AbstractID: 6942 Title: The Dosimetric Consequences of Intra-Fraction Prostate Motion in Intensity Modulation

In Intensity Modulated Radiation Therapy (IMRT), each modulated field must line up exactly with the other modulated fields in order for the planned doses to be delivered. If organ motion occurs during treatment, the composite dose to the target can be significantly altered. This study was undertaken to determine the effects of intrafraction motion on dosimetry for prostate patients treated with five-field fixed gantry intensity modulation and bilateral intensity modulated arc treatments (IMAT). Intrafraction motion was assessed by acquiring CT scans in the supine position immediately before and after the first three fractions. Each pair of CT images were fused by matching bony anatomy. The prostate, rectum, and bladder were contoured on each data set by the same investigator. Isocenters were automatically placed in the geometric center of the prostate. Intrafraction motion was characterized by changes in organ volumes and isocenter displacements. Dosimetric effects were evaluated by shifting the isocenter between fields on the initial IMRT treatment plan. In addition, a treatment planning comparison was made between IMRT and IMAT to determine which is more sensitive to intrafraction motion. Preliminary results indicate that simple bladder filling can cause the prostate to shift posterior at a rate of 2 to 3 mm every ten minutes. Depending on the intradependence of the intensity patterns and the length of treatment, intrafraction dosimetric errors can be as large as 10 percent. Results for a group of patients will be presented as well as information on how to minimize intrafraction dosimetric error.