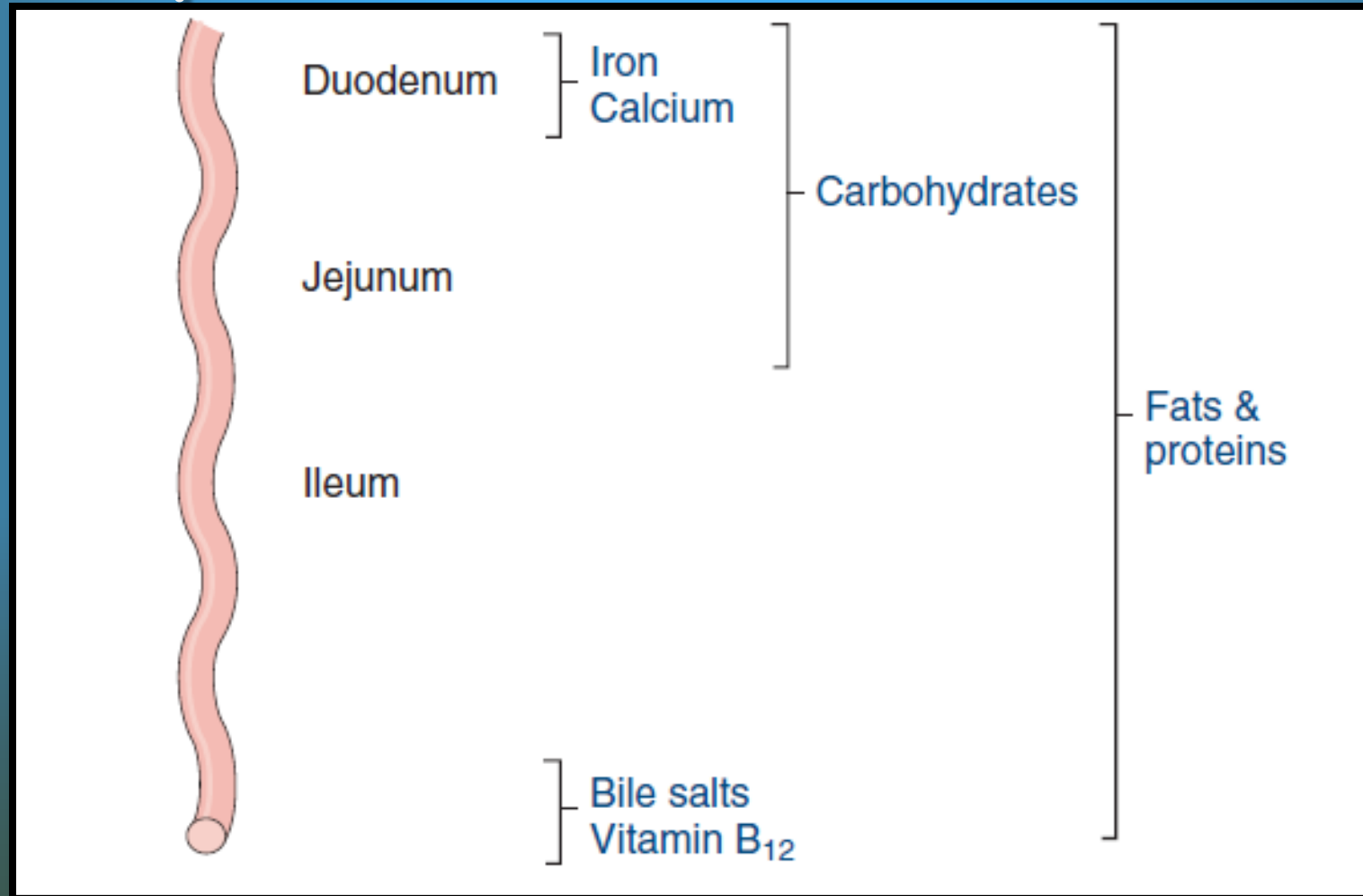


Small intestine

- Anatomically, the small intestine is divided into the duodenum, jejunum and ileum.
- The duodenojejunal flexure is supported by the *ligament of Treitz*, an arbitrary point used by clinicians to distinguish upper (proximal to the ligament of Treitz) from lower gastrointestinal bleeding.
- The jejunum is slightly thicker and has a greater number of mucosal folds compared to the ileum



Overview of nutrient absorption in the small intestine.



