Nutritional Consequences of Radiotherapy

Simon Lal
Consultant Gastroenterologist
Intestinal Failure Unit
Salford Royal Foundation Trust

BAPEN, November 2010
Nutritional Consequences....

UNITED KINGDOM
Pelvic XRT: ~17000 patients/yr\(^1\)
H&N XRT: ~3500 patients/yr\(^2\)

SHORT-TERM
LONG-TERM

1. West CM Curr Opin Supp Paliative Care 2009. 3: 36-40
Nutritional Consequences....

SHORT-TERM

LONG-TERM
‘Short-term’ Consequences – H&N XRT

57% malnourished before XRT\(^1\)

- Mucositis
- Dysgeusia
- Xerostomia
- Dysphagia
- Odynophagia

Upto 80% lose weight during XRT\(^2\)

‘Short-term’ Consequences - Pelvic XRT

11-33% malnourished before XRT\(^1\)

Acute Radiation Enteritis >70\(^2\)
- Diarrhoea
- Bloating
- Abdo pain
- Nausea

Upto 83% lose weight during XRT\(^1\)

‘Short-term’ Consequences


↑ XRT Toxicity
↑ Hospitalisation
↑ Interrupted XRT
↑ Incomplete XRT

↑ Surgical complications
‘Short-term’ Consequences

- XRT Toxicity
- Hospitalisation
- Interrupted XRT
- Incomplete XRT
- Surgical complications

RADIOTHERAPY

MALNUTRITION

Sarcopenia?

Sarcopenia & Cancer Outcome

- Loss muscle mass/function.
- Can be masked in overweight/obese.¹
- Increased chemotherapy toxicity & faster tumour progression.²
- Impact on radiotherapy outcome?

Identical BMI=24.3 kg/m²

¹ Prado C et al. *Curr Opin Supp Pall Care* 2009. 3: 269-75
Nutritional Status & Cancer Treatment

Nutritional Status

Wt, BMI → Sarcopenia?

- Diagnosis
- XRT
- Surgery
Nutritional Status & Cancer Treatment

Wt, BMI → Sarcopenia?

Diagnosis

XRT

Surgery

Nutritional Status

[Nutritional] Interventions
Radiotherapy: Nutritional Management

*What are the roles of…*

- Oral nutrition support/Dietary Counselling?
- Enteral tube feeding?
- Parenteral Nutrition?
- Nutritional ‘Therapies’?
Radiotherapy: Nutritional Management

What are the roles of...

Oral nutrition support/Dietary Counselling?

Enteral tube feeding?

Parenteral Nutrition?

Nutritional ‘Therapies’?
# Role of Oral Nutrition Support

<table>
<thead>
<tr>
<th>Study</th>
<th>Oral</th>
<th>No suppl</th>
<th>Study length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglass 1978</td>
<td>15</td>
<td>15</td>
<td>6-35d</td>
</tr>
<tr>
<td>Moloney 1983</td>
<td>42</td>
<td>42</td>
<td>21-35d</td>
</tr>
<tr>
<td>Arnold 1989</td>
<td>23</td>
<td>27</td>
<td>70d</td>
</tr>
</tbody>
</table>

**ONS increased energy intake by 381kcal/d**

![Standardised mean difference (95% CI)](image)

Dietary Counselling: sustained increase in nutritional intake in patients undergoing XRT
<table>
<thead>
<tr>
<th><strong>During radiotherapy</strong></th>
<th><strong>Recommendation</strong></th>
<th><strong>Grade</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use intensive dietary counselling &amp; ONS to increase intake &amp; prevent therapy-associated wt loss &amp; interruption of radiation therapy in patients undergoing radiotherapy of GI or H+N areas.</strong></td>
<td></td>
<td>A</td>
</tr>
</tbody>
</table>

**RECOMMENDATION GRADE**
A=At least 1 randomised controlled trial
C=Expert opinions and/or clinical experience
Radiotherapy: Nutritional Management

What are the roles of...

Oral nutrition support/Dietary Counselling?

Enteral tube feeding?

Parenteral Nutrition?

Nutritional ‘Therapies’?
ONS vs. Tube Feeding?

