

AbstractID: 5804 Title: Assessment of Lung Tumor and Diaphragm Motion using Cone-Beam CT and 4DCT

Purpose: To determine the variability in diaphragm and tumor motion assessed at planning and for each treatment fraction for patients with inoperable early stage non-small cell lung cancer treated using stereotactic body radiation therapy (SBRT).

Method and Materials: Six patients with upper lobe lung tumors were treated using SBRT. For each patient, tumor motion was assessed initially using fluoroscopy on a conventional simulator. The subsequent scanning session involved a helical scan and a four-dimensional CT (4DCT) scan to assess tumor motion at the inspiration and expiration phases of breathing. Each of the three treatments was performed under on-line cone-beam computed tomography (CBCT) image guidance. Similarly to 4DCT, the projections for the CBCT scans were sorted based on an internal surrogate of the breathing cycle to provide volumetric datasets at the inspiration and expiration phases of breathing for each treatment fraction.

Results: For five of the six patients treated, lung tumor and diaphragm motion measured on the treatment unit using CBCT was consistent with the tumor motion measured by 4DCT at planning. However, for the sixth patient, diaphragm motion, and to a lesser extent tumor motion, was markedly different between planning and the three treatment fractions. For this patient, the average tumor motion difference observed between 4DCT and projection-sorted CBCT scans was 4.5 mm (A/P) and the average diaphragm motion difference was 12.0 mm (A/P) and 9.5 mm (S/I), respectively.

Conclusion: Our study has shown that the relative motion and position of the tumor at the time of treatment may not match that of the planning scan. Application of breathing motion data acquired at scanning time to modulate or gate radiation therapy may not be suitable for all patients.

Conflict of Interest: Princess Margaret Hospital is part of the Elekta Synergy Consortium. The research is supported, in part, by Elekta Inc.