AbstractID: 1218 Title: Investigation of the Delivery Accuracy of Respiratory Motion-Corrected Radiation Treatments

Organ motions during respiration and consequent dosimetric effects are on-going problems in radiation therapy. This study aimed to evaluate the accuracy of the respiratory tracking and compensatory ability of an image-guided robotic controlled linear accelerator. Tumor motions defined by fiducial positions were assumed to correlate with respiratory motions. All experiments were conducted using a fiducial-containing film cube placed inside a phantom positioned on top of a motion table, which had three independently moving axes. Four Gafchromic films placed inside the cube were used for quantitative dose verification. An elliptical dose distribution was run with no motion, three-dimensional sinusoidal motion, one-dimensional 4^{th} order sinusoidal function, a healthy person breathing pattern and with a patient breathing pattern. In addition, a lung patient plan was superimposed onto the phantom and recalculated, the plan was then run with a patient breathing pattern. Absolute doses from Gafchromic films were derived using a calibration curve obtained from the red color filter in the RGB scanned images. Initial results showed the difference for the 70% and the 50% isodose lines between the measurements and calculations was 1 mm for the stationary case, up to 3 mm for periodic functions and healthy person breathing pattern. For the case using a patient plan dose distribution and a patient breathing pattern, the 50% isodose spatial difference was up to 5 mm, which could result in large dose differences due to the non-flatten beam. Delivery accuracy could be improved with more frequent imaging.

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