AbstractID: 10884 Title: Dose painting by numbers using single photon emission computed tomography with intensity-modulated radiotherapy to reduce dose to highly functional lung region for lung cancer patients

Dose painting by numbers using single photon emission computed tomography with intensity-modulated radiotherapy to reduce doses to highly functional lung region for lung cancer patients

Purpose: To reduce doses to highly functional lung region for lung cancer patients by dose painting by numbers using single photon emission computed tomography with intensity-modulated radiotherapy.
Method and Materials: A non-small-cell lung cancer (NSCLC) patient treated in our institute was randomly selected for this study. Two cost functions (referred to Bio_function and nonBio_function) for IMRT optimization were built as research plug-ins by incorporating and not incorporating single photon emission computed tomography (SPECT) image data of the lung into the optimization algorithm in Pinnacle treatment planning system. Two strategies were evaluated: 1) the IMRT plan with Bio_function (SPECT_Plan); 2) the IMRT plan with nonBio_function (nonSPECT_Plan).
Results: The difference of prescription dose coverage of PTV between the two plans was within 1%. Compared to the nonSPECT_Plan, the SPECT_Plan had -0.6 