MANAGEMENT

- Multidisciplinary approach
 - Surgeon
 - Physician
 - Dietician
 - Pharmacist
 - Stomal therapist
 - Radiologist
 - Social worker



STEPS IN MANAGEMENT

- Resuscitation
- Elimination of sepsis
- Wound management
- Optimisation of nutrition
- Assessment of anatomy
- Planned surgical procedure

SNAP



RESUSCITATION

SNAP

- Correction of fluid and electrolyte imbalances
- Open abdomen is equivalent to large full thickness burn in terms of fluid losses
- Electrolyte replacement (esp. Na^+ , K^+ , Mg^{2+})
- Close monitoring of input and output
 - IDC, measure stoma losses, CVP measurement



Management

- *Sepsis and fistulation* are the primary factors associated with the development of intestinal failure in more than 70% of patients, although approximately 10% will also have a significant reduction in absolute bowel length even at diagnosis (i.e. they will go on to develop type III intestinal failure, irrespective of treatment) .



CONTROL SEPSIS – THE BASICS

- Sepsis is most common cause of mortality in ECF patients (approx 2/3)¹
- CT scan
 - percutaneous drainage of intra-abdominal abscesses
 - open drainage if superficial
- Rarely laparotomy if peritonitis present
 - exteriorise fistula or proximal diversion
- Line associated sepsis not be overlooked (more common with central line vs. PICC)²

SNAP

1. Hollington P, Mawdsley J, Lim W, Gabe SM, Forbes A, Windsor AJ. An 11-year experience of enterocutaneous fistula. Br J Surg. 2004;91:1646-1651.
2. Collignon, PJ. Intravascular catheter associated sepsis: a common problem. The Australian Study on Intravascular Catheter Associated Sepsis. Med J Aust. 1994 Sep 19;161(6):374-8.



'Sepsis-Nutrition-Anatomy-Plan' - SNAP!

- *First:* The Prompt Diagnosis And Treatment Of Abdominal Sepsis.
- *Second:* Effective Nutritional Support
- *Third:* Anatomy
- *Fourth:* Planned Procedure



The Prompt Diagnosis And Treatment Of Abdominal Sepsis (the most important)

- The detrimental effect on survival is multifactorial :
- Impairment of GIT functions ; nutrient transport, intestinal motility, enterocyte proliferation and apoptosis.
- Spontaneous healing of fistulas is less likely
- Increased metabolic need → progressive weight loss

- Aggressive nutritional support is unlikely to be successful until the Sepsis is investigated and treated;
- This concept is fundamental to the 'SNAP' approach of managing Type 2 intestinal failure.



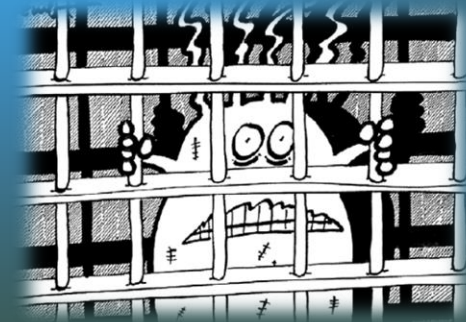
The Prompt Diagnosis And Treatment Of Abdominal Sepsis (the most important)

- *Classical signs;* pyrexia(may be absent when?),leukocytosis, & cachexia, hypoalbuminaemia and abnormalities in liver function.
- *Cultures & Swabs* (other sites ?!)
- *Adequate radiological localization* (US , CT)
- *Immediate drainage:* CT guided Percutaneous drainage whenever possible, thus avoiding the 'second hit' associated with a difficult further laparotomy. trans-gastric, trans-gluteal, trans-vaginal, trans-rectal or even trans-hepatic approaches to facilitate drainage of deep-seated collections



The Prompt Diagnosis And Treatment Of Abdominal Sepsis (the most important)

- *Antibiotic therapy*, guided by results of aspirate culture,
- *Surgical treatment* (multiple interloop abscesses, a high-output enteric fistula feeding the cavity, marked lack of intestinal continuity or obstruction distally, or extensive anastamotic breakdown)
- In cases of recurrent severe abdominal sepsis, adequate source control may necessitate management of the patient with a diverting stoma and maybe an *open abdomen (laparostomy)*

