

Using MRI imaging for tumor volume delineation: seeing is believing? (20 min)

Program Objectives:

At the conclusion of this activity, the learner will be able to:

- 1) Understand the different tools and strategies available to determine tumor volume and motion extent from 4D CT imaging, MRI, PET, and Deformation image registration
- 2) Compare the benefits and pitfalls of applying multi imaging modality (4D CT imaging, MRI, PET) for tumor volume delineation and motion extent determination at various anatomical sites such as thorax and abdomen.
- 3) Develop and establish institution-specific guidelines for incorporating tumor volume and motion extent based on available technology, including 4D CT, PET, MRI, with Deformation Imaging Registration Tools

Session Descriptive:

The advent of multi-imaging modalities has afforded tremendous treatment planning opportunities to better define and delineate tumor volumes, and effectively apply highly conformal strategies for targeted therapy techniques such as IMRT and SBRT. With 4D CT imaging providing motion specific information, PET yielding tumor molecular physiologic imaging, and MRI enhanced soft tissue differentiation, these multi-imaging modalities can introduce a comprehensive image of the planned target volumes. However, each of these technological innovations come with limitations specific to each image acquisition modality, and importing these various imaging studies into the planning system requires the employment of image registration tools, and in some case non-rigid, deformation image registration, in order to successfully delineate tumor and target volumes for planning. Commissioning and management of a comprehensive strategy for tumor delineation and targeting using multi imaging modalities in a safe and effective manner presents several challenges across the various commercial platforms used for treatment planning. The purpose of this presentation is to educate the community on the different approaches to determine tumor volume delineation with the sophisticated approaches available: 4D CT, PET, MRI, and the various tools of deformation image registration that may be required to accurately apply these multi-modality imaging studies to the treatment planning process.

Potential Challenges/Barriers to Change:

1. Although access to 4D imaging, PET, MRI, and Deformation registration tools is rapidly growing, these technologies are not uniformly available at all centers.
2. Applications discussed may not be available on all commercial platforms and systems
3. Commissioning and employment of these technologies will require further specialized training by the physicists and other staff.

Reference:

New developments in MRI for target volume delineation in radiotherapy. Khoo VS, Joon DL. Br J Radiol. 2006 Sep;79 Spec No 1:S2-15