

# Stereotactic Radiation for Stage I NSCLC

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September 8, 2018

# 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



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## NCCN Guidelines Version 9.2017 Non-Small Cell Lung Cancer

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### CLINICAL ASSESSMENT

### PRETREATMENT EVALUATION<sup>9</sup>

### INITIAL TREATMENT

Stage IA  
(peripheral T1ab, N0)

- PFTs (if not previously done)
- Bronchoscopy (intraoperative preferred)
- Consider pathologic mediastinal lymph node evaluation<sup>h,i</sup>
- FDG PET/CT scan<sup>j</sup> (if not previously done)

Negative  
mediastinal  
nodes

Positive  
mediastinal  
nodes

Operable →

Medically  
inoperable<sup>k</sup> →

Operable →

Surgical exploration and resection<sup>k</sup> + mediastinal lymph node dissection or systematic lymph node sampling

Definitive RT including stereotactic ablative radiotherapy (SABR)<sup>l,m</sup>

[See Stage IIIA \(NSCL-7\)](#) or [Stage IIIB \(NSCL-11\)](#)

Surgical exploration and resection<sup>k,n</sup> + mediastinal lymph node dissection or systematic lymph node sampling

[See Adjuvant Treatment \(NSCL-3\)](#)

[See Adjuvant Treatment \(NSCL-3\)](#)

# Stereotactic Body Radiation Therapy (SBRT)

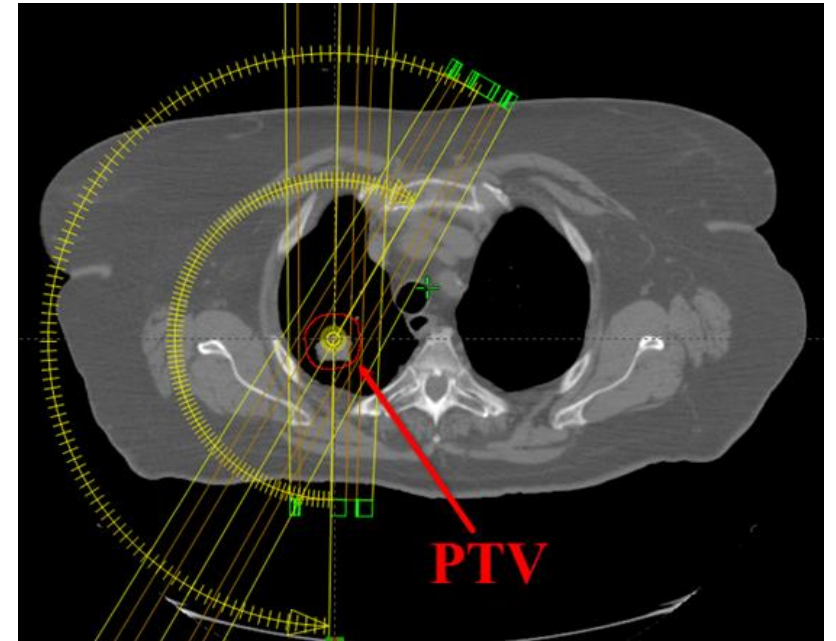
- Very difficult patient population
  - Numerous Co-Morbidities
  - Observe?
    - Over half of patients with no treatment die of cancer with median OS of 9 months
- For inoperable patients, conventional radiation treatments had poor outcomes
  - 15% long term survivors
  - 25% death from intercurrent 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%



# 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%

Onishi (JTO 2007)	245 pts with T1-2N0 treated with 18-75 Gy in 1-22 fx	BED > 100 Gy – 5 yr LF 8% – 5 yr OS 72%
RTOG 0236 (Timmerman JAMA 2010)	59 pts with T1-3N0 medically inoperable	3 yr outcomes: Tumor control 98% LC 91% LRC 87% DM 22% OS 56%  Toxicity: Grade 3 in 13%, Grade 4 in 4%, no Grade 5



# 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

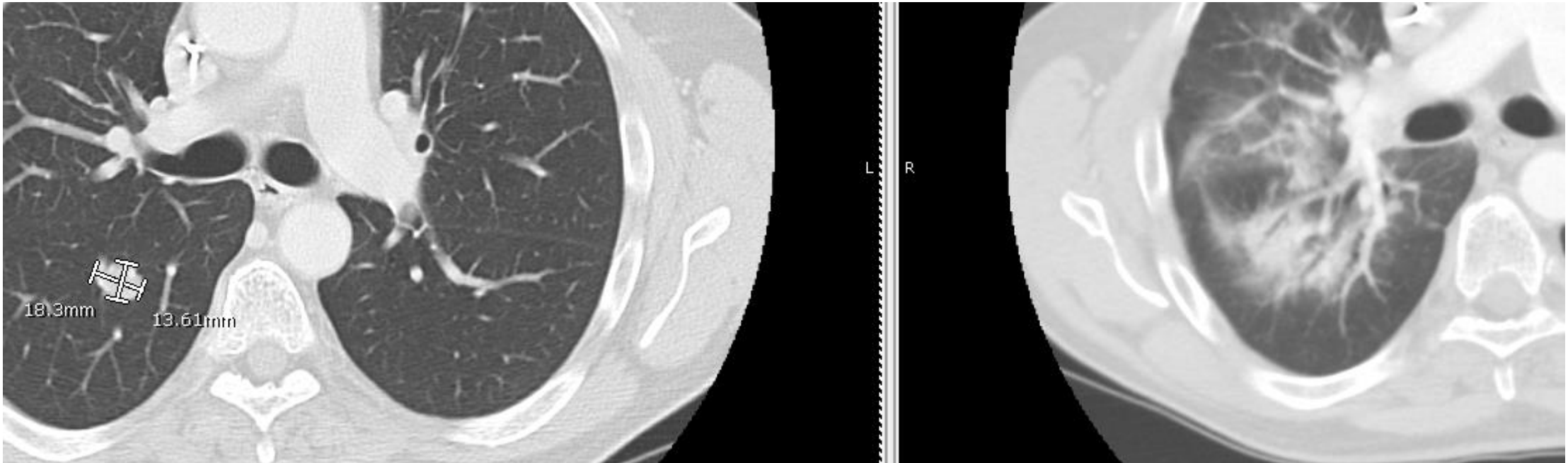
# Toxicity

- 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

Thank you!

Any Questions?