Intestinal failure
management of the acute condition

Marek Pertkiewicz
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Intestinal failure

- The reduction in functioning gut mass below the minimal amount necessary for adequate digestion and absorption.

  R.Fleming, 1981

- Reduction of intestinal absorption so that macronutrient and/or water and electrolyte supplements are needed to maintain health and/or growth

  J.Nightingale, 2001
Intestinal failure – acute conditions

Anastomotic failure, bowel wall opening, Fistula

Water-electrolytes loss

Intraabdominal infection

Gut inflammation, chemotherapy

Translocation

Extended gut resection

Short bowel syndrome

Jejunum and colon

Jejunum – end – jejunostomy

Water-electrolytes loss

Unefficient oral feeding

Water-electrolytes loss
Abdominal catastrophe

Ex. Postoperative fistula
Consequences of fistula

- Water – electrolyte disturbances
- Sepsis, haemorrhage
- Hypermetabolism
- Intestinal failure
- Malnutrition
Natural history of GI fistulas

Fistula → Dehydration → Water-electrolyte disorders → Malnutrition → Infection → SIRS or shock → Death → Stabilisation → Healing → Other complications
Postoperative fistula - aims of treatment

- Allowing conditions for spontaneous healing

  "time heals all wounds"

- General and local preparation for definitive surgical repair
Main steps in fistula management

Th. Billroth – 50%
Palmer – professional
Cameron – suction drainage + oral feeding
Smirnow – Roux – en - Y
Brunschwig – surgery + nutrition
West – early surgery
Tremolieres – lactic acid
Edmunds – causes of death
Dudrick – TPN
Levy - EN
Sitges-Serra - ST
Byrne - HPN

ABrunschwig, A., Bigelow, R. R., Nichols, S.: Intravenous nutrition for eight weeks; partial enterectomy, recovery. JAMA, 1945, 129, 441 – first PN
Management of GI fistulas

1. General resuscitation
2. Correction of water-electrolyte and acid-base disorders
3. Nasogastric decompression
4. Suction drainage
   - from fistulous tract
   - from gastrointestinal tract
5. Pharmacological blockade of GI and pancreatic secretion
# Fluid – electrolyte fistula loss

<table>
<thead>
<tr>
<th>Fistula</th>
<th>V</th>
<th>Na</th>
<th>K</th>
<th>Cl</th>
<th>HC03</th>
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<tr>
<td>Oesophhageal</td>
<td>1500</td>
<td>10-20</td>
<td>20-30</td>
<td>10-20</td>
<td>30-50</td>
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<tr>
<td>Gastric</td>
<td>1500-3000</td>
<td>10-100</td>
<td>5-20</td>
<td>100-150</td>
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<tr>
<td>Duodenal</td>
<td>2000-4000</td>
<td>90-150</td>
<td>5-15</td>
<td>90-120</td>
<td>10-50</td>
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<tr>
<td>Biliary</td>
<td>800-3000</td>
<td>120-160</td>
<td>5-15</td>
<td>80-120</td>
<td>10-30</td>
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<tr>
<td>Pancreatic</td>
<td>800-1500</td>
<td>120-160</td>
<td>5-15</td>
<td>80-100</td>
<td>70-120</td>
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<tr>
<td>Jejunal</td>
<td>3000</td>
<td>100-140</td>
<td>5-15</td>
<td>80-120</td>
<td>10-50</td>
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</tbody>
</table>
Management of GI fistulas

6. Skin care

7. Nutritional support -
   Parenteral, enteral and combined

8. Active rehabilitation

9. Search for sepsis -
   USG, CT, X-RAY, CULTURES

10. Infection prophylaxis
Management of GI fistulas

11. Treatment of sepsis

   Abscess drainage
   Antibiotic local/systemic

12. Early surgery only for

   abscess, haemorrhage, peritonitis
   gut exteriorisation, if possible + mucous fistula

