AbstractID: 11777 Title: Influence of Respiratory Motion on Helical Tomotherapy Treatment Planning for Chest Wall Irradiation

Purpose: To investigate the influence of respiratory motion on helical tomotherapy treatment plans for chest wall irradiation. **Methods and Materials**: Helical tomotherapy plans were generated on 3DCT and 4DCT data for post-mastectomy radiation therapy patients. Plans were generated on the 4DCT data for 0% phase (full inspiration), 50% phase (full exhalation), and the minimum and maximum intensity projection (MIP) data. Since TomoTherapy dose delivery incorporates a temporal component, the result of respiratory motion is dependent on the specific phase interplay of the breathing cycle and the TomoTherapy rotation. As an approximation, we performed treatment planning on the extrema phases (i.e., full inhale and full exhale) of the breathing cycle. Though this does not represent true respiration, it does represent the worst case effect of respiration as a displacement of the anatomy relative to the treatment beam for the entire delivery. Plans were compared based on dose volume histograms (DVHs) for the planning target volume (PTV) and organs at risk (OARs), dose homogeneity indices (DHIs), percentage of PTV receiving the prescription dose, minimum dose received by 90% of PTV, and maximum (D_{max}) and minimum (D_{min}) doses in the PTV. **Results**: DVHs show insignificant differences for OAR (lungs, heart) for the four planning geometries. The tumor control probability (TCP) is 100% for all cases, and DHI varies from 0.125 to 0.165 (hot spots 110-113%, cold spots 96-98%). **Conclusions**: We conclude that there is little dosimetric and radiobiological difference among these results and that the respiratory motion does appear to have a clinically significant effect on the treatment plans. **Conflict of Interest**: This work was supported in part by a research agreement with TomoTherapy, Inc.