- Both can reduce wt loss &
  - Maintain QOL
  - Reduce hosp admissions
  - Reduce interruptions to treatment

- No RCTs → Choice depends on tolerability.

NG vs. Gastrostomy?

NG vs. Gastrostomy?

↑ mobility, cosmesis, QOL

↓ irritation, blockage

vs. gastrostomy risk inc.

persistent dysphagia?

**COCHRANE:** 1 RCT (n=33) → insufficient evidence

---

1. Lees J. *Eur J Cancer Care* 1997;6:45-9
3. Mekhail T *Cancer* 2001;91:1785-90
5. Nugent B *Cochrane Review* 2010
NG vs. Gastrostomy?

- NG vs. Gastrostomy?
  - ↑mobility, cosmesis, QOL\(^1\)
  - ↓irritation, blockage\(^1,2\)
  - vs. gastrostomy risk inc. persistent dysphagia?\(^3\)

**COCHRANE:** 1 RCT (n=33) → *insufficient evidence*\(^4,5\)

- Prophylactic Gastrostomy vs. ‘as required’?
  - ↓Wt loss, hospitalisation, Rx interruption\(^6,7,8\)
  - ↑Achieve target chemo-radiation dose\(^9\)

**NO RANDOMISED STUDIES**

1. Lees J. *Eur J Cancer Care* 1997;6:45-9
3. Mekhail T *Cancer* 2001;91:1785-90
5. Nugent B *Cochrane Review* 2010
Pull through vs. Push Gastrostomy?

- Incidence [estimates]: 0.06% to 3% gastrostomy insertions\textsuperscript{1,2}
- BSG recommend direct introducer or RIG approach.\textsuperscript{3}
- 77% UK H&N Units: pull-through technique.\textsuperscript{1}

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<td></td>
<td><em>If an obstructing H+N or oesophageal tumour interferes with swallowing, EN should be delivered by tube.</em></td>
<td>C</td>
</tr>
<tr>
<td></td>
<td><em>Tube feeding is suggested if severe local mucositis is expected.</em></td>
<td>C</td>
</tr>
<tr>
<td></td>
<td><em>PEG may be preferred because of oral or oesophageal mucositis.</em></td>
<td>C</td>
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**RECOMMENDATION GRADE**

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Radiotherapy: Nutritional Management

What are the roles of...

Oral nutrition support/Dietary Counselling?

Enteral tube feeding?

Parenteral Nutrition?

Nutritional ‘Therapies’?
<table>
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<th>During radio-therapy</th>
<th>Recommendation</th>
<th>Grade</th>
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<tr>
<td></td>
<td><em>The routine use of PN during radio- or radio-chemotherapy is not recommended.</em></td>
<td>A</td>
</tr>
<tr>
<td></td>
<td><em>PN is recommended if patients are malnourished or facing a period longer than one week of starvation and EN is not feasible.</em></td>
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Radiotherapy: Nutritional Management

What are the roles of...

Oral nutrition support/Dietary Counselling?

Enteral tube feeding?

Parenteral Nutrition?

Nutritional ‘Therapies’?
Nutritional ‘Therapies’?

Probiotics

Elemental Diet

Glutamine

Fish Oil

REDUCED RADIATION INJURY?

McGough C, Br J Cancer 2004; 90: 2278-87
Spyropoulos B, Dig Dis Sci 2010. Epub
Efficacy of probiotics in the prevention of radiation-induced diarrhoea

Nutritional ‘Therapies’?

- Probiotics
- Elemental Diet
- Glutamine
- Fish Oil

**REduced Radiation Injury?**

*Mixed results…more studies required*

McGough C *Br J Cancer* 2004; 90: 2278-87
Crowther M *Proc Nutr Soc* 2009; 68: 269-73
Spyropoulos B *Dig Dis Sci* 2010. Epub
Reduced Treatment Toxicities
Nutrition Support

XRT

SHORT TERM
Anti-Inflammatory
Appetite Stimulants
Anabolic Agents
Physical Activity
Counselling
Reduced Treatment Toxicities
Nutrition Support
Cachexia Anorexia
Nutritional Intervention

RADIOThERAPy

MALNUTRITION

⇔ XRT Toxicity
⇔ Hospitalisation
⇔ Interrupted XRT
⇔ Incomplete XRT
⇔ *Surgical complications*
Nutritional Consequences….  

