

Purpose: To determine if new RPM amplitude averaging enlarges NSCLC iGTV delineation in the 4D-CT simulation.

Methods: We selected 24 NSCLC patients with respiratory-induced lung motion of 1 cm or greater and generated two 4D-CTs (from one scan) for each patient using a GE 8-slice PET/CT scanner with a Varian RPM respiratory surrogate. For each patient both 4D-CTs used phase-corrected phase-binning (PC-PB) for image selection; however, for phase determination one 4D-CT assigned phases based on the RPM amplitude at the median time point of the image acquisition (the contemporary technique), and the other 4D-CT assigned phases based on the average RPM amplitude recorded over the image acquisition time. We developed software to assign phase and select images as described to create maximum intensity projections (MIPs) of the 4D-CTs. These two MIPs and the cine MIP (CMIP; generated from all acquired images before image selection in 4D-CT) were sent to the Pinnacle 9.0 treatment planning software for auto-contouring to obtain internal gross tumor volumes (iGTVs). Auto-contouring was done at the lung window level with a threshold of 800 and occasional, consistent manual intervention to prune regions that included non-tumor tissue.

Results: On average, iGTVs generated using the median time point RPMs and averaged RPM amplitudes were 91.9% and 94.1% of the iGTV generated from the CMIP, respectively (a 2.2% difference). The mean increase in iGTV when switching to RPM averaging was 0.37 cc with a p-value of 0.0402 and corresponds to a mean percent increase in iGTV of 2.40%.

Conclusions: This work demonstrates that new RPM amplitude averaging enlarges NSCLC iGTVs generated from MIPs of 4D-CT.

Funding Support, Disclosures, and Conflict of Interest:

The presenting author, Luke Hunter, received funding support as a recipient of the Hertz Foundation Applied Science Fellowship.