Stereotactic Radiation for Stage I NSCLC

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Disclosures

• None

• I am partial to radiation!
Objectives

- Identify appropriate patients for SBRT
- Define and describe the technique for delivery of radiation.
- Discuss follow up, including radiographic changes and potential toxicity, of SBRT
Stage I Non-Small Cell Lung Cancer
Stereotactic Body Radiation Therapy (SBRT)

• Very difficult patient population
  • Numerous Co-Morbidities
  • Observe?
    • Over half of patients with no treatment die of cancer with median OS of 9 months

• For inoperable patients, conventional radiation treatments had poor outcomes
  • 15% long term survivors
  • 25% death from intercurrent illness
  • 30% death from metastatic disease
  • 30% death from local failure only

Sibley, Cancer 1998
McGarry, Chest 2002
Details of Treatment

• Critical steps in accurate treatment delivery
  • Immobilization for reproducible treatment
  • Image guided radiation therapy (IGRT)
  • Compensation for respiratory movement
    • 4D CT simulation for treatment planning
    • Dedicated physics staff
• Treatment itself occurs in 30 minutes over the course of 3-5 treatments
  • Either daily or every other day
• Completely non-invasive with virtually no acute short term toxicity
  • Experience is similar to receiving an X-Ray
Excellent Local Control

- SBRT (SABR or Cyberknife or Truebeam) delivers ultrahigh doses of radiation in 1-5 treatments to small (less than 5 cm tumors)
- Multiple Phase II prospective studies have demonstrated drastically improved rates of local control
- Local Control of ~90% at 3-5 yrs
- OS: 55-60% at 3 years
  - Reflects sick population
- Distant Failure: 8%
- Loco-regional Recurrence: 6%
- New Primary: 6%

S enthi, Lancet Oncol 2012
Stereotactic Body Radiation Therapy (SBRT)

- **Phase 2 for Medically Inoperable Patients With Stage I Peripheral Non-Small Cell Lung Cancer: NRG Oncology RTOG 0915**
  - 2-year OS rate 77.7%
  - 2-year DFS was 71.1%
  - 1-year local control rate was 92.7%

<table>
<thead>
<tr>
<th>Study</th>
<th>Description</th>
<th>Results</th>
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<tbody>
<tr>
<td>Onishi (JTO 2007)</td>
<td>245 pts with T1-2N0 treated with 18-75 Gy in 1-22 fx</td>
<td>BED &gt; 100 Gy</td>
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<tr>
<td></td>
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<td>- 5 yr LF 8%</td>
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<td>- 5 yr OS 72%</td>
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<td>RTOG 0236 (Timmerman JAMA 2010)</td>
<td>59 pts with T1-3N0 medically inoperable</td>
<td>3 yr outcomes: Tumor control 98%</td>
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<td>LC 91%</td>
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<td>LRC 87%</td>
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<td>DM 22%</td>
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<td>OS 56%</td>
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<td>Toxicity: Grade 3 in 13%, Grade 4 in 4%, no Grade 5</td>
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Stereotactic Body Radiation Therapy (SBRT)

• 3 randomized trials between surgery and SBRT
  • All closed early due to poor accrual

• Prelim results from combines ROSEL and STARS
  • Only 58 patients
  • 3-year OS 95%
  • Recurrence free survival 86%
  • 97% local control
  • 10% grade 3 toxicity
    • Chest wall pain most common
  • No grade 4-5 toxicity

Chang, Lancet Oncol, 2015
Toxicity

• Very Few Late Effects
  • Decrease in lung function
    • Minimally affected PFT’s
  • Damage to the Bronchial structures
    • Extremely rare <5%
• Pneumonitis
  • Varies based on pulmonary function and tumor size
• Rib fracture/Chest Wall Pain
  • Asymptomatic and symptomatic may occur in 5-10%
Follow Up

• Local recurrence rates are low; more common to see nodal and distant recurrences

• Surveillance CT’s performed at 3, 6, 9, 12, 18, and 24 months

• Common to see post-treatment area of inflammatory changes
  • Routinely see opacities 3-9 months post treatment
  • It is really important for radiology to know the patients have undergone radiation
Follow Up

- Distinguishing local recurrences from radiation fibrosis
  Pneumonitis is clinical diagnosis
- Only 10-15% of mass like changes after SBRT represent recurrence
- PET uptake can remain moderately elevated up to 1 year post treatment
Radiation Pneumonitis

• Often seen radiographically but only treated if symptomatic
  • Grade 2 – 7%
  • Grade 3 - 2%
• Median time to Pneumonitis was 5 months
• Treated with high dose steroids
  • Refer back to Rad Onc/ Pulmonology for management

Grills, J Thor Onc, 2012
Thank you!

Any Questions?