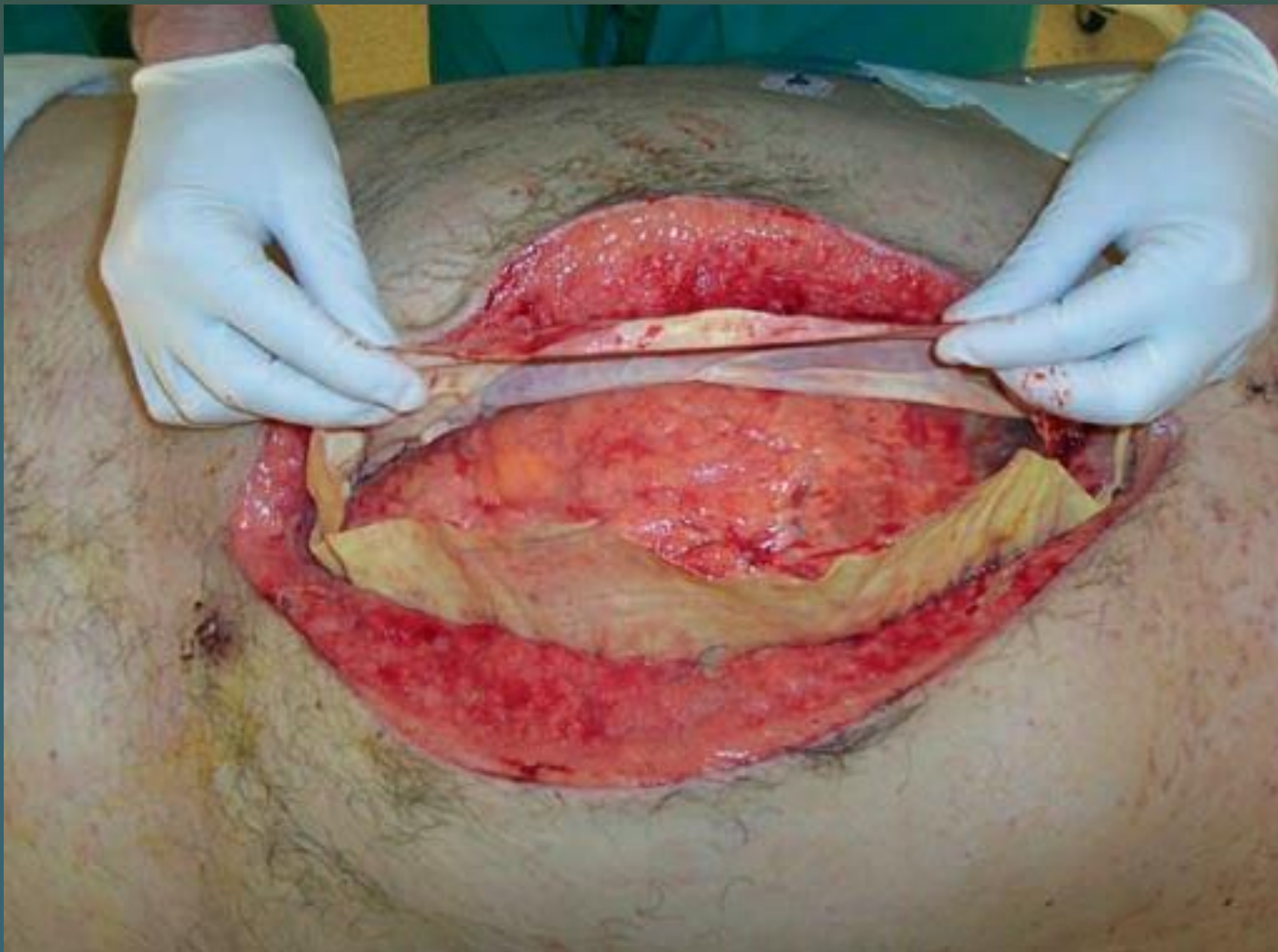




WOUND MANAGEMENT

- Protect skin from corrosive fistula effluent
- Careful measurement of fistula output
- Experienced stomal therapist essential
- “creative bagging”
- Open abdomen
 - vacuum dressings with isolation of fistula and protection of other bowel segments
 - don't apply sponge directly to bowel or anastomosis

