

The advantages of MRI for radiation treatment planning, such as soft tissue discrimination and multi-contrast capability, are well recognized. It is routine practice to use MRI for tumor target definition of brain tumors, with or without a corresponding CT scan. Superior soft tissue visualization has led to the emergence of MRI-guided brachytherapy for cervical and prostate cancers. In addition, functional and physiological MR imaging can aid assessment of tumor and normal tissue response for adaptive RT as well as pre-treatment boost target definition. Several past limitations of MRI have hindered its wide application in radiation therapy, including concerns about geometric accuracy, high resolution volumetric acquisition, acquisition speed, motion-sensitivity, small bore size, and lack of definition of bony structures and electron density. Many of these shortcomings have been overcome or will be overcome by new MRI technologies.

This lecture will provide an overview on new MRI technologies and their application for radiation treatment planning. The limitations of these techniques will also be discussed.

Learning objectives:

- (1) Understand new MRI technologies that are relevant to radiation treatment planning;
- (2) Understand the influence of imaging parameters on image quality and contrast.
- (3) Understand clinical applications and limitations.