Enteral and parenteral nutrition in GI failure and short bowel syndrome

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Intestinal failure
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Inadequate functional intestine to allow health to be maintained by ordinary food and drink.
Not equivalent to short bowel syndrome but includes it.
Aetiology – usually ....

SBS pathophysiology
Intestinal failure

- usually follows major resection
- also when intact intestine is dysfunctional because of severe inflammation or disorders of motility
- both causes may coexist (e.g., Crohn’s)

“Non-short bowel syndrome”

- Increasing prevalence in most units
- Usually no concerns about fluid balance
- Often possible for artificial feed to be less than 7 days/week
- Different challenges
Intestinal failure

Inadequate functional intestine to allow health to be maintained by ordinary food and drink
Not equivalent to needing parenteral nutrition but ....

Chronic intestinal failure

• Rare: prevalence ~2 per 100,000 incidence ~2 per 1,000,000
• Ischaemia and surgical mishap everywhere, and Crohn’s in some countries account for most benign long-term cases
• More common if cancer cases included
• Best managed when anticipated
Acute intestinal failure

• Very common
• Almost every patient after laparotomy
• Mild and brief but
• Worth understanding the concepts

Intestinal failure - anticipate

Ileostomy and <200cm small bowel
<150cm with colon
Stoma or fistula output >1.5L/day
### Normal gastrointestinal volumes

<table>
<thead>
<tr>
<th>Source</th>
<th>Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and drink</td>
<td>1500ml</td>
</tr>
<tr>
<td>Saliva</td>
<td>750ml</td>
</tr>
<tr>
<td>Gastric secretion</td>
<td>1250ml</td>
</tr>
<tr>
<td>Biliary secretion</td>
<td>1000ml</td>
</tr>
<tr>
<td>Pancreatic secretions</td>
<td>1000ml</td>
</tr>
<tr>
<td>Jejunal secretion</td>
<td>2500ml</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>8000ml</strong></td>
</tr>
<tr>
<td>Stool liquid</td>
<td>100ml</td>
</tr>
</tbody>
</table>

### Intestinal losses

- Output proportional to jejunal length
- Positive fluid balance requires ~1m
- Concept of net absorber/net secretor
- If high/normal secretion and poor absorption, output may be dramatic
Normal physiology

Osmosis and sodium gradients
Proximal intestinal response is secretory
Threshold about 100mmol/L

Net absorber/net secretor?

Normal person is net absorber
Drink more □ absorb more
Net absorber/net secretor?

Normal person is net absorber

Dehydration □ Thirst □ Drinking □
Increased fluid retention □ Resolution

Net absorber/net secretor?

If <1.5m small intestine
Normal proximal secretion is not compensated by distal absorption
Net absorber/net secretor?

- Drink more □ absorb LESS

Net absorber/net secretor?

- Dehydration □ Thirst □ Drinking □ Increased fluid loss □ Deterioration
Net secretor and fluid restriction

Fluid restriction is central challenge

Thirst requires LESS drinking
  initially and when severe - iv “saline”
  moderate - oral rehydration solutions
  mild - limit (sodium-free) fluids

The colon in short bowel

Retained colon (>half) equivalent to ~50cm small intestine
Value mainly in fluid balance
Some nutritional gain from fermentation
May include nitrogen salvage (D Ng)
Assessment

Serum electrolytes
Plasma osmolarity
Serum urea/creatinine
Full blood count

Assessment

Serum electrolytes
Plasma osmolarity
Serum urea/creatinine
Full blood count
Serum magnesium (tetany)
Urine sodium

Marked sodium retention in dehydration
Very early feature
Simple untimed sample sufficient
<20 mmol/L almost diagnostic

Unreliable if renal failure or diuretics

Short bowel syndrome management

Resuscitate if necessary with iv “saline”
Reduce oral intake of low sodium fluid
Increase sodium intake
Food selection

- Regular food if possible
- Encourage high energy density
- Separate food from liquid
- Avoid fluids (as low Na⁺)
- Little and often

Enteral fat intake

- If no colon
  - useful: energy dense
- If retained colon
  - may give steatorrhea
  - fat less utilised than carbohydrate
  - less (beneficial) fermentation
Formula feeds in SBS

NOT elemental - because
high osmolality
low energy density
high volume
poor palatability

Formula feeds in SBS

Polymeric ≈ semi-digested feeds
No relevant modified/supplemented feeds
Regular feed (1 kcal/ml) or high energy
(1.5-2 kcal/ml) determined by needs
and tolerance of osmolality
Simple electrolyte mix

20g glucose
3.5g NaCl
2.5g NaHCO$_3$ (or citrate)

Na$^+$ = 90mmol/L
Perhaps advantage from polymeric mix – trial awaited

40g rice-derived carbohydrate
3.5g NaCl
etc

Na$^+$ = 90mmol/L

SBS: enteral therapy

Limit “free” fluid intake to 500ml/day
Oral rehydration solution (>60mmol/l) ad libitum
Antisecretory regime
Encourage oral feeding
  ± formula feed
  ± tube feed
Intestinal failure: pharmacological therapy

Proton pump inhibitors reduce gastric secretion
Loperamide reduces speed of transit

Codeine less favoured – sedative
Anticholinergics less favoured – dry mouth
Somatostatin and derivatives disappointing
Teduglutide (GLP-2) great promise
Intestinal failure
parenteral nutrition

Continue all components of enterally based regime (but less rigidly)
Always aim for maximal possible enterally
Usually give more nutrition than estimated or measured because of malabsorption

Intestinal failure: parenteral nutrition

Usually give more nutrition than predicted
Example: patient needs 2000 kcal/day
But has SBS and absorption of 50%
Eats 2000kcal - absorbs 1000kcal
Needs 1000kcal parenterally
Total 3000kcal administered
Correct 2000kcal received
Intestinal failure: parenteral nutrition

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Example: patient needs 2000 kcal/day
  But has SBS and absorption of 50%
  Eats 2000kcal - absorbs 1000kcal
  Needs 1000kcal parenterally
  Total 3000kcal administered
  Correct 2000kcal received
  Same applies to other nutrients

Intestinal failure: parenteral nutrition

Continue all components of enterally based regime (but less rigidly)
Consider subcutaneous fluids if parenteral fluid requirement less than 1L/day
Intravenous nutrition with additional sodium, magnesium and volume
Limited lipid content …
Short bowel syndrome

Remember fluid restriction