

AbstractID: 6512 Title: Tumor Motion and the Effect of Gated Set-up on the Treatment of Liver Tumors

Purpose: To determine if (1) respiratory-gated setup of liver patients based on megavoltage (MV) images of implanted fiducials is more accurate than conventional setup based on external skin marks, and (2) the intrafractional motion of implanted fiducials is consistent with that determined from 4D-CT images acquired for treatment planning.

Method and Materials: A 68 year-old woman with metastatic liver cancer was positioned prior to daily treatment based on conventional external skin marks. An orthogonal pair of respiratory-gated MV images of gold fiducials implanted in the vicinity of the lesion were acquired at end expiration and used to determine couch shifts by comparing the coordinates of the fiducials with those obtained from the 4D-CT images. The treatment itself was delivered without gating but MV cine images were acquired during treatment. The positions of the internal fiducials from the cine images were then compared to the average positions observed during 4D-CT simulation.

Results: The range of tumor motion was dominant in the superior-inferior (SI) direction. During simulation, the SI range of motion was 1.1 cm. Over the course of 26 fractions, for one typical field, the SI range of motion was 1.3 cm, ranging from 0.8 cm to 2.1 cm. The average position of the fiducials from the cine images throughout the entire treatment differed from the 4D-CT by 0.3 ± 0.2 cm in the SI direction. Had the patient not been shifted from external marks during each fraction, the average position of the fiducials would have differed by 1.5 ± 0.2 cm relative to the 4D-CT.

Conclusion: The range of tumor motion over the course of treatment may be greater than that at the time of simulation, and a simple ITV may not be adequate to account for respiratory motion. Moreover, the accuracy of patient set-up can be improved using implanted fiducials and respiratory gating.