Abstract ID: 15972    Title: A Comparison of Apparent Tumor Volume On Treatment Planning Scans and Daily Volumetric Imaging Scans for Lung SBRT

Purpose: The effectiveness of stereotactic body radiation therapy (SBRT) depends on proper alignment of the patient and tumor. The objective of this study is to analyze the apparent tumor volume measured on daily volumetric imaging scans compared to the volume measured on various simulation and planning computed tomography (CT) images.

Methods: Gross tumor volumes (GTVs) were contoured retrospectively in MIMVista for 10 lung cancer patients who underwent SBRT. Daily pretreatment megavoltage CT (MVCT) GTVs were compared to the treatment plan internal target volume (ITV), a contour derived solely from four-dimensional CT (4DCT) cine in MIMVista, the maximum intensity projection (MIP) of the 4DCT data, and the average (phase-binned) intensity projection (AIP).

Results: On average, the ITV was 2.1  1.08 times larger than the MVCT GTV. Similarly, the MIP volume was 1.85  0.84 and the AIP volume was 1.07  0.37 times larger. Minimum and maximum values ranged from 0.95 to 6.93 times larger for the ITV and 0.92 to 5.73 for the MIP. Results for the AIP were more centrally distributed, ranging from 0.54 to 2.97.

Conclusions: For lung cancer patients, daily MVCT scans show significantly smaller tumor volumes than treatment planning CT scans. For 9 out of 10 patients, all MVCTs showed smaller tumor volumes than the ITV and MIP. Because lung tumors are not stationary, this could cause uneven target dose and greater dose to healthy tissue. MVCT GTVs were closest in size to the AIP, but the minimum and maximum deviations were still significant. The largest tumor displayed relatively small deviations from the ITV and MIP volume, but there was no clear relationship between tumor volume and the magnitude of the deviations. This effect was less pronounced for the AIP. Further investigation will determine the effect this volume difference has on daily target registration.