Dietary Management of Intestinal Failure

Everyday Challenges and Solutions

Naomi Bates
Senior Dietitian for Surgery
St Vincent’s University Hospital
Intestinal Failure

IF results from obstruction, dysmotility, surgical resection, congenital defect or disease associated loss of absorption and is characterised by the inability to maintain protein, energy, fluid, electrolyte or micronutrient balance

(Nightingale, 2001)
Classification of Intestinal Failure (IF)

- **Type 1 IF** – Self limiting post abdominal surgery
- **Type 2 IF** – Major bowel resections with septic, nutritional and metabolic complications
- **Type 3 IF** – Chronic IF with long-term nutritional support e.g. Short Bowel Syndrome, intestinal fistulae

(Lal et al, 2006)
# Summary of Dietary Management of IF

<table>
<thead>
<tr>
<th>Type I</th>
<th>Type II</th>
<th>Type III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enteral Nutrition +/- PN</td>
<td>PN =&gt; Enteral Nutrition</td>
<td>Long term PN</td>
</tr>
<tr>
<td>Dietary modification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral Rehydration Solution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypotonic fluid restriction (500-1000 ml/d)</td>
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<td></td>
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</tbody>
</table>
### Predicted Fluid and Nutrition Management

<table>
<thead>
<tr>
<th>Jejunal length (cm)</th>
<th>Jejunostomy</th>
<th>Jejunum – colon</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-50</td>
<td>PN +IVF</td>
<td>PN</td>
</tr>
<tr>
<td>51-100</td>
<td>PN+IVF*</td>
<td>ON+/ - EN</td>
</tr>
<tr>
<td>101-150</td>
<td>EN +ORS</td>
<td>None</td>
</tr>
<tr>
<td>151-200</td>
<td>ORS</td>
<td>None</td>
</tr>
</tbody>
</table>

PN= parenteral nutrition   IVF= IV Fluid +/- magnesium
ON= oral nutrition   EN= enteral nutrition   ORS= oral rehydration solution

* At 85-100cm, may need IVF only

(Nightingale, 2006; MacKeigan 2004)
Nutritional Consequences

Jejuno-colic anastomosis

- Loss of terminal ileum leads malabsorption of $B_{12}$ & bile acids, fat soluble vitamins, $Ca^{2+}$, $Mg^{2+}$

However colon in situ allows:

- Water and Na+ absorptions and slower transit
- Salvage of energy from SCFA

End Jejunostomy

- Reduced nutrient absorption due to fast transit time
- Malabsorption of $B_{12}$, bile acids, fat soluble vitamins
- Fluid and electrolyte depletion ($Mg^{2+}$, $Ca^{2+}$, $Na^+$, $K^+$)
Most Common Problems

- Dehydration and loss of sodium
- Magnesium (Vit D)
- Maintaining Nutritional Status
Factors Affecting Dehydration and Sodium Loss

- Absorber / Secretor
- Oral Fluid intake
- Appetite
- Other medication
- Adequate hydration
- Compliance (Dry mouth)
- GI Secretions

High Output
Why Restrict Hypotonic Fluids?

Bowel Lumen

Hypotonic Fluids

Unable to maintain Na+ gradient

Stomas output containing >90mmol/L Na+

Plasma
ORS Absorption

Bowel Lumen

Oral Rehydration Solution
Na+ 90-120 mmol/L

Bowel

Plasma

Na+ & H2O
Oral Rehydration Solutions

<table>
<thead>
<tr>
<th>Type of ORS</th>
<th>Na+ (mmol)</th>
<th>K+ (mmol)</th>
<th>Glucose (mmol)</th>
<th>Volume (ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Double strength Dioralyte (10 sachets in 1000 ml)</td>
<td>120</td>
<td>40</td>
<td>180</td>
<td>1000</td>
</tr>
<tr>
<td>St Mark’s Solution (<a href="http://www.stmarksfoundation.org/upload/docs/patientinformationleaflets">www.stmarksfoundation.org/upload/docs/patientinformationleaflets</a>)</td>
<td>90</td>
<td>0</td>
<td>111</td>
<td>1000</td>
</tr>
</tbody>
</table>
Magnesium

Hypomagnesaemia

• Dehydration and loss of sodium =>

  secondary hyperaldosteronism (renal tubular cation exchange with Na⁺) => loss of Mg²⁺

• Treatment

  Magnesium Oxide (12-24mmol/day) –nocte or IV

  If chronic => Oral 1-alpha-cholecalciferol (0.25µg – 9.0µg) in a gradually increasing dose every 2-4 weeks (monitor serum calcium)

  Vit D

  • If Vit D < 30 give IM 300,000 i.u. then recheck in 3 months
Dietary Management of SBS
(Maintaining Nutritional Status)

Introduce Oral Fluids

- Hypotonic fluid restriction 500-1000ml/day
- Antimotility & antisecretory medication

Introduce diet

- Start as light diet and then low fibre
- Keep food and fluid separate
- ORS < 1000 ml/day
- Monitor tolerance (fluid balance, urinary sodium, U&E’s, daily weight)
- If tolerated consider reducing PN and IV fluids and then dietary modification
## Dietary Modification

<table>
<thead>
<tr>
<th>Jejunum-colon</th>
<th>Jejunostomy/Fistula</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>High energy &gt;30-60kcals/kg/day</td>
</tr>
<tr>
<td>High CHO ~60%</td>
<td>Moderate CHO ~ 40-50%</td>
</tr>
<tr>
<td>High protein ~20%</td>
<td>High protein ~20-30% or 0.2-0.25g N₂/kg/day</td>
</tr>
<tr>
<td>Low-moderate fat ~20%</td>
<td>High fat (~30-40%)</td>
</tr>
<tr>
<td>High proportion of MCT</td>
<td>Low fibre</td>
</tr>
<tr>
<td>Low oxalate diet to reduce renal stone formation</td>
<td>Added Salt</td>
</tr>
<tr>
<td>Limit/exclude: Rhubarb, beetroot, spinach, okra,</td>
<td>Polymeric ONS as part of fluid restriction</td>
</tr>
<tr>
<td>baked beans, almonds, cashews, peanuts, peanut</td>
<td>ONS = Oral Nutritional Supplements</td>
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<tr>
<td>butter, tea, ovaltine, drinking chocolate, parsley.</td>
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<tr>
<td>(Jeppessen, 2000; Nightingale, 2001)</td>
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</tbody>
</table>
Considerations for Enteral Tube Feeding

If inadequate absorption from diet (nasogastric) or you have >75 cm of distal small bowel in continuity (distal feeding/fistuloclysis)

=> Start with a 1.0 kcal/ml whole protein feed 10-20 ml/hr and increase gradually, monitor output and tolerance
Aim for ~100mmol Na\(^+\) per litre of feed

Some units add 30% NaCl (10ml = 50mmol Na\(^+\)) to enteral feeds. Consult with manufacturer of enteral feed

Use electrolyte mix for flushing
The Patient is at the Core!

- Patients become experts at coping with own condition and management
- All decisions should be made in conjunction
- May be more knowledgeable
- Should look after their physical, emotional, psychological, social and QoL issues

(Small Bowel and Nutrition Committee of the British Society of Gastroenterology 2006)
References


Lal S, Teubner A, Shaffer JL. Intestinal Failure Aliment Pharmacol & Ther 2006, 24, 19-31


Jeppessen PB, Morrensen PB, Intestinal Failure defined by measurements of intestinal energy and wet weight absorption. Gut 2000,46,701-706