

AbstractID: 14065 Title: Temporal dose-response of normal lung tissue in patients treated with stereotactic body radiation therapy for lung tumors

Purpose: To study the temporal changes of normal lung tissue dose-response for patients with lung tumors who received stereotactic body radiation therapy (SBRT).

Methods: Between 2003 and 2009, 63 patients received a hypofractionated treatment with a maximum of 5 fractions and a median total dose of 54 Gy (range, 30-60). RT-induced lung density changes were evaluated after fusion of planning CT scans with a maximum of 5 post-RT follow-up scans corresponding to interval periods of approximately 3, 6, 12, 18, and 24 months after treatment. Patient specific dose-response curves (DRC) were obtained by averaging CT number changes for regions receiving the same dose at 10 Gy intervals. In a secondary analysis, SBRT dose schedules were converted into 2Gy-equivalent using a biological equivalent dose (BED) model.

Results: At 6 months, transient increases of up to 100% were observed compared to the pre-treatment lung density. After 12 months, the density changes stabilized to less than 50% of pre-treatment levels. Different evolutions of the lung density were observed for BED levels of 0-45 Gy and 45-110 Gy. For the late response, no significant increase of lung density was visible for doses below 45 Gy. Above this threshold, the dose-density change was linearly increasing but not as rapidly as after 6 months.

Conclusion: This analysis is the first report, to our knowledge, of SBRT-induced lung density changes showing that the lung density temporal response varied significantly with the received dose. More than 90% of the lung volume experienced an acute response that reversed to nearly no late response, indicating that the lung morphology was mostly unaffected after 12 months. Since the acute response also partially reversed for the remaining 10%, SBRT was expected to only marginally affect long term lung function.