Radiation Therapy: The Promise of Proton and Stereotactic Radiation for Lung Cancer

> Steven Feigenberg, MD Professor Chief, Thoracic Oncology Vice Chair of Clinical Research September 13, 2018

## **Evolution of Radiation for Lung Cancer**







## Early Stage Disease and the Challenges from 15 years ago



- Radiation is used when surgery is too risky or is refused
- Standard is 7 weeks of daily treatment
- This can be a major challenge for sick patients
- Treatment works about 70% of the time

What Can We Do to Improve the Standard of Care?



### **Stereotactic Radiation**





## Radiation Therapy is an outpatientTreatment: Evolved over the last 15 years



### RTOG 0236 (Timmerman JAMA 2010)

Stereotactic Body Radiation Therapy for Inoperable Early Stage Lung Cancer





www.rtog.org

## **The Impact of Stereotactic Radiation**

## Irradiated tumour

## Unirradiated tumours





### In the more advanced setting, ...





## **Better Imaging has led to Major Benefits**





## **3 Dimensional Radiation**





## **Benefits in treatment Delivery:**





## **RTOG 0617: Quality of Life**

#### <u>3DCRT vs. IMRT</u>:

- IMRT more commonly used for larger tumors (p<0.001), higher stage disease (p=0.04)
- Greater decline in QOL at 12 months for 3DCRT (46% vs. 21%, p=0.003)
- For a given PTV volume, IMRT was associated with <u>lower lung</u> V20 (p=0.08), <u>lower heart doses (p<0.05)</u>
  - Heart dose predicted for survival (p<0.001)
- IMRT had <u>fewer grade ≥3 pneumonitis</u> (3.5% vs. 7.9%, p=0.0653) [adjusted p=0.046]
- IMRT was associated with <u>higher compliance with full dose consolidative</u> <u>chemotherapy</u>
- High volume centers had longer overall survival
  - more likely to treat with IMRT (p=0.002) and had RT plans with <u>lower mean</u>

esophageal dose (p=0.03), lower median heart dose (p=0.006

Movsas B, et al. JAMA Oncol. 2016, Chun SG, et al. J Clin Oncol. 2017; Eaton RB, et al. J Natl Cancer Inst. 2016



# Can We Do Better? Why Protons Can be Superior to Photons



#### PENN RADIATION ONCOLOGY

14

## **PROTONS Delivery is Complex**



## **PROTONS Delivery is Complex**









### **Definitive Chemoradiation Case**





## **LA-NSCLC Proton Therapy Enrolling Studies**

 RTOG 1308: Phase III Randomized Trial Comparing Overall Survival After <u>Photon Versus Proton</u> Chemoradiotherapy for Inoperable Stage II-IIIB NSCLC

## **PENN Thoracic Radiation Oncology**



Abigail T. Berman, MD



Keith Cengel, MD, PhD



Steven Feigenberg, MD







William Levin, MD Samuel Swisher-McClure, MD





