AbstractID: 3507 Title: Image Guided Radiation Therapy: Investigation of Interfraction Setup and External Contour Variation for Prostate IMRT Using CT and MRI

Purpose: The interfraction setup and external contour variation during a treatment course may directly impact the accuracy of dose delivery. The purpose of this study is to investigate these effects for prostate IMRT using CT and MR images.

Method and Materials: Eleven prostate patients were included in the MRI studies. Each patient underwent MRI scan once a week prior to treatment resulting in 4-6 MRI scans. Paired MRI scans were obtained in the treatment position in both an alpha cradle and a stereotactic body frame. External contour variations were quantified from the isocentric MRI slices. The immobilization and setup uncertainty between the alpha cradle and the body frame were evaluated. Eighteen prostate patients were included in the CT studies using a CT-on-rails system twice a week. Paired scans were generated before and after the treatment. BB/isocenter positions and external contours were quantified on both CT and MR images.

Results: The isocenter and target localization accuracy was ensured to within 3 mm with in-room CT imaging. The maximum interfractional differences in external contours ranged 0.5 - 2.2 cm over the whole treatment course for patients with lateral dimensions of 34 – 43 cm. The patient lateral sizes fluctuated up to 5% compared with the initial simulation CT. In general, contour variations increased with the patient size. The maximum contour difference measured with MRI in an alpha cradle was 4.3 ± 2.8mm (ranged 0-9.5mm) while with a body frame it was 8.1 ± 4.1mm (ranged 3.3 -16.2 mm) for patient sizes between 35 and 39.5cm.

Conclusions: Image guidance improves isocenter and target localization accuracy for prostate IMRT. Large interfraction setup and external contour variations (2cm) may occur for large patients due to obesity, which may alter daily dosing by 2-4%. An alpha cradle introduces less external contour variation than a body frame.