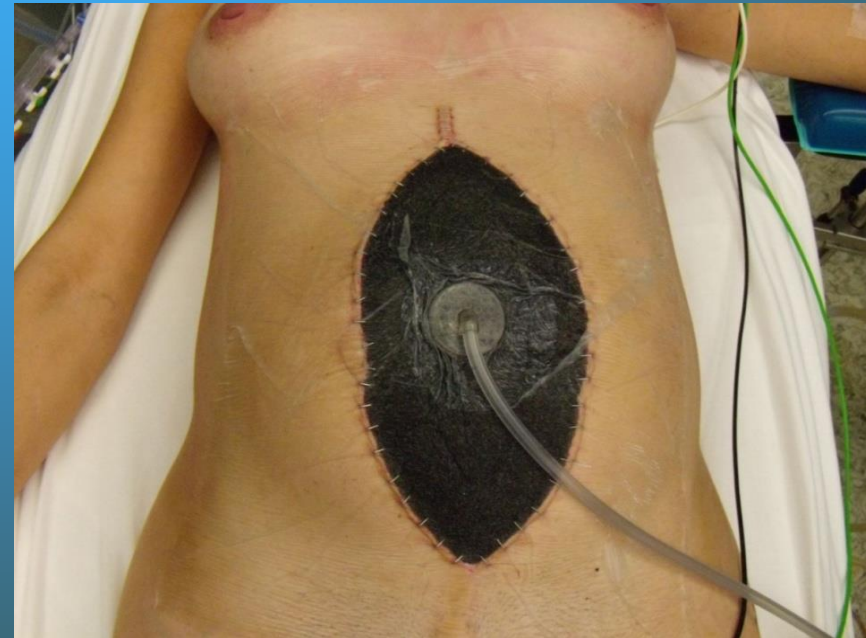




OPEN ABDOMEN



Bogota bag



Vacuum dressing





Effective Nutritional Support

Nutritional intervention should be considered whenever;

- *Starvation* for longer than 5 days is expected or has occurred, whether as a result of impaired intake or gastrointestinal disease.
- The *underlying disease* has led to an increase in nutritional requirements beyond that which can be provided by a 'normal diet'.
- *Nutritional depletion* already existed prior to the onset of acute gastrointestinal failure.

Effective Nutritional Support

- *Enteral nutrition*
- the enteral route should be used for nutritional support whenever possible.
- Enteral feeding is safer, more physiological, may preserve intestinal mucosal integrity and is certainly far less expensive than parenteral nutrition.
- In acute intestinal failure, however, enteral feeding may be impractical or inappropriate.



Effective Nutritional Support

- Enteral nutrition may prove satisfactory in patients with a *low output distal ileal or colonic fistula* but is inappropriate when there is obstruction or a fistula of the upper gastrointestinal tract, unless access can be gained to the gut below the diseased segment.



Effective Nutritional Support

- It may be possible to place an enteral feeding tube directly into the small intestine through an entero-cutaneous fistula. The output of the fistula can be collected, mixed with enteral feed and infused into the distal, healthy gut, but the technique is demanding for nursing staff, unpleasant.



Effective Nutritional Support

Parenteral Nutrition:

- The preferred modality of nutritional support.
- This may either be because of the presence of disease of the intestine, which precludes satisfactory enteral nutrition, an inability to tolerate enteral nutrition or altered nutritional requirements such as those associated with severe sepsis or injury.



Effective Nutritional Support

- If the anticipated period of nutritional support is fewer than 14 days, parenteral nutrition can be provided safely via a peripheral vein.
- The chief attraction of peripheral total parenteral nutrition (TPN) is that it requires little in the way of special expertise and is not associated with the potential morbidity of central venous cannulation.
- This can be minimized by the use of lipid-containing regimens (which have a lower osmolality than glucose-based regimens and are therefore less irritant to venous endothelium),



Effective Nutritional Support

- Also by adding heparin and hydrocortisone to the feed and by the application of nitrate patches to promote venodilatation at the feeding site.
- Central venous TPN is therefore recommended in patients with large fluid requirements or acutely ill adult patients, who may have energy requirements greater than 2000 kcal/day. Central venous TPN is also necessary where it is evident that a prolonged period of parenteral feeding is likely to be required.

