AbstractID: 7482 Title: Correlation Analysis between Internal and External Motion

Purpose: Respiratory-induced motion of thoracic tumors is a primary issue for patients receiving radiation therapy (RT). Image Guided Radiation Therapy (IGRT) increases the efficacy of RT, but the risk for radiation poisoning remains secondary to multiple sampling images. Thus, treatments utilizing external markers, which are radiation-free, have ensued. Determining the relationships between the internal and external motion data through the retrospective analysis of concurrently obtained data will lead to more effective treatment for patients.

Method and Materials: Twenty-eight patient files were evaluated. Data were normalized and segmented by piecewise linear representation based on an online finite state model. Each line segment represents a state of the breathing cycle—exhale (EX), end of exhale (EOE) and inhale (IN). Aggregate data analyses, including frequency, minimum, maximum, and mean, were calculated on the segmented results. Two relationships—the difference between starting times and positions of the internal and external coordinates—were represented graphically and analyzed. A starting time (or position) is the time instance (or position) of the beginning point of a line segment.

Results: More than one pattern was observed for both starting time and position difference. A predominant pattern of starting time difference observed in 64% of the data is $\delta t(EOE) < \delta t(EX) < 0 < \delta t(IN)$ where $.\delta t = t(external) - t(internal)$. The foremost pattern of starting position difference for 71% of the data is $\delta y\ (EOE) < 0 < \delta y\ (IN) < \delta y\ (EX)$. 54% of the data has the combination of these two patterns.

Conclusion: Predominant patterns are seen for both the starting time and position of the internal and external motion markers. Further work includes evaluating other relationships and predicting tumor positions based on external motion.

Conflict of Interest (only if applicable):