Distal Feeding, is it worth the effort?

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Laurence Lacaze:
None
Distal Feeding – Key messages

• Indications: mainly type 2 intestinal failure with enterocutaneous fistula or double enterostomy
• Improves nutritional status, liver function
• Decreases fistula output
• PN replacement: decrease in PN-related complications
• Part of intestinal rehabilitation
• Safe if respect of dedicated protocol
• Need for muldisciplinary team

Distal feeding:

I. What is distal feeding?
II. In which patients should we use distal feeding?
III. What are the expected benefits?
IV. What to do in practice?
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Distal feeding - ESPEN definitions

Fistuloclysis = Enteroclysis: enteral nutrition or hydration through an enterostomy or an enterocutaneous fistula in the distal small bowel

Re-feeding enteroclysis = chyme reinfusion: chyme collection from the proximal stoma and re-infusion down the distal stoma

ESPEN endorsed recommendations. Pironi et al, Clin Nutr 2015;34:171-180
Distal feeding in practice

Example of a temporary double enterostomy

Water-electrolytes

Enteral nutrition: NE, upstream chyme (food, nutrients, or EN by naso gastric tube)

Enteral nutrition promotes intestinal absorption (n=15 short bowel syndrome >3 months)

ETF, exclusive tube feeding; OF, oral feeding; OCF, oral combined with tube feeding

Joly et al, Gastroenterology 2009;136:824-31
Distal feeding:

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IV. What to do in practice?
Intestinal failure: ESPEN definition

= The reduction of gut function below the minimum necessary for the absorption of macronutrients and/or water and electrolytes, such that intravenous supplementation is required to maintain health and/or growth.

ESPEN endorsed recommendations. Pironi et al, Clin Nutr 2015;34:171-180
ESPEN definitions: intestinal failure classification

- Type I: acute, short-term and usually self limiting condition.
- Type II: prolonged acute condition, often in metabolically unstable patients, requiring complex multi-disciplinary care and intravenous supplementation over periods of weeks or months.
- Type III: chronic condition, in metabolically stable patients, requiring intravenous supplementation over months or years. It may be reversible or irreversible.

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Pironi et al, Clin Nutr 2015;34:171-180
Question 4: In adult patients with ECF, is fistuloclysis associated with better outcomes than standard care?

Recommendation:

- We suggest the use of fistuloclysis for nutrition therapy for patients with intact intestinal absorptive capability distal to the infusion site and when the infusion ECF site is not expected to close spontaneously.
- We suggest the use of polymeric formulas initially and change to semi-elemental (oligomeric) diet if intolerance occurs.

Quality of Evidence: Very low.
Enteroclysis / Chyme reinfusion part of intestinal rehabilitation

- Complex management of opened abdominal wounds, high intestinal outputs
- Multi-disciplinary nutrition team, including specially trained nurses and nutritionist gastroenterologists or surgeons.

Distal feeding

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Enteroclysis
Fistuloclysis improves liver function in patients with high-output upper enteric fistula

<table>
<thead>
<tr>
<th>Variables</th>
<th>Groups</th>
<th>Baseline</th>
<th>Day 14</th>
<th>Day 28</th>
<th>Delta</th>
<th>( P^a ) Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALT (U/L)</td>
<td>Control</td>
<td>50.5 ± 17.6</td>
<td>62.5 ± 25.1</td>
<td>53.6 ± 15.7</td>
<td>3.2 ± 1.2</td>
<td>0.181</td>
</tr>
<tr>
<td></td>
<td>Fistuloclysis</td>
<td>212.2 ± 85.1</td>
<td>165.1 ± 65.2</td>
<td>113.7 ± 41.3</td>
<td>98.4 ± 33.5</td>
<td>0.033*</td>
</tr>
<tr>
<td></td>
<td>( p^b )</td>
<td>0.058</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>ALP (U/L)</td>
<td>Control</td>
<td>219.7 ± 89.9</td>
<td>188.3 ± 69.5</td>
<td>161.2 ± 34.7</td>
<td>57.6 ± 20.9</td>
<td>0.005*</td>
</tr>
<tr>
<td></td>
<td>Fistuloclysis</td>
<td>210.9 ± 90.1</td>
<td>106.2 ± 44.7</td>
<td>53.4 ± 23.9</td>
<td>157.5 ± 52.6</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td>( p^b )</td>
<td>0.182</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GGT (U/L)</td>
<td>Control</td>
<td>223.4 ± 62.4</td>
<td>177.2 ± 70.3</td>
<td>103.7 ± 37.5</td>
<td>119.8 ± 38.5</td>
<td>&lt;0.001*</td>
</tr>
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<td>&lt;0.001*</td>
</tr>
<tr>
<td></td>
<td>( p^b )</td>
<td>0.422</td>
<td></td>
<td></td>
<td></td>
<td>0.019*</td>
</tr>
</tbody>
</table>

