

AbstractID: 6517 Title: Dosimetric and Clinical Benefits of Image Guided Patient Setup for Hypofractionated Radiotherapy (HFRT) in Lung

Purpose: To estimate the clinical advantages of reduced field margins made possible by image guided patient setup and monitoring.

Method and Materials: The limitations in patient setup using skin marks and the uncertainties of intrafractional motion are well known. In this study, kV cone-beam images were taken before and after treatment on 10 lung patients (1-3 fractions/patient). Pre and post treatment images were registered according to bone and to tumor. In 4 of 10 patients we observed GTV shifts, intrafractional motion, and/or differences between bony and tumor registrations exceeding 5mm and as large as 16mm. These 4 patients were retrospectively replanned using GTV-PTV margins of 5, 10, 15, and 20 mm, on the assumption that Image Guidance (IG) enables such reductions compared to conventional patient setup. The same optimization constraints and beams were used as in the original plans. Lung V_{20} , d_{mean} (mean physical dose), f_{dam} (functional damage model), and NTCP were calculated for HypoFractionated (HF) prescriptions of 12Gyx4f, 20Gyx3f, and 30Gyx1f.

Results: For a small tumor in the lateral apex, little clinical gain was found by reducing field margins from 20 to 5 mm even for the highest prescription doses with $d_{\text{mean}} < 5\text{Gy}$, $V_{20} < 8\%$, $f_{\text{dam}} < 0.09$, and $\text{NTCP} < 0.25$ for all treatment plans. For a larger tumor near midline even a modest HF dose (12Gyx4f) resulted in d_{mean} of 24Gy and $f_{\text{dam}} = 0.43$ for 20mm margins. These parameters could be reduced to 10 Gy and 0.23 respectively with IG and 5mm margins.

Conclusions: The use of IGRT for HFRT in lung is beneficial to some but not all patients. For small peripheral tumors reduced field margins made possible by IGRT result in real but clinically minimal benefits. For larger, more mobile tumors, the benefits of IG setup and reduced field margins enable significant dose escalation, making more patients eligible for such treatments.