

Purpose: To study volume parameters and how they might affect tumor motion in lung cancer patients.

Methods: Nine patients with lung lesions were imaged with a Philips Brilliance Big Bore 4D CT scanner before and after receiving radiation therapy treatment. A single board certified radiation oncologist contoured all patient tumors in zero (maximum inhalation) and fifty percent (full exhalation) phases. Images were ported to the treatment planning system Pinnacle© 9.0. Volume measurements of the lesions were automatically obtained from these contours. Maximal tumor dimensions were obtained manually in the saggital, coronal, and transverse planes. Tumor motion was assessed from the centroid tumor locations (obtained automatically) between respiratory phases. Centroid distance to the diaphragm was also measured.

Results: A comparison of the difference from the spherical equivalent volume (SV) based upon the maximal tumor dimension and the volume measurements from Pinnacle© were compared. A linear correlation ($R^2 = 0.972$) was noted. A correlation using a power law fit was determined between tumor motion and distance from the diaphragm for the initial scan and subsequent rescan ($R^2 = 0.251$ and $R^2 = 0.249$ respectively). Tumor motion was separated based upon which planar view the maximal tumor dimension was found to be in. Tumors with the largest sagittal dimensions (5 scans) had an average and standard deviation in tumor motion of 0.47 ± 0.61 cm, coronal (5 scans) had 1.29 ± 0.43 cm, and transverse (8 scans) had 0.61 ± 0.31 cm.

Conclusions: The data suggests a correlation to estimate spherical equivalent volume (SV) and thus the maximal dimension of the lesion. Also, if this maximal dimension was found in the coronal view, those tumors exhibited approximately twice as much tumor motion between respiratory phases as compared with tumors with maximal dimensions found in the other planar views.