Enteroclysis improves serum albumin and decreases fistula output

<table>
<thead>
<tr>
<th></th>
<th>Fistuloclysis</th>
<th>Control</th>
<th>Control</th>
<th>Fistuloclysis</th>
<th>Control</th>
<th>Control</th>
<th>Fistuloclysis</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alb (g/L)</td>
<td>31.2 ± 3.4</td>
<td>37.1 ± 9.5</td>
<td>42.5 ± 12.7</td>
<td>11.3 ± 2.5</td>
<td>&lt;0.001*</td>
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<tr>
<td></td>
<td>32.5 ± 12.8</td>
<td>33.4 ± 10.5</td>
<td>36.8 ± 7.6</td>
<td>4.2 ± 1.3</td>
<td>0.078</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>0.472</td>
<td></td>
<td></td>
<td>&lt;0.001*</td>
<td></td>
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</tr>
<tr>
<td>Fistula output (mL/day)</td>
<td>1306.2 ± 281.1</td>
<td>753.0 ± 254.5</td>
<td>519.6 ± 173.2</td>
<td>786.6 ± 285.8</td>
<td>&lt;0.001*</td>
<td></td>
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<tr>
<td></td>
<td>1455.2 ± 203.6</td>
<td>1020.5 ± 312.3</td>
<td>1063.7 ± 423.4</td>
<td>391.5 ± 125.3</td>
<td>0.052</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.152</td>
<td></td>
<td></td>
<td>&lt;0.001*</td>
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</tr>
</tbody>
</table>

Enteroclysis improves 1-year survival

P = 0.045

Fistuloclysis replace parenteral feeding in patients with enterocutaneous fistula

- 12 patients with enterocutaneous fistula
- All with total parenteral nutrition before fistuloclysis
- Fistuloclysis replaced total parenteral nutrition in 11 of the 12 patients
- Median of replacement: 28 (4 – 68) days
- No complications
- Lower hospital stay, hospital mortality

Safe
PN replacement and maintain of nutritional status

Conclusions-Distal Feeding

- Improves liver function probably by restoring enterohepatic cycle
- Decreases fistula output
- PN replacement: prevent PN-related complications and lower cost
- Lower hospital stay & hospital mortality
- Best 1-year survival

Chyme reinfusion
Specific pumps for automated chyme reinfusion

Enteromate® II      portable Enteromate® Mobile

From upstream small bowel  To downstream small bowel
From upstream small bowel  To downstream small bowel
Automated chyme reinfusion with Entéromate™

Physiological principles of chyme reinfusion

- Technique of enteral nutrition
- Use all the potentially functional intestine and correct the intestinal failure
- Prefigure the intestinal function post-surgical reestablishment of intestinal continuity
- Restore ileal brake
- Use post-duodenal chyme for:
  - extracting the nutrients
  - restoring enterohepatic cycles

Chyme reinfusion in patients with intestinal failure due to temporary double enterostomy: A 15-year prospective cohort in a referral centre

Denis Picot a,*, Sabrina Layec a, Laurence Dussaulx a, Florence Trivin a, Ronan Thibault b, **

Chyme reinfusion restores intestinal function during temporary small bowel interruption with intestinal failure (type 2).
Chyme reinfusion improves intestinal function

