

AbstractID: 1742 Title: Development and implementation of 1.5T MR as a simulator in radiation therapy

We present the development of MR-based simulation (MR-Sim) in radiation therapy and its integration in the process of treatment planning. MR provides superior volumetric visualization of soft tissue, able to image in any plane and better visualize anatomical and pathological details. However, the inherent geometric distortion introduces uncertainty in the tumor localization. On the other hand CT is the gold standard in radiation therapy due to its geometrical integrity, but it lacks soft tissue delineation. We have installed a 1.5T MR and are using it as an MR-Sim in treatment planning as a registered data set secondary to CT images. We envision to use the MR images alone for treatment planning of certain sites that do not require dose inhomogeneity corrections. It is important to quantify the image distortion for this newly installed scanner, and correct it if required. We describe the MR-Sim development that includes a compatible alignment laser system, a flat table top, site specific immobilization devices applicable for both CT and MR, and modification of RF coils to accommodate the immobilization. Two major sources of geometrical distortions, the gradient field non-linearity and the magnetic field inhomogeneity, are investigated. The entire magnet was mapped and the geometrical distortion of up to 15 mm was observed. Several transformations are adopted to suppress the distortion. The local weighted mean transformation is found most effective. Image transformations are stored in an index table that is used to correct each image. Most distortions are corrected within 0.5 mm by applying this technique.