

Purpose: To quantify the effect of geometric distortions on patient dosimetry for MR-based radiotherapy treatment planning (MR-RTP) and to evaluate the clinical importance of distortion correction.

Methods and Materials: Ten prostate patients underwent MR imaging in the standard treatment position. Axial MR images (MRIs) were segmented for bone and tissue, bulk electron densities were assigned, and images were corrected for machine- and patient-related image distortion. Intensity modulated plans (IMRT) were developed for each patient and dose distributions were calculated on both the original and corrected images. The effect of MR distortion correction on both target and organ at risk (OAR) dosimetry was studied.

Results: Maximum and mean image distortion for all patients was 5.4 mm and 1.4 mm, respectively. Distortions near the target and OARs were considerably less. The minimum dose received by the planning target volume (PTV) was most affected by distortion correction and changed, on average, by -0.3% for IMRT plans. Changes in mean and maximum PTV dose were smaller and dose volume histograms (DVHs) were insignificantly altered.

Conclusions: For the combination of the MR scanner and imaging sequence, distortion correction has no impact on prostate plan dosimetry when patients are properly positioned within the magnet. MR-RTP will be further studied but appears to be clinically viable for prostate patients.