

AbstractID: 5128 Title: Effectiveness of 4D CT on stereotactic radiosurgery of lung cancer

Purpose: In order to spare the normal tissues as much as possible during stereotactic radiosurgery (SRS) of lung cancer by limiting the tumor motion within 5 mm, 4D CT was implemented and its usefulness was evaluated. By comparing CT during the simulation with CT during the treatment, the interfractional positioning errors were assessed and image guided radiotherapy was performed using the images from ExacTrac x-ray system (BrainLab, Germany) in the treatment room.

Method and Materials: For 11 lung cancer patients positioned in the SRS frame, 4D CT was acquired and treatment was planned based on 4D CT. For the patients whose tumor motion was larger, the motion was controlled to be less than 5 mm using the real-time positioning management (RPM, Varian, USA) system. To verify the interfractional patient positioning errors, CT was acquired twice during the course of treatment and ExacTrac x-ray system was used to reproduce the patients' setup.

Results: From the 4D CT, mean GTV and PTV were 15.9 ± 9.6 cc and 40.7 ± 16.6 cc, respectively. Tumor motions were 2.9 ± 1.4 mm, 3.4 ± 3.2 mm, and 12.1 ± 5.0 mm in lateral, vertical, and longitudinal direction, respectively, for the full respiratory phases, which were reduced to 3.7 ± 1.1 mm during 30 ~ 70 % phases selected for the gated radiotherapy. Discrepancy between planning CT and two CT during treatment was 1.2 ± 1.0 mm, 1.4 ± 1.2 mm, and 2.3 ± 1.5 mm, and setup errors from ExacTrac system were 1.0 ± 1.8 mm, -0.3 ± 2.2 mm, and -0.6 ± 3.2 mm in lateral, vertical, and longitudinal direction, respectively.

Conclusion: The use of 4D CT, the repeated CT scans during treatment, and image-guided technique using x-ray imaging system in treatment room for setup correction was effectively implemented for SRS of lung cancer, which assured the tumor motion and positioning errors within 5 mm during treatment.