AbstractID: 7892 Title: Quantifying the Effect of Intrafraction Motion during Breast IMRT Planning and Delivery

Respiration motion during IMRT causes two types of problems. First, the CTV to PTV margin needed to account for respiration motion necessitates that the lung and heart dose is higher than would occur in the absence of such motion. Second, because respiration motion is not synchronized with MLC motion, the delivered dose is not the same as the planned dose. A method to synchronize respiration motion with MLC motion is 4D IMRT. The aims of this work were to determine (a) the effects of set-up errors and respiration motion on the lung and heart dose during treatment planning, (b) the effect of the interplay between respiration motion and MLC motion during IMRT delivery, and (c) the potential benefits of 4D IMRT. Seven early stage breast cancer patient datasets were planned for IMRT. For each case, the respiration motion magnitude and set-up error were varied, yielding multiple plans per patient. The effect of the interplay between respiration motion and MLC motion during IMRT delivery was simulated for every radiation fraction of each plan. The lung and heart dose increases if set-up errors, respiration motion, or both are high. PTV coverage worsens as set-up errors and respiration motion increase. For DMLC IMRT delivery, the interplay between MLC motion and respiration motion does not significantly degrade the delivered dose distribution. 4D IMRT may allow a reduction in the lung and heart dose as compared with 3D IMRT.