

AbstractID: 7042 Title: Use of daily kV cone-beam CT data to analyze the effectiveness of a weekly correction strategy for lung cancer radiotherapy

Purpose: A common practice in lung radiotherapy is the correction of setup errors based on the initial and weekly 2D portal images. We have evaluated the effectiveness of this correction strategy using data collected from daily kV cone-beam CT (CBCT) imaging.

Material and Method: Eighteen lung cancer patients immobilized with a wing board were treated on an Elekta Synergy LINAC using our daily on-line IGRT protocol. Daily CBCT imaging was performed and setup variations were corrected before treatment. A total of 282 CBCT images were collected and the daily setup errors along the anterior-posterior, superior-inferior and right-left axes were calculated using volumetric image registration. With this data we simulated the weekly correction strategy where patient setup error is adjusted once every five fractions based on weekly 2D portal imaging after the initial setup. 3D shift vectors for the whole treatment course were calculated. The frequencies with which the 3D shifts exceeded 5 mm, 10 mm, 15 mm and 20 mm were used to evaluate the effectiveness of this correction strategy.

Results: For these eighteen patients, the setup errors along right-left, superior-inferior and anterior-posterior axes range from -1.17 to 1.34 cm, -1.29 to 1.30 cm and -1.71 to 1.21 cm respectively. The maximum value of the 3D shift vectors was 1.78 cm. Out of a total of 282 treatments, the 3D shift vectors were within 5 mm for 144 fractions (51.1%), within 10 mm for 250 fractions (88.7%), and within 15 mm for 278 fractions (98.6%). Four fractions had errors greater than 15 mm.

Conclusion: Daily CBCT data can be used to evaluate different correction strategies. For the lung patients, the setup errors can be large along R-L, S-I and A-P directions. A large margin is warranted to ensure adequate tumor coverage if weekly correction scheme is used.