13. Fistula investigation

   Fistulography, x-ray passage
   gastrogafine, avoid barium x-ray
Surgery

Local Mediators

SIRS

Immunocyte Activation

Immunocyte Suppression

SECOND HIT

FISTULA

SEPSIS EARLY REOPERATION = SECOND HIT

Excessive Response

MOF

SECOND HIT
Management of GI fistulas

14. Preparation for delayed surgery
   cultures
   wound / GI tract decontamination
   perioperative infection prophylaxis

15. Delayed definitive surgery when
   serum albumin > 35 g/l,
   patient able to walk
   resolution of intraabdominal inflammation
General rules of parenteral nutrition in management of GI fistulas

**VOLUME**
To allow urine output necessary for excretion of protein catabolism products

**PROTEIN**
To allow positive nitrogen balance, 0.2-0.25 gN/kg b.w.

**ENERGY**
To allow positive energy balance, 20 –25 % as fat, check Harris-Benedict, avoid overfeeding
General rules of parenteral nutrition in management of GI fistulas

Electrolytes, trace elements intake
Basic + necessary to cover fistula losses
Na,K, Mg    Zn,Cu, Se

Vitamines
Basic + additional thiamin 25 – 50 mg

H₂ blockers, proton pump inhibitors
somatostatin?

DON’T FORGET ENTERAL NUTRITION
Enteral nutrition

- The only management in low output fistulas
  (when signs of local peritonitis absent)
- by the tube bypassing fistula in upper GI tract
- by the tube inserted below through fistulous tract
- Supplementary to PN always when possible
- Low residue diet in lower GI fistulas
- Necessary for preparation of distal GI tract for surgery
Patient E.K. Multiple jejunal fistulas.
Body composition, serum albumin and TLC in fistula patients
Patient B.S. B-I and B-II re-resections after partial gastrectomy for fistula

End-duodenal fistula, fistula of gastroenteric anastomosis, Subphrenic abscess, mechanical ileus.
### Timing and kind of surgery

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Surgery Details</th>
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</thead>
<tbody>
<tr>
<td>G.Ł., 24</td>
<td></td>
<td>Anastomotic leak, Ileal fistula, 6 reoperation/1 year, SBS 20 cm + fistula, Fistula repair after 1.5 years, HPN</td>
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<tr>
<td>R.P., 19</td>
<td></td>
<td>Anastomotic leak, End-jejunostomy + mucous fistula, 2 reoperations for haemorrhage, HPN + HEN – 1 year, Fistula closing, Working</td>
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</table>
Fistula first day output versus spontaneous healing rate

Skumul. proporcja zagojeń przetok w zależności od początkowego wydzielania i czasu leczenia przetoki

Grupa 1 - do 200 ml, grupa 2 - 201-500 ml, grupa 3> 500 ml/dobę

Grupa 1vs 2 - p<0,05,
Grupa 1vs 3 - p<0,0001

Czas leczenia zachowawczego (dni)
Spontaneous healing depending on fistula external orifice

Prawdopodobieństwo zagojenia przetoki zależnie od rodzaju ujścia zewnętrznego

- Zagojone
- Niezagojone

Grupa 1 - Ujście w kanale po drenie
Grupa 2 - Ujście w kanale w ranie
Grupa 3 - Ujście w rozległym ubytku powłok

Dni leczenia:

- Grupa 1
- Grupa 2
- Grupa 3
Results of fistula treatment depending on following treatment rules.

Częstość wyleczeń wśród chorych kolejnych grup leczonych z powodu przetok w zależności od odsetka chorych leczonych zgodnie z zasadami leczenia przetok

Wsp. korelacji: r=0,99608, p<0,05
Co-existing complications in GI tract fistula patients

%

- Abscess
- Bleeding form
- Eventration
- Total

- a, b - p < 0.05
- c, d - p < 0.005

Patient S.F. SBS, remnant necrosis, fistulas, abscesses.
Management of fistulas - Impact of PN on outcome

% CURED

The Dept. of Gastroenterological Surgery and Nutrition, Warsaw, 1975 - 1996
Extended gut resection
Acute Mesenteric Ischemia: Intraoperative Determination of Bowel Salvageability

Vascular surgeons are frequently consulted intraoperatively to evaluate a patient for acute mesenteric ischemia. Often, the patient has been taken to the OR on an emergency basis for acute abdominal pain with peritoneal signs or hemodynamic instability. In the OR, acute mesenteric ischemia typically presents as diffuse bowel ischemia. The first decision point in the evaluation is the determination of whether the bowel is salvageable.