Irrespective of the route chosen for venous access, a strict aseptic technique is essential



NUTRITION - SUMMARY

SNAP

- Aim to return malnourished patient to health, allowing spontaneous closure or optimisation for future surgery
- Enteral vs. TPN debate (no L1 evidence)
- Enteral preferred
 - Avoids line-related complications (sepsis, thrombosis, pneumothorax)
 - Trophic effect on bowel mucosa¹
 - Supports immunological, barrier and hormonal functions of gut²
 - High calorie, protein supplements, electrolyte mix, minimise hypotonic fluids and drinking with meals
- Fistuloclysis may be used to avoid TPN³

1. Datta V, Engledow A, Chan S, Forbes A, Cohen CR, Windsor A. The management of enterocutaneous fistula in a regional unit in the United Kingdom: A prospective study. *Dis Colon Rectum* 2010;53:192-199.
2. Schechter, WP, Hirshberg A, Chang DS, Harris HW, Napolitano LM, Wexner SD, Dudrick SJ. Enteric fistulas: Principles of management. *J Am Coll Surg* 2009;209: 484-491.
3. Tuebner A, Morrison K, Ravishankar HR, Anderson ID, Scott NA, Carlson GL. Fistuloclysis can successfully replace parenteral feeding in the nutritional support of patients with enterocutaneous fistula. *Br J Surg* 2004;91:625-631.



NUTRITION - SUMMARY

SNAP

- TPN may be required if high output, distal obstruction, ongoing sepsis
- High dose anti-diarrhoeals (loperamide, codeine), proton pump inhibitor^{1,2}
- Octreotide & somatostatin
 - can reduce fistula output and time to spontaneous closure³
 - limited evidence for improved closure rate⁴
 - expensive

1. Datta V, Engledow A, Chan S, Forbes A, Cohen CR, Windsor A. The management of enterocutaneous fistula in a regional unit in the United Kingdom: A prospective study. *Dis Colon Rectum* 2010;53:192-199.
2. Hollington P, Mawdsley J, Lim W, Gabe SM, Forbes A, Windsor AJ. An 11-year experience of enterocutaneous fistula. *Br J Surg.* 2004;91:1646-1651.
3. Dorta G. Role of octreotide and somatostatin in the treatment of intestinal fistulae. *Digestion* 1999;60:53-56.
4. Alivizatos V, Felekis D, Zorbalas A. Evaluation of the effectiveness of octreotide in the conservative management of postoperative enterocutaneous fistulas. *Hepatogastroenterology* 2002;49:1010-1012.



SPONTANEOUS CLOSURE

- May occur during the “waiting period”
- 7-70% spontaneous closure reported^{1,2}, varies with referral patterns and underlying cause
- 90% within 1st month, none after 3 months
- Octreotide may speed closure³, no improvement in closure rate⁴

1. Hollington P, Mawdsley J, Lim W, Gabe SM, Forbes A, Windsor AJ. An 11-year experience of enterocutaneous fistula. Br J Surg. 2004;91:1646-1651.
2. Datta V, Engledow A, Chan S, Forbes A, Cohen CR, Windsor A. The management of enterocutaneous fistula in a regional unit in the United Kingdom: A prospective study. Dis Colon Rectum 2010;53:192-199.
3. Dorta G. Role of octreotide and somatostatin in the treatment of intestinal fistulae. Digestion 1999;60:53-56.
4. Alivizatos V, Felekis D, Zorbalas A. Evaluation of the effectiveness of octreotide in the conservative management of postoperative enterocutaneous fistulas. Hepatogastroenterology 2002;49:1010-1012.



