Early enteral nutrition after acute stroke

Overview
1. Prevalence and consequences of nutritional risk in acute stroke
2. Nutrition support in acute stroke
3. Summary

Stroke statistics
- Worldwide: 2nd leading cause of death — 4.4 million (9%) deaths/year
- US: 3rd leading cause of death — prevalence 7 million — 795,000 new cases/year
- Europe: incidence 100–700 events/100,000 — incidence predicted to increase over next 5–10 years by 12% (general pop) to 20% (low income) — Mortality at 30 days: 20% — Mortality at 1 year: 30% — 65–85% ischaemic
- Even with optimal management, >30% survivors have long term disability; 20% will require institutional care at 3 months

Bouziana and Tziomalos, 2011; Corrigan et al, 2011

Stroke and nutritional risk
- Pre-admission: Insufficient food intake due to: Pre-existing sub-optimal nutritional status Age Co-morbidities
- Acute: Dysphagia Reduced consciousness Arm or facial weakness
- Chronic: Dysphagia Impaired ability to eat, access, prepare or cook food Depression Social isolation

Prevalence of “malnutrition” within 1 week after stroke
- 18 studies
- 17 nutritional assessment methods
- “Malnutrition” prevalence 6.1 - 62%

<table>
<thead>
<tr>
<th>Author</th>
<th>Method</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davis et al (2004)</td>
<td>SGA (B+C)</td>
<td>16%</td>
</tr>
<tr>
<td>Dennis et al (2005a)</td>
<td>FOOD trial</td>
<td>“Informal assessment”</td>
</tr>
<tr>
<td>Dennis et al (2005b)</td>
<td>FOOD trial</td>
<td>“Informal assessment”</td>
</tr>
<tr>
<td>Crary et al (2006)</td>
<td>MNA &lt; 23.5</td>
<td>26.3%</td>
</tr>
<tr>
<td>Foley et al, 2009</td>
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</table>
Nutritional risk persists after stroke

- 36 stroke patients with 2-7 eating difficulties/reduced swallowing or alertness in acute phase

<table>
<thead>
<tr>
<th>Acute phase</th>
<th>3 months post-stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>Majority of eating problems persisted 3 months after stroke despite marked improvement in most physical functions</td>
<td></td>
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<tr>
<td>About 50% were at nutritional risk 3 months after stroke</td>
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Medin et al, 2012

Nutritional risk has far-reaching consequences

- Impaired ability to fight infection
- Impaired wound healing
- Apathy, depression, reduced QoL
- Increased morbidity and mortality
- More healthcare resource use
- Reduced ability to work, shop, cook, self-care
- Reduced muscle strength, fatigue, mobility
- Increased morbidity and mortality
- More healthcare resource use

Stratton et al, 2003

Malnutrition may also impact on mechanisms of ischaemic brain injury and recovery

- Data from experimental models
- Expression of plasticity-associated genes associated with recovery mechanisms after global ischaemia
- Induction of changes in hippocampal plasticity-associated proteins
- Intensified expression of proteins related to stress response and hyperexcitability in the hippocampal circuitry

Prosser-Loose et al, 2010; 2011

How can nutritional risk be managed?

- Early identification and follow up is key to effective management
- A range of strategies can be used e.g. dietary advice, oral nutritional supplements (ONS), tube feeding or parenteral nutrition (intravenous nutrition)

* Based on ESPEN definition, Lochs et al, 2006

Nutritional support considerations in acute stroke

- Nutritional strategies should provide specific and adequate nutrition to prevent prolonged hospitalisation, poor functional outcomes, and death
- Nutritional care plans will vary depending on the patient
- If the gut works, it should be used: EN should be possible in the majority of stroke patients
- Tube feeding indicated when oral nutrition is not feasible
- Post-pyloric feeding may be needed if gastric emptying is delayed

* Based on ESPEN definition, Lochs et al, 2006
Advantages of enteral versus parenteral

- Guidelines for ICU, 2009 - enteral is the preferred route of feeding over parenteral for the critically ill patient who requires nutrition support therapy.

