AbstractID: 11252 Title: Target Relocalization Accuracy and PTV Margin Verification using Three-dimensional Cone-Beam Computed Tomography (CBCT) in Stereotactic Body Radiotherapy (SBRT) of Lung Cancers

Purpose: To assess the target relocalization accuracy in respect to the bony structures using daily CBCT and thus to validate the planning target volume (PTV) margin used in the lung SBRT.

Methods and Materials: All patients underwent 4D CT scanning in preparation for lung SBRT. The internal target volume (ITV) is outlined from the reconstructed 4D data using the maximum-intensity projection (MIP) algorithm. The clinical target volume (CTV) is defined as the ITV plus 3 mm margin and an additional 3 mm margin is added to the CTV to make the PTV. Conformal treatment planning is performed on the helical images, to which the MIP images were fused. Prior to each treatment, CBCT is used to align with the simulation CT (helical) based on bony anatomy. The necessary shifts are recorded. The treating physician then checks and modifies the alignment based on target relocalization within the PTV (soft tissue alignment). The final shifts are derived based on the soft tissue alignment. Two sets of shifts are compared here for the purpose of the study.

Results: For 8 consecutive patients, treating 9 targets for a total of 36 fractions, it was found that the treatment setup errors (based on bony anatomy alignment) are 0.23±0.47 cm in the anterior-posterior (AP), 0.06±0.5 cm in the lateral (Lat), and 0.18±0.39 cm in the superior-inferior (S-I) directions, respectively. After the setup error correction, the targets were found to be within the PTV margin with the average shifts of 0.064±0.64 cm in AP, 0.089±0.41 cm in Lat, and 0.21±0.38 cm in S-I directions, respectively.

Conclusions: For this patient population, the target relocation accuracy is generally satisfactory after patient setup error correction. This demonstrates that the PTV margin designed based on the ITV outlined on MIP images is appropriate to account for intra and inter-fractional tumor motions.