Surgeon is consulted intraoperatively for evaluation of acute mesenteric ischemia

Determine whether bowel is salvageable. About 30 cm of viable bowel is required to sustain life if ileocecal valve is present; 100 cm is preferred.

Bowel is salvageable

Assess pulses in SMA.

No pulse is felt in SMA

Proximal jejunum and transverse colon are spared from ischemia

Embolic disease of SMA is likely diagnosis

Treat with surgical embolectomy and anticoagulation.
Assess bowel for possible resection.

Diffuse midgut bowel ischemia is present

Thrombotic disease of SMA is likely diagnosis

Perform mesenteric bypass, either antegrade (from suprarenal aorta to SMA) or retrograde (from infrarenal aorta or iliac artery to SMA). Assess bowel for possible resection.

Normal pulse is felt in SMA

NOMI is likely diagnosis

Correct underlying condition. Optimize fluid status, improve cardiac output, and eliminate pressors.
Consider catheter-directed intrarterial infusion of vasodilator. Assess bowel for possible resection.

MVT is likely diagnosis


Bowel resection was required, or there is marginally perturbed bowel after revascularization

Perform second-look exploratory laparotomy.

Bowel is viable

Close abdomen.
Extended gut necrosis – incidence and early results

Dept. of Gastroenterological Surgery, 1985-1996
Consequences of extended gut resection

- **Metabolic and nutritional**
  - Dehydration
  - Acid-base and electrolyte disorders
  - Malnutrition
  - Electrolyte, trace elements and vitamins deficiencies
- **General**
  - Decreased / lack of synthesis of gut hormones
  - Decreased reabsorption
  - Infectious
  - Other organ disease / failure
  - Psychological (decreased value, inability to work etc.)
Nutrients absorption after surgery

- **Short bowel**
  - Protein
  - Fat
  - Carbohydrates

- **Control**
  - Protein
  - Fat
  - Carbohydrates
Primary hospitalization

- diagnostic procedures
- evaluation and qualification
- correction of metabolic disturbances
- parenteral nutrition
- general and alimentary rehabilitation
- HPN training
- HPN regime planning and verification
- treatment of complications
- logistic
- modification of treatment for associated disease
Postoperative care in short bowel

- Always appropriate drainage
- Antibiotics chosen according to preoperative / postoperative cultures
- Prevention of acute GI ulcers, bleeding
  - two ways secretion blockade
    - (H-2 blocker, proton pump inhibitor)
- Every day metabolic monitoring
- Cave – tendency to acidosis, hyper-hypokaliemia, arrhythmias and embolism
- Antithrombotic prevention
Postoperative care in short bowel

- Parenteral nutrition / fluid therapy
- Usual programme in early postoperative period (ex. Bicarbonate)
- Volume – according to needs and losses
- Increased PN in reparative phase
- Rehabilitation
Postoperative care in short bowel

- General care

- Cave - dosage of medicines taken before operation via enteral route
  (esp. cardiac, antiarrhythmic drugs)

- Cave – abdominal symptoms of postoperative peritonitis are rather general than local
• Mr J.C.
• 2 (3?) MI
• Mitral valve 2/4
• Atrial fibrillation
• Cholelithiasis
• Critical stenosis of iliac artery
• COPD
Associated diseases in 34 elderly SBS patients

- Heart disease 30
- Arrhytmia 24
- Hypertension 12
- Mental disorders 7
- Diabetes 3
- Renal failure 2
- Liver cirrhosis 1
- TBC and liver cirrhosis 1
- Blindness, tracheostomy 1

In most patients appropriate pharmacological treatment, modified according to absorption disorders, was necessary.
Resection → Dehydration → Water-electrolyte disturbances → Malnutrition → Infection → SIRS or shock → Death

