AbstractID: 14485 Title: Single and Hypo-fractionated Stereotactic Irradiation of Brain & Body Lesions

Stereotactic irradiation has been in clinical use for decades. It was initially performed almost exclusively for brain lesions with Gamma Knife radiosurgery. In the 1990s, it was expanded to the rest of the body. Over the years the emphasis has shifted from benign lesions like AVMs to malignancies such as early-stage lung carcinoma in medically inoperable patients. Stereotactic body radiation therapy (SBRT) now is available at approximately 700 institutions in the United States (American Hospital Association guide 2009). Almost 1500 articles have been published on SBRT, and there are several ongoing prospective randomized trials comparing SBRT with standard radiation therapy. Major considerations in single and hypo-fractionated radiotherapy are the therapeutic gain and technical challenges for precise imaging, planning, and dose delivery. In this educational session, we will first briefly review the results of recently completed studies for intracranial and extracranial stereotactic irradiation with an emphasis on SBRT; and then discuss the technical aspects in image registration, stereotactic localization, target delineation uncertainties particularly using FDG-PET for the lung cancer; and finally address the physics QA procedures to ensure optimal planning that differentiate the doses between tumor and normal tissue without detracting of target coverage and to deliver the desired dose under image-guidance using stereotactic frame or frameless refixation systems.

Learning Objectives:

1. Understand the therapeutic gain in stereotactic radiosurgery (SRS) or hypo-fractionated SBRT and recognize that the success of SBRT relies on both the dose escalation to the tumor and the margin reduction and tumor shrinkage
2. Discuss the rationale and technical details about how to use fine CT or MRI scans for the delineation of small targets and critical structures, how to eliminate motion or other image artifacts using stereotactic-type image localization, and how to combine anatomic information from CT or MRI with physiological information from PET or functional MRI for optimal treatment planning
3. Learn the physics QA procedures for plan evaluation with empirical rules on the conformity index, target coverage, and periphery dose gradient, and QA for dose delivery under image-guided target refixation and patient tracking
4. Develop mock training for SBRT in procedural design and implementation for annual training of the SBRT team to prevent the occurrence of systematic and human errors