AbstractID: 2598 Title: MRI and MRSI in Radiation Therapy Treatment Planning

Radiation therapy is an image-guided procedure whose success depends strongly on the image modality used for treatment planning and the level of integration of the available imaging information. Advancement in intensity modulated radiation therapy (IMRT) has provided an unprecedented means to produce highly conformable dose distribution while sparing sensitive structures, which calls for better imaging tools for tumor target definition and for the management of inter- and intra-fractional organ motion. Clinically, MRI imaging is an important anatomical imaging modality and posses superior soft tissue contrast. It has played a pivotal role in radiation oncology practice and made significant impact in cancer diagnosis, staging, treatment planning, and monitoring of therapeutic response. In the last decade, much progress has been made in high field MRI and in the development of new MRI contrast agents. MR spectroscopic imaging (MRSI) has also emerged as a powerful noninvasive tool for providing the type of metabolic and physiology information needed to identify biologically conformal dose distributions for biologically conformal radiation therapy (BCRT). This presentation will provide an overview of the fundamental principles of MRI and MRSI imaging and inform the audience with some of the new developments in the field and their practical implications to radiation therapy. Examples of these applications in a few disease sites will be presented. Finally, issues related to the quality assurance of MRI/MRSI and BCRT will also be addressed.

Educational objectives:

1. Review MRI and MRSI physics.
2. Illustrate the steps involved in integrating MRI and MRSI into treatment planning process.
3. Introduce MRI/MRSI image fusion techniques (including deformable image registration).
4. Provide an overview on recent advances in high field MRI and MRSI.
5. Update on the new development of MRI contrast media, including nanoparticles-based contrast agents.

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