SPONTANEOUS CLOSURE

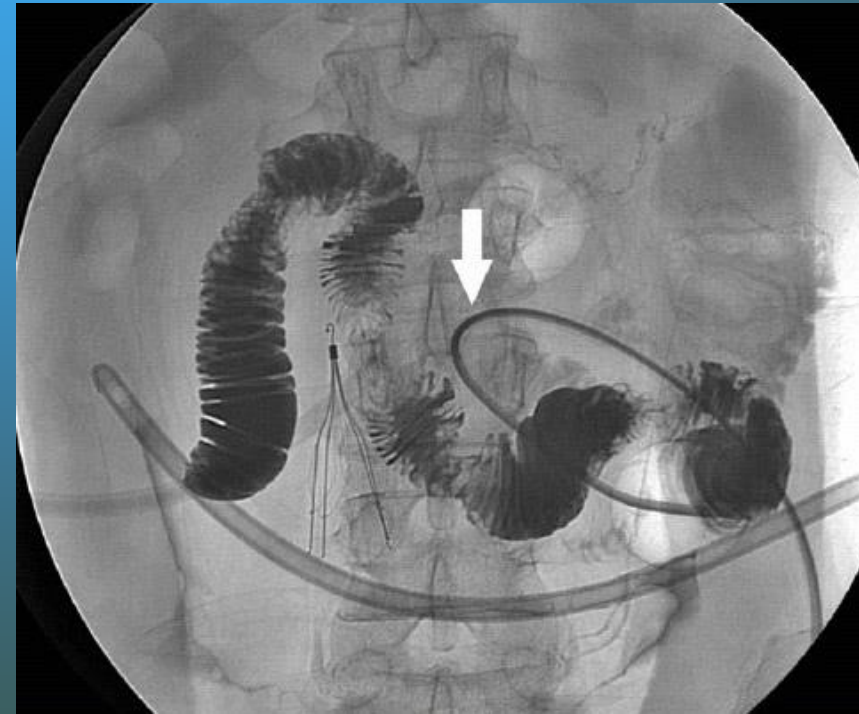
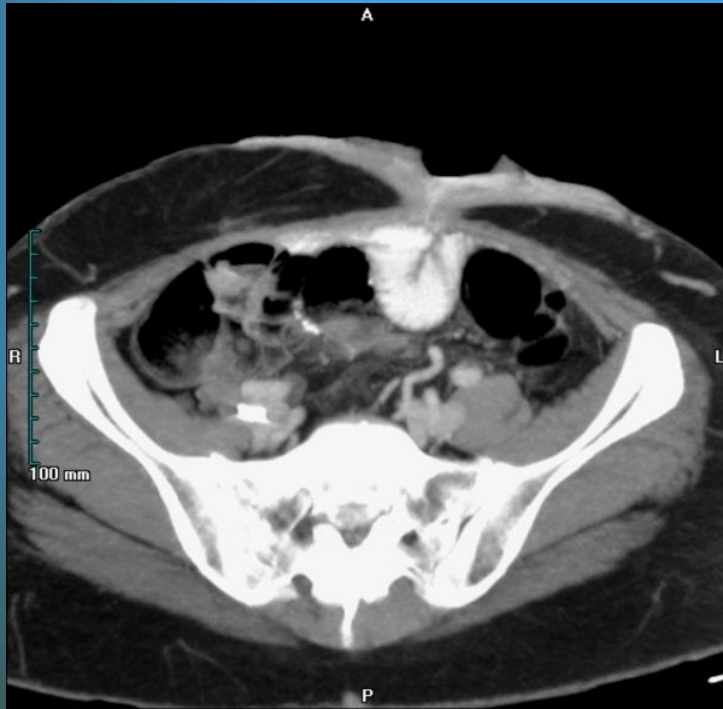
Favourable	Unfavourable
Long tract	Short, wide tract, eversion of mucosa
Intestinal continuity	Disruption of GIT
No distal obstruction	Distal obstruction
No sepsis	Sepsis
Low output	High output
Good nutrition	Malnutrition
No underlying bowel disease	Diseased bowel (egg Crohn's, malignancy, radiation enteritis)



