AbstractID: 7268 Title: Extraction of Internal and External Marker 3D-Motion in Liver Patients with Compression Belt Using kV Cone-Beam Radiographic Projections.

Purpose: To study correlation of internal implanted vs. external skin markers for tracking respiratory motion in liver patients using radiographic projections from on-board kV cone-beam scans.

Material and Method: Cone-beam projections were analyzed to extract 3D-motion of internal and external markers for five liver patients receiving hypofractionated radiotherapy. Patients were immobilized in a stereotactic body frame and an abdominal compression belt was used to constrain respiratory motion. Marker motion was derived using a tracking algorithm and analysis of a sequence of 650 cone-beam projections acquired during a 1 minute scan. Corrections were made for imager rotation and sag.

Results: External and internal markers had the same frequency of respiratory motion, however, the amplitude of external marker motion is smaller. Internal and external marker motion was also out-of-phase in some patients. Internal marker motion is greater in the superior-inferior direction than in anterior-posterior and right-left directions, which is due to compression belt constraining of respiratory motion in these direction. Two patients showed small or no motion of the external marker, whereas, internal marker motion was as large as 1.0 cm, which may be due to the proximity of the external marker to the compression belt.

Conclusions: Although, the motions of internal and external markers are usually correlated and have similar motion frequency, the amplitude of marker motion may differ significantly and in some patients markers may move our-of-phase. The abdominal compression belt suppresses respiratory motion strongly normal to patient skin and may contribute to phase differences. The external markers motion for monitoring internal changes of respiration should be used with caution. Marker 3D-motion from cone-beam projections provides real time tumor trajectory that can be used to determine accuracy of PTV margins with no extra dose other than that used in CBCT imaging.

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