UNITED KINDGOM  
Pelvic XRT: ~17000 patients/yr\(^1\)  
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Nutritional Consequences...

SHORT-TERM

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Chronic Radiation Enteritis

UNITED KINGDOM
Pelvic XRT: ~17000 patients/yr

1. West CM Curr Opin Supp Palliative Care 2009. 3: 36-40
Radiation Enteritis

Acute RE: Resolves within 3 months of XRT.
Chronic RE: Onset >3 months – 6 yrs….or later.

Chronic RE:-
Histopathological changes

- Obliterative endarteritis
- Submucosal fibrosis
- Lymphatic dilatation
- Ischaemic necrosis

malabsorption, bleeding, stricture, fistulae…

20% of patients receiving pelvic XRT or more?

Radiation Enteritis: Risk Factors

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<tr>
<th>Patient Factors</th>
<th>Treatment Factors</th>
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<tr>
<td>Low BMI</td>
<td>SI volume in XRT field</td>
</tr>
<tr>
<td>Co-morbid illness</td>
<td>XRT dose &amp; fractionation</td>
</tr>
<tr>
<td>Smoking</td>
<td>XRT technique</td>
</tr>
<tr>
<td>Previous GI surgery</td>
<td>Concomitantant Chemotherapy</td>
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Chronic Radiation Enteritis

- 87/107 (81%) patients described new onset GI symptoms > 1yr after pelvic XRT.
  - Only 59/87 (68%) sought medical attention.¹

- 43/95 (45%) females restricted diet > 6 months following XRT for cervical or endometrial cancer.²

¹ Gami B et al. APT 2003. 18: 987-94
### Chronic GI Symptoms following XRT

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<tr>
<th>Diagnosis</th>
<th>% Patients</th>
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<td>Bile Salt Malabsn</td>
<td>1-75</td>
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<tr>
<td>SI Bact O’growth</td>
<td>4.5-45</td>
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<tr>
<td>CHO Malabsn</td>
<td>1-63</td>
</tr>
<tr>
<td>Stricture</td>
<td>3-15</td>
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<tr>
<td>Fistula</td>
<td>0.6-4.8</td>
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Surgery in Chronic Radiation Enteritis

- ~1/3 patients undergo surgery (obstrn/fistulae).

- ~60% undergo > 1 laparotomy.

- Post-op complications (anastamotic leak) in upto 30%.

→ Risk of Intestinal Failure

Disease spectrum of Acute ‘Type 2’ Intestinal Failure patients admitted to SRFT IFU (2002-2005)

N=134

- Surgical complications: 21%
- Crohn's disease: 32%
- GI Ischaemia: 13%
- Motility: 14%
- Cancer: 8%
- Coeliac disease: 2%
- Radiation: 2%
- Other: 8%

Lal S et al. *Alimen Pharm Ther* 2006; 24: 19-31
SI obstruction (n=30)  
*Retrospective, 2 groups with ‘similar signs & symptoms.’*

17/30: immediate surgery  
→ 10/17 HPN at 2 yrs.

13/30: immediate HPN  
→ 6/13 surgery after mean 1yr.  
→ 0/13 HPN at 2 yrs.

British Artificial Nutrition Survey: Chronic ‘Type 3’ Intestinal Failure (HPN)

- IBD
- Ischaemia
- Misc. (e.g. surg comp)
- Pseudo-obstrn
- Cancer
- Radiation enteritis
- Neuro conditions
- Systemic sclerosis
- Benign Strictures

% Point Prevalence

N=870

BANS report 2008 (BAPEN publications)
Radiation Enteritis: HPN Survival

HPN: 5-year Survival
Radiation Enteritis: 52%
Crohn’s Disease: 87%

Role of
- SI Transplantation
- Intestinal Lengthening?

1. Lloyd DA et al. APT 2006 24:1231-1240
LONGTERM CONSEQUENCES
Nutritional Consequences of Radiotherapy

Nutritional Status

Nutritional Interventions Reduce Treatment Toxicities

SHORT-TERM

LONG-TERM

↑ Diagnosis

↑ XRT

↑ Surgery
THANK-YOU