

AbstractID: 11394 Title: Characterization of liver motion based on implanted markers

Purpose: The purpose of this work is to evaluate the use of implanted markers to characterize motion and deformation of liver tumors and tissue.

Method and Materials: We retrospectively analyzed 4DCT data sets of liver cancer patients treated with stereotactic body radiation therapy at our center. All of these patients had either gold- or carbon-markers (Civco medical solutions, IA) implanted in the surrounding tissue of the lesion. Using a Varian RPM system, ten phase-CT-image sets were acquired for treatment planning and prior to every treatment.

Two reference points, one in bony anatomy and one external were used for analysis. The movements of markers with reference to each other and the reference-locations for each phase as well as the shift of the geometric center of the implanted markers were studied. The intra session and inter session motion range and geometric deformation was investigated.

Results: The average motion-range of the three markers for these patients differed in location, direction and magnitude for each day as well as from day to day. All motion vectors of these markers show a predominance in SI motion, but deviated for some degrees from each other. The spread of motion vectors additionally indicates a shift of the centroid of the virtual marker triangle for each phase, showing the deformation of tissue and the change in position in LR and AP direction. The greatest difference in motion-range between the treatment days for one marker was 10.4 mm for one marker, which was located centrally the liver.

Conclusion: Motion of liver and liver tumors can be visualized with implanted markers and is similar to previous publications, comparing organ outlines/edges for motion deduction. Markers additionally provide information on different rates of motion at point locations and deformation within the region of interest in the organ, helping deformation algorithm validation.