AbstractID: 7480 Title: Comparison of Daily Setup Corrections using On-Board Cone-beam computed tomography, and Two Planar Kilovoltage Imaging systems

Purpose: The purpose of this study is to compare bony landmark-based setup corrections derived from a linac gantry-mounted kilovoltage (kV) imaging system that can either be used in orthogonal radiography (OBI) or kV circular orbit computed tomography (CBCT) imaging mode. A third commercial image-guided radiotherapy system, consisting of orthogonal room-mounted planar x-ray imaging system, Exac Trac (ET), was also tested. In addition to daily setup corrections, imaging doses were compared.

Methods and Materials: Both patient and phantom data were used to perform this study. Five patients were selected and couch shifts ware determined using both the OBI and ET systems. Using a pelvic phantom, intentionally introduced shifts of 0, 5, and 20 mm in the anterior/posterior (AP/PA), superior/inferior (S/I), and lateral directions, respectively, were applied. The estimated couch shifts were compared using all three Image Guided Radiotheraphy (IGRT) systems. Two cranial cases, one liver case, one lung case, and one prostate case were selected and the estimated couch shifts using the OBI and the ET systems were determined while the patient is in place. Couch shifts are not applied until all imaging modalities are performed.

Results: Comparison of simulated shifts using all three imaging modalities showed a standard deviation of setup uncertainties is within 1 mm in all directions. Patients' data showed that the biggest difference is in the order 4 mm in the superior/inferior direction for liver patient and 2 mm in the superior/inferior direction for cranial patient.

Conclusions: This study showed that while using 3D/3D image fusion is an excellent choice for online daily patient setup, it is possible to determine couch shift to high degree of accuracy using either 2D/2D or 2D/3D image fusion. For lung and liver patient, tracking of organ motion must be used to any imaging modality.