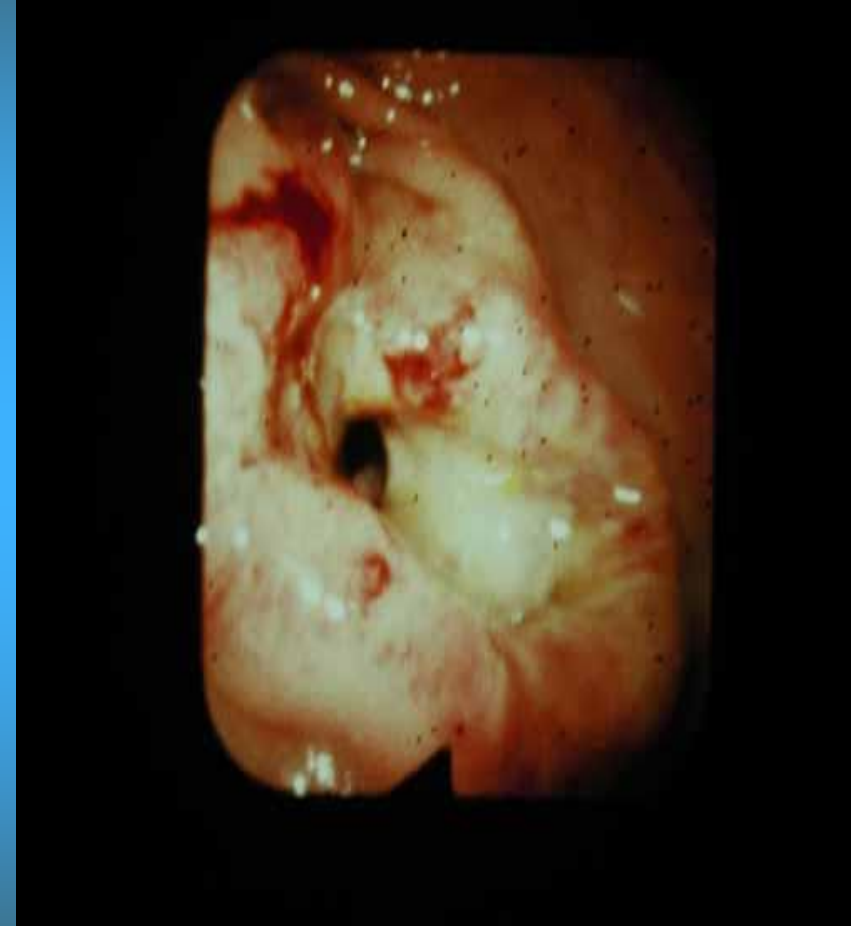
ASSESS ANATOMY

SNAP

- CT – fistula + abdominal wall
- Contrast studies - roadmap



Colonoscopy



DEFINITIVE SURGERY

SNAP

- Wait at least 3 months for resolution of obliterative peritonitis.
- **Most centres recommend >6 month wait from last laparotomy¹**
- Signs that adhesions have “matured” (neoperitoneum formed)¹
 - Fistulae prolapse
 - Skin/skin graft loose over bowel
- Ensure whole day list available, ICU available postop

1. Hollington P, Mawdsley J, Lim W, Gabe SM, Forbes A, Windsor AJ. An 11-year experience of enterocutaneous fistula. Br J Surg. 2004;91:1646-1651.



TECHNIQUE

- Full adhesiolysis, including laterally
- Avoid enterotomies, repair immediately if occur
- Resection of fistulating segment with preservation of as much enteric length as possible
- Measure residual length carefully (ruler and tape)
- Resection and anastomosis preferred over fistula closure (>35% recurrence with simple closure¹)
- CO₂ test for enterotomies
- Defunctioning stoma's as needed
- Abdominal wall reconstruction a major challenge
- Success rate
 - Approx 60% with simple fistula closure¹
 - >80% with formal resection^{1,2}
 - More than one procedure may be required²
 - Higher recurrence with Crohn's, irradiation etc¹

1. Lynch AC, Delaney CP, Senagore AJ, Connor JT, Remzi FH, Fazio VW. Clinical outcome and factors predictive of recurrence after enterocutaneous fistula surgery. Ann Surg 2004;240:825-31
2. Hollington P, Mawdsley J, Lim W, Gabe SM, Forbes A, Windsor AJ. An 11-year experience of enterocutaneous fistula. Br J Surg. 2004;91:1646-1651.



ABDOMINAL WALL RECONSTRUCTION

- Fascial edges often retracted widely (open abdomen)
- Avoid synthetic mesh
- Dissolvable mesh
- Biologic mesh
- Component separation technique
- Avoid open abdomen (increased risk of re-fistulation – 25%)



ABDOMINAL WALL



Loss of domain



Enterocutaneous fistula

COMPONENT SEPARATION

- Ramirez 1990 – cadaveric and 11 patients¹
- Incise external oblique aponeurosis and mobilize in plane deep to EO, incise rectus sheath and separate rectus from posterior sheath
- Allows medialisation of rectus, to obtain midline fascial closure
- 8+2cm advancement at umbilicus (each side)

1. Ramirez OM, Ruas E, Dellon AL. "Components Separation" method for closure of abdominal-wall defects: an anatomic and clinical study. Plastic and Reconstructive Surgery. 1990;86:519-526.



Summary and Conclusions

1. Complex cases not for the fainthearted
2. **SNAP** will keep you safe
3. Time is the great healer – the process will likely take a year or more
4. Proximal diversion can be a life saver
5. Never get clever



It's a Team Sport