Dehiscence → Haemorrhage → Abscess, peritonitis → Other complications

Parenteral nutrition → GI rehabilitation → HPN → Adaptation → GI autonomy

Late complications:
- Deficiencies
- Toxicity
- Infection
- Organ failure

Catheter sepsis
Management for extended gut resection - aims et rules

- Hemodynamic stability
- Anastomosis healing
- Treatment for early complications
- Parenteral nutrition
- General rehabilitation
- Blockade of upper GI secretion
- Intestinal rehabilitation
- Oral WHO formula
- Decreasing diarrhea

Other medicines – choice, way of delivery, dosage
Planning parenteral nutrition

Poor planning

Overfeeding

Malnourished and / or critically ill

Slow increase from 4-6 g N and 600 – 900 kcal
Additional thiamine, P, Mg, K

All nutrients in one bag. Water, electrolytes, trace elements intake adopted to additional losses

Re-feeding syndrome

Careful metabolic evaluation, water, pH, electrolyte, thiamine, glucose correction when necessary

Own approach

Not malnourished

Gradual increase from 8 -10 g N and 1200-1500 kcal
17 g N, 2000 kcal
## Patient M.B. - TPN regimen versus labs

<table>
<thead>
<tr>
<th>Patient M.B.</th>
<th>10.03.2005</th>
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<th>5.04.2005</th>
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<tr>
<td>Glukoza mg %</td>
<td>119</td>
<td>100</td>
<td>95</td>
<td>100</td>
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<tr>
<td>Bilirubin mg %</td>
<td>2</td>
<td>0,8</td>
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<td>0,6</td>
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<tr>
<td>Protein g/l</td>
<td>64</td>
<td>61</td>
<td>58</td>
<td>77</td>
</tr>
<tr>
<td>Albumin g/l</td>
<td>27</td>
<td>27</td>
<td>29</td>
<td>36</td>
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<tr>
<td>Urea mg %</td>
<td>92</td>
<td>27</td>
<td>36</td>
<td>40</td>
</tr>
<tr>
<td>Creatinin mg %</td>
<td>1,8</td>
<td>1,5</td>
<td>1,9</td>
<td>2,5</td>
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<td>AspAT i.u./l</td>
<td>207</td>
<td>67</td>
<td>32</td>
<td>32</td>
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<tr>
<td>AIAT i.u./l</td>
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<td>108</td>
<td>43</td>
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<td>623</td>
<td>485</td>
<td>376</td>
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<td>GGTP i.u./l</td>
<td>302</td>
<td>234</td>
<td>200</td>
<td>179</td>
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<tr>
<td>AP i.u./l</td>
<td>372</td>
<td>293</td>
<td>313</td>
<td>193</td>
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<tr>
<td>Body weight kg</td>
<td>92,5</td>
<td>92,5</td>
<td>93</td>
<td>95</td>
</tr>
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</table>

17 g N, 2000 kcal

7 g N, 1000 kcal
Refeeding syndrome

Starvation $\rightarrow$ Glukoneogenesis, protein catabolism $\rightarrow$ Weight loss

Refeeding syndrome

Water, electrolytes, vitamins deficiency

Refeeding

Glucose intake

Thiamine deficiency

Mg, PO$_4$, K

Insulin secretion

Anabolism
Patient W.M. Fibroma malignum complicated by cancer.
Patient W.P. Total gut resection. End-duodenal and colonic fistula.
Short bowel patients 1984- 2005 – own material

- 1984 – 2005
- 280 short bowel
- F: M = 144 : 136
- Age - 12 – 91 years
- 19– weaned , 152 – running, 109 - died
Intestinal failure — what one should know

- TPN/ EN high level
- Timing for surgery
- How to manage emergency situations, esp. surgical
- Prevention, diagnosis and treatment of underlying disease and complications, ex. haemorrhage, catheter sepsis
Gdansk 2003, with Stanley Dudrick, HPN free, married, working, two daughters