

Purpose: To characterize the motion baseline for lung tumors using cone-beam CT images and to verify if it is possible to adjust PTV margins during treatment based on the patient's anatomy and reduce OARs dose.

Methods: A set of cone-beam CT images from 28 patients each having between 1 and 20 CBCTs was used to evaluate the temporal evolution of the lung tumor's position and volume. GTVs have been contoured for each CBCT and compared with those on the corresponding planning CT images. Planning contours were done by a radiation oncologist and all CBCT contours were reviewed by radiation oncologist resident. We then extracted the volume and center of mass coordinates. Furthermore, points have been placed at extremities of tumors in axial, sagittal and coronal axis for each CBCT in order to characterize the maximum extent of the GTV in all directions.

Results: Determination of volume variation shows that the set of patients have an average loss of 42% of their tumors volume over the entire course of treatments (on average treatment ended 48 days after the plan CT was acquired) and an average loss of 14% at the first CBCT after a mean time of 21 days since the planning CT. The tumor center of mass had an average displacement of 0.85 cm during a mean time of 48 days with a maximum of 2.03 cm and a minimum of 0.16 cm, and move equally in lateral, AP and SI axis, but has greater movement in left, anterior and superior directions.

Conclusions: This study shows that there is a non-negligible volume reduction and a significant tumor displacement of lung tumors to adjust PTV margins, especially for patients with atelectasis. We could probably reduce OARs dose with more conformal contours.