Benefits of enteral well documented in prospective RCTs with a variety of patients, showing:

- Reduction in infectious morbidity
- Reductions in hospital LOS
- Reductions in costs
- Return of cognitive function


Cost savings with enteral versus parenteral nutrition

<table>
<thead>
<tr>
<th>Study Year</th>
<th>Country</th>
<th>Patient group</th>
<th>Reduction in cost</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>2001</td>
<td>USA</td>
<td>Parenteral</td>
<td>70%</td>
<td>0.02</td>
</tr>
<tr>
<td>2005</td>
<td>Italy</td>
<td>GI surgery</td>
<td>71%</td>
<td>0.05</td>
</tr>
<tr>
<td>2006</td>
<td>USA</td>
<td>GI surgery</td>
<td>72%</td>
<td>0.08</td>
</tr>
<tr>
<td>2007</td>
<td>UK</td>
<td>GI surgery</td>
<td>63%</td>
<td>0.04</td>
</tr>
<tr>
<td>2008</td>
<td>USA</td>
<td>GI surgery</td>
<td>69%</td>
<td>0.01</td>
</tr>
<tr>
<td>2009</td>
<td>Italy</td>
<td>GI surgery</td>
<td>60%</td>
<td>0.02</td>
</tr>
<tr>
<td>2010</td>
<td>USA</td>
<td>GI surgery</td>
<td>63%</td>
<td>0.04</td>
</tr>
<tr>
<td>2011</td>
<td>UK</td>
<td>GI surgery</td>
<td>60%</td>
<td>0.01</td>
</tr>
<tr>
<td>2012</td>
<td>China</td>
<td>GI surgery</td>
<td>81%</td>
<td>0.001</td>
</tr>
</tbody>
</table>


Benefits of enteral well documented in prospective RCTs with a variety of patients, showing:

- Reduction in infectious morbidity
- Reductions in hospital LOS
- Reductions in costs
- Return of cognitive function

Advantages of enteral versus parenteral

- Reduced infectious morbidity
- Reduced hospital stay
- Reduced costs
- Improved cognitive function


Cost savings with enteral versus parenteral nutrition

Indications for tube feeding

Healthcare professionals should consider enteral tube feeding in people who are malnourished or at risk of malnutrition and have:

- Inadequate or unsafe oral intake
- A functional, accessible gastrointestinal tract

NICE, 2006

Tube feeding reduces complications

Stratton et al, 2003

Complications: OR 0.50 (95% CI 0.35-0.70), p<0.001; 17 RCT; n 749

Infectious complications: OR 0.26 (95% CI 0.15-0.44); p<0.001; 9 RCT; n 442

Tube feeding reduces mortality

Odds ratio 0.48 (95% CI 0.30 to 0.78), p<0.001; n 600; 12 RCT

Stratton et al, 2003

NICE guidance on stroke management (UK)

On admission: screen swallowing before giving any oral food, fluid or medication.

Problems with swallowing - refer for specialist assessment within 24-72 hours.

In uncertain aspiration or in those who require tube feeding or a modified diet: reassess and consider for instrumental examination.

In dysphagia, give food and fluids in a form that can be swallowed without aspiration, following the specialist assessment of swallowing.

Royal College of Physicians, 2008; NICE, 2008

Stratton et al, 2003

Control

Tube feeding

Mortality (%)
Neurological dysphagia

In geriatric patients with severe neurological dysphagia, EN is recommended in order to ensure energy and nutrient supply and thus, to maintain or improve nutritional status. For long-term nutritional support PEG should be preferred to NGT, since it is associated with less treatment failures, better nutritional status (A), and is also more convenient for the patient. In patients with severe neurological dysphagia TF has to be initiated at home as soon as possible (C). EN based domiciliary enteral nutrition therapy until safe and sufficient oral intake from a normal diet is possible (C).

