

Spatial and dose-response analysis of fibrotic lung changes after stereotactic body radiation therapy

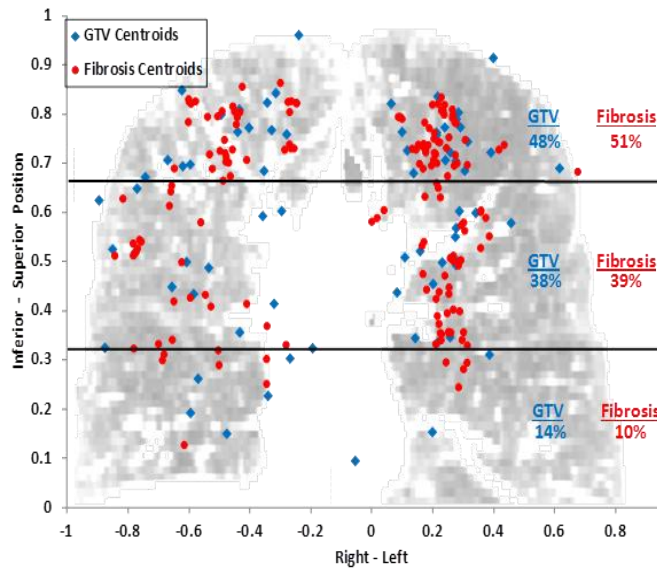


Figure 1: Coronal view of the relative position of all GTV and fibrosis volume centroids. The concentration of fibrosis volume and GTV centroids is located in the superior third of the lung. The average radial travel between the fibrosis volume and GTV centroid was 2.6 ± 0.2 cm. Our data also shows that the radial distance between the fibrosis volume and GTV decreases with increasing time. There was no preferential direction of travel (superior vs inferior, or medial vs lateral) of the fibrosis volumes relative to the original GTV centroids.

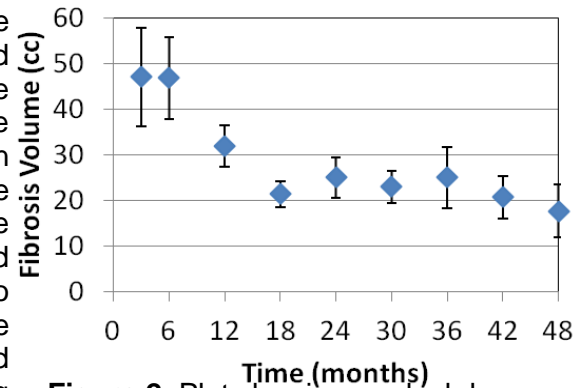


Figure 2: Plot showing gradual decrease of fibrosis volume with time, starting at 47cc at 3 months and ending with 18cc at 48 months. The data implies a consolidation of the fibrotic regions as post therapy time increases.

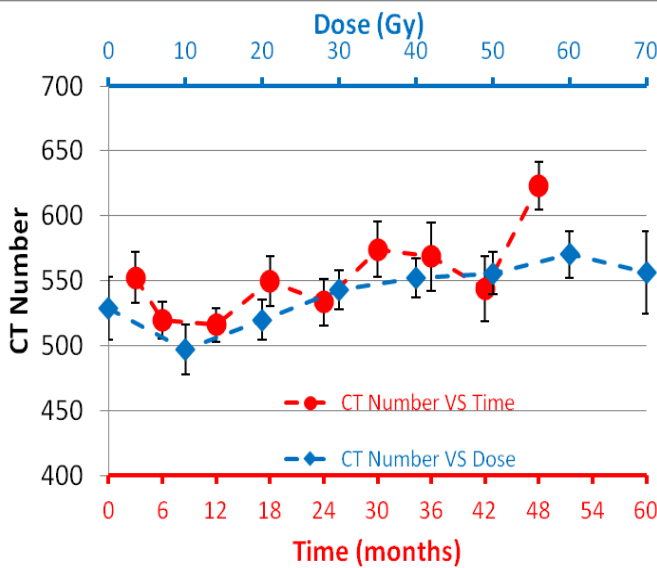


Figure 3: Scatter plot showing the average CT number of each dose and time bin. Consistent with previous data, there is an initial increase of CT number with dose, followed by a saturation effect. Unlike the results reported by Diot et al., and Palma et al., (Red Journal) our new analysis does not show decreasing CT number at higher doses; indicating that restricting the analysis to fibrotic regions may help mitigate some of the effects caused by averaging over non fibrotic lung tissue for SBRT. Our data also indicates a trend of increasing CT number with time post therapy.

Summary: The current study is unique in that it uses volumes restricted to visible fibrotic changes for dose-response analysis. Using the restricted volumes enabled us to perform a spatial analysis and address the issue of a skewed average caused by incorporating non-fibrotic high-dose tissue. The data show that the highest concentration of fibrotic tissue was located in the upper third of the lung. Future work will explore the relationship between fibrosis spatial location, fibrosis volume, and dose. Our results also show consolidation of the fibrotic volume and increase of CT number with time.