Clinical indications for IMRT

A/Prof June Corry – Radiation Oncologist, Chair H&N Service PeterMac
A/Prof Annette Haworth, Medical and Research Physicist, PeterMac
Clinical indications for IMRT

Background

• IMRT was introduced into clinical practice on the (reasonable) expectation of clinical benefit based on the demonstrable improved dosimetry possible.

• Improve therapeutic ratio by reducing dose to normal tissues (less treatment toxicity) and potential to increase dose to GTV (potential better tumour control).
Clinical indications for IMRT

- In reality in H&N cancer, IMRT has reduced late toxicity
- LRC for advanced NPC look better from data published from large centres – short follow-up
- Potential for worse tumour control with IMRT as unlike II opposed photon fields, nothing gets a significant treatment dose in IMRT plans unless volumed and specified, need greater knowledge of H&N anatomy and sites of potential spread
- Supported by the data showing 20% improved OS for HNC patients treated in large volume centres
### First 3 RCT of IMRT: None compared to conformal RT

<table>
<thead>
<tr>
<th>Study</th>
<th>Comparator</th>
<th>Endpoint</th>
<th>Result</th>
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</thead>
<tbody>
<tr>
<td>Pow EHN IJROBP 2006 66:981</td>
<td>51 NPC</td>
<td>Mod Ho technique IMRT mean parotid dose 41Gy</td>
<td>Salivary flow QOL (SF 36, EORTC QLQ-C30, HN 35) IMRT better</td>
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<tr>
<td>Kam MKM JCO 2007 25: 4873</td>
<td>60 NPC</td>
<td>Mod Ho technique IMRT mean parotid dose 32Gy</td>
<td>Xerostomia (observer rated) IMRT better in observer rated but not patient rated xerostomia</td>
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<tr>
<td>Nutting C Lancet 2011</td>
<td>94 HNC</td>
<td>Il opposed photons IMRT mean parotid dose 26Gy</td>
<td>Xerostomia IMRT better 84% vs 29% G2 at 2 yrs More fatigue IMRT patients</td>
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</tbody>
</table>
• Gupta T et al Radioth Oncol 2012;104:343-48
• RCT of IMRT versus conformal RT (CRT) for total of 60 HNC (non NPC) patients
• RTOG >G2 xerostomia 59% IMRT vs 89% CRT p=0.009
• CRT description only given in supplementary file
• Essentially you cant get 70Gy into patients who have N2c disease without exceeding spinal cord dose – no N2c patients
Boomerang
TRIARC – the beams
Conformal RT gave a good approximation of IMRT re parotid and mandibular and pharyngeal constrictor sparing, but not as rapid fall off re dose to optic nerves/chiasm and brainstem.
IMRT and cancer outcomes

- None previous mentioned RCT studies powered to show a difference in cancer outcomes
- Reported outcomes in retrospective series of IMRT Rx NPC show 3 year LRC rates of >90%
- Peng G et al, Radiother Oncol 2012 – RCT on 2D vs IMRT in NPC toxicities and outcomes
- 616 patients
- 5 yr LC in IMRT for T3 - 91%, T4 82%. OS 78%
- 5 yr LC in 2DRT for T3 – 80%, T4 62%. OS 67% p=000.1
Conclusions IMRT HNC

• Reasonable evidence that IMRT results in reduced late toxicity – xerostomia
• Poor data for other OAR – ORN, hearing, swallowing – but expect to be improved
• Some unexpected results (fatigue, hypothyroidism)
• Clinical data suggests better LC in advanced T NPC due to better coverage of GTV, hasn’t been shown in other HNC disease subsites
Conclusions - Future

• Now – as all LINACs have IMRT capability, the question of whether to use IMRT or conformal RT has become academic
• Issue greater RT planning time now required with NON- IMRT techniques
• IMRT Now standard of care in H&N patients
• Lesson learnt is that we need to have mechanisms for faster assessment of the benefits (including cost benefits) of new technologies – protons, carbon ions etc