**Individualised nutritional care (n=58)**

- Improvement in energy intake (*p*=0.032)
- Improvement in QOL (EQ-5D) (*p* = 0.009)
- Improvement in handgrip strength (*p*=0.002)

**Routine care (n=66)**

- 20.7
- 36.4
- 0.055

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**Energy requirements are probably not increased in acute stroke**

No single formula to calculate energy requirements has been validated in a large sample of stroke patients.

- **REE**
- **Physical activity**
- Change in muscle tone
- Barbiturates
- Hypothermia

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**Energy and protein requirements**

- **Energy (maintain body weight)**: ≥ 25 kcal/kg body weight
- **Energy (obesity)**: < 25 kcal/kg body weight
- **Protein**: 1.5g/kg body weight

Bouziana and Tziomalos, 2011; Corrigan et al, 2011

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**Appropriate enteral formula**

- 1-1.5 kcal/ml
- Whole protein
- Balanced fat
- Mixed fibre

Bouziana and Tziomalos, 2011; Corrigan et al, 2011
Balanced fat composition in line with recommendations

<table>
<thead>
<tr>
<th>Monounsaturated - MUFA</th>
<th>Polyunsaturated - PUFA</th>
<th>Saturated - SFA</th>
</tr>
</thead>
<tbody>
<tr>
<td>By difference</td>
<td>Total PUFA</td>
<td>&lt; 10% Energy</td>
</tr>
<tr>
<td>35%En – others FA</td>
<td>6 – 11% Energy</td>
<td>&lt; 7% Energy</td>
</tr>
<tr>
<td>% cholesterol</td>
<td>% LDL</td>
<td>% triacylglycerol</td>
</tr>
<tr>
<td>↑ cholesterol</td>
<td>↑ fat oxidation</td>
<td>↑ triglycerol</td>
</tr>
<tr>
<td>↓ LDL</td>
<td>↓ HDL</td>
<td>↓ cholesterol</td>
</tr>
<tr>
<td>↓ fat oxidation</td>
<td></td>
<td>↑ plasma LDL</td>
</tr>
<tr>
<td>20.7% En</td>
<td>16.6% En</td>
<td>3.6% En</td>
</tr>
</tbody>
</table>

45% High oleic sunflower oil & 55% Rapeseed oil (canola oil)

Elia et al., 2008

Systematic review: conclusions

Recommendation for fibre mixture
Reduces diarrhoea

Elia et al., 2008

MF6 increases short chain fatty acids (SCFA)

• 12 long term tube fed patients with dysphagia
  • RCT, cross over (fibre-free vs MF6)
  • 2 x 2 weeks

Schneider et al., 2001

Butyrate and total faecal SCFA were significantly increased with Nutricia Multi Fibre

Systematic review: meta-analysis: the clinical and physiological effects of fibre-containing enteral formulation

Studies included

- Enteral nutrition as primary source of nutrition
- Minimum 3 days
  - 51 studies (43 RCTs)
    - 38 in patients (n = 1591)
    - Intensive care/critically ill
    - Surgical/post-operative
    - Medical
    - Chronic care
    - Paediatrics
    - 13 in healthy volunteers (n = 171)

Outcome parameters

- Incidence diarrhoea, constipation, stool consistency, GI symptoms
- Transit time, stool weight, bowel frequency

Elia et al., 2008

Common medications in stroke patients may impact bowel function

Corrigan et al., 2001
Summary

- Stroke is a leading cause of death and disability
- Nutritional risk is common in stroke
- Nutritional risk is associated with poor outcomes after stroke
- Guidelines and expert consensus support the use of early nutritional intervention via the enteral route
  - Tube feeding if oral intake not possible
  - PEG feeding if NG tube is not tolerated
  - Post-pyloric feeding if gastric emptying is impaired
  - A balanced, whole protein enteral formula containing mixed fibre

Further reading


Thank you