AbstractID: 4998 Title: Reduction of Respiratory Motion using Diaphragm Compression and Gating for Hypofractionated Radiotherapy of Lung and Liver Cancer

Purpose: Hypofractionated radiotherapy for lung and liver cancer has received great attention recently because of possible improved efficacy and convenient treatment length. Respiratory motion presents a special challenge, as hypofractionated radiotherapy requires a high level of confidence in image targeting and delivery. This study evaluates reduction of respiratory motion using combined diaphragm compression and gating.

Method and Materials: Patients received either 45 or 60 Gy in 3 fractions. Patients were immobilized with customized Alpha Cradles body cast and a vac bag on abdomen and pelvis. The vac bag served for diaphragm compression and position immobilization. Gated CT data were first acquired at the end-of-expiration and then at the end-of-inspiration 30 minutes later using a commercial gating system. These two CT data sets were registered and positional changes in target were evaluated to estimate residual target motion during gating using scaling factor derived from external marker motion track and gating amplitude. Portal images were acquired for each fraction using manual gating at the end-of-expiration with the guide of the gating system.

Results: In this ongoing study, we have treated 3 lung cancer and 2 liver cancer patients. The mean difference in CT lung volume between end-of-expiration and end-of-inspiration was 10.5% (range 7.7- 15.5%). The mean differences in position of GTV mass center was 1.5 (range 0.2-2.9 mm) in lateral, 3.3 (range 1.3-7.4 mm) in anterior-posterior, 3.5 (range 0.4-9.0 mm) in superior-inferior. The residual target motion during gating was 0.5 (range 0.1-1.0 mm) in lateral, 1.1 (range 0.4-2.4 mm) in anterior-posterior, 1.1 (range 0.2-3.0 mm) in superior-inferior. For tumors visualized in portal images, target-to-lung positions were reproducible in 2 mm.

Conclusion: Combined with diaphragm compression and gating and daily imaging, respiratory motion has been effectively reduced to a minimal residual motion during gating, suggesting that CTV-PTV margin reduction may be feasible.