Abstract ID: 17040 Title: Initial Experience with MR simulation in radiation therapy using an open-platform MR scanner: considerations for routine clinical use

Purpose:To evaluate the considerations associated with use of magnetic resonance imaging (MRI) as a simulation tool in radiation therapy.

Methods:A 1.0 Tesla(1T) Open-platform MRI scanner (Panorama, Philips Healthcare) was used to acquire whole pelvis T1, T2 and 3D bTFE images on 3 prostate cancer patients to define extra capsular involvement. For the MRI setup, a flat table top insert (Civco) and our standard immobilization devices, were used to reproduce patient positioning during treatment. MR images were used in conjunction with CT simulation datasets to define anatomical structures and validate typical treatment planning clinical flow with the goal of using MRI as a stand-alone modality. Contouring was done on T2 images and validated against T1 and 3D bTFE datasets. Dose calculation on MRI was performed by assigning bulk densities to structures based on average CT intensities (HUs) and compared with CT calculations using heterogeneity correction. Atlas-based contouring has been investigated to improve on organ-specific HU representation.

Results:Significant differences in organ contours were noted between MRI and CT. For the 3 patients, with MR, reduction in prostate and penile bulb volumes was on average, 25% (max. 36%) and 22% (max. 31%), respectively. Seminal vesicle volumes varied on average by 71% (max. of 202%). MR was found to be especially useful in defining boundaries of the prostate and penile bulb; the latter structure was indiscernible on CT. MRI-based calculations with assigned bulk densities agreed within 1% of CT-based planning calculations with heterogeneity correction for all cases.

Conclusions:This study confirms the feasibility of using MRI as a sole imaging modality for treatment planning simulation and dose calculations. Significant volume reduction in the PTV based on the MRI images may be beneficial for dose escalation studies, and improved structure delineation affords possible additional dose sparing to surrounding critical organs.