AbstractID: 8881 Title: An evaluation of intrafraction motion-induced error for fractionated IMRT delivery.

The combination of dose modulation and respiratory target motion is an impediment to dose escalation for some targets in treatment with intensity-modulated radiotherapy. The purpose of this study was to investigate the effects of target motion on fractionated IMRT delivery. Ion chamber and diode array measurements were made in both moving and stationary phantoms for the delivery of a single IMRT field. A 10 cm by 10 cm micro-multileaf collimator was used for segmental IMRT delivery. A positioning stage was used to simulate target motion, and an analytical liver motion function was used to drive the stage. The measurements were repeated multiple times to simulate fractionation. For the measurements in moving phantom, the delivery of each fraction was started at a random phase of the motion cycle. Measurements were made with varying amplitude of motion and total number of monitor units. The average and standard deviation of dose per fraction at various spatial locations was calculated for the moving and stationary measurements, and the percent difference between the moving and stationary average doses was calculated as well. As the amplitude of motion decreased, the percent difference between moving and stationary average dose approached zero. For clinically-relevant motion amplitude of 1.5 cm, the percent difference was as high as 36.55%. This result is due to the large amplitude of motion in relation to the central leaf width and thus the amount of dose modulation. This study shows that the phase and amplitude of target motion may affect IMRT delivery.