![Box plot showing statistical data comparison](chart.png)

<table>
<thead>
<tr>
<th>Stominal / fecal output (dl/24h)</th>
<th>NAC (%)</th>
<th>Steatorrhea (g/24h)</th>
<th>LAC (%)</th>
<th>Citrulline (µmol/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>162 pairs</td>
<td>56 pairs</td>
<td>36 pairs</td>
<td>36 pairs</td>
<td>72 pairs</td>
</tr>
</tbody>
</table>

Mean (square points), SD (vertical solid bars), quartile 2 + 3 (shade squares), median (horizontal bar in the shade squares), extremes (vertical dashed bars). **P<0.001.**

Picot et al, Clin Nutr 2017;36:593-600
# Chyme reinfusion improves nutritional parameters (n=166)

Picot et al, Clin Nutr 2017;36:593-600

<table>
<thead>
<tr>
<th></th>
<th>Admission</th>
<th>Discharge</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight loss % §</td>
<td>13.3 ± 9.8</td>
<td>9.7 ± 9.1</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Body Mass Index §</td>
<td>23.0 ± 5.2</td>
<td>23.8 ± 4.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Plasma albumin (g/L) §</td>
<td>27.7 ± 6.6</td>
<td>33.8 ± 4.5</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&lt;30 g/L #</td>
<td>108 (65)</td>
<td>41 (25)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nutritional risk index (NRI) #</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;83.5</td>
<td>115 (69)</td>
<td>37 (22)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>83.5 - 97.5</td>
<td>44 (27)</td>
<td>103 (62)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>&gt;97.5</td>
<td>7 (4)</td>
<td>26 (16)</td>
<td></td>
</tr>
<tr>
<td>Parenteral nutrition #</td>
<td>139 (84)</td>
<td>13 (8)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

PN weaning: 93.5%, 2±9 d after CR beginning - 9723 days (26.6 patients.years)  

#n (%), § mean ± SD
Chyme reinfusion decreases the proportion of plasma liver tests >2N (n=155)
Conclusions – Chyme reinfusion

• Chyme reinfusion reestablishes the small bowel continuity and *restores the intestinal function*.

• Patients are fed with what they eat, their nutritional and liver status improves, allowing *to stop PN in 94%* of the cases.

Picot et al, Clin Nutr 2017;36:593-600
Enteromate® mobile for home chyme reinfusion - 2015 ESPEN Technology grant

- For 28% of patients, CR was feasible at home.
- No patient had to stop CR
- But home CR is not yet recognized by health insurances as a nutrition support technique.

Labodial.com, Les Clayes sous Bois, France
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Which evaluation doing before initiating distal feeding?

• Mandatory to evaluate the anatomy of the downstream intestine before distal feeding:
  - Length of remaining bowel
  - Check for bowel stenosis or downstream bowel perforation
Which protocol doing before initiating chyme reinfusion?

• 2 days before:
  – instilling one liter of oral rehydration solution
  – ± with laxatives in case of fecal residues or fecaloma in the colon.
  – Stop anti-motility drugs (loperamide)
• Antisecretory gastric drugs (PPI) are used before and during CR.
Patient with double high output ileostomy or enterocutaneous fistula

No stenosis, no downstream perforation
More than 15 cm of downstream bowel

Agreement of the patient

Chyme reinfusion/enteroclysis

If diarrhoea: loperamide
If abdominal pain: antispasmodic
Research needed!
Impact of chyme reinfusion compared to parenteral nutrition on the incidence of complications in patients with a temporary high-output double enterostomy: a multicentre randomized controlled trial

- FRY: efFicieny of Reinfusion of chYme -
Distal Feeding – Key messages

• Indications: mainly type 2 intestinal failure with enterocutaneous fistula or double enterostomy
• Improves nutritional status, liver function
• Decreases fistula output
• PN replacement: decrease in PN-related complications
• Part of intestinal rehabilitation
• Safe if respect of dedicated protocol
• Need for multidisciplinary team

Distal Feeding, is it worth the effort?
YES
Hippocrate (470-377 before JC)

« Be your food your medicine! »