AbstractID: 11835 Title: Compare with phase correlated image registration to 4D CT for liver stereotactic radiosurgery with image guidance cone beam CT

**Purpose:** Stereotactic radiosurgery (SRS) is characterized by high doses delivered to small targets in a few fractions. Image guidance systems, cone beam computed tomography (CBCT), that yield volume imaging and sufficient soft-tissue contrast have permitted daily imaging of bony anatomy and target permitting online correction of tumor position prior to treatment delivery, but CBCT is not perfectly support in phase correlated image guidance for targeting. The main objective was to overcome breathing induced uncertainties in the process of image guided RT using phase correlated image registration both the planning CT scan and CBCT for verification imaging scan.

**Methods and materials:** For 20 patients with liver SRS, respiratory correlated 4D CT scan and CBCT for image guidance was acquired. Internal target volume (ITV) is determined utilizing 50% phase end exhalation reconstructed images by 4DCT, In order to check the accuracy of maximum intensity projection for various target motion, especially for target moving irregularly with three implanted gold seed. The data analyzed were respiratory-induced peak-to-trough distance, 3D motion from LR, AP and SI directions and motion nonlinearity and hysteresis. Motion hysteresis occurs when three seed follows different paths between inhale and exhale phases during a respiratory cycle.

**Results:** The overall mean respiratory-induced peak-to-trough distance is 0.48 cm, with individual treatment fraction means ranging from 0.02 to 1.44 cm. The overall mean respiratory period is 3.8 s, with individual treatment fraction means ranging from 2.2 to 6.4 s.

**Conclusions:** The motion nonlinearity and hysteresis are important characteristics of respiratory tumor motion. Seppenwoolde et al (2002) calculated the hysteresis as a phase difference between the fitted parameterized curves of the average breathing cycles of two directions. From 3D tumor trajectories, they showed that the hysteresis ranged from 0.1 to 0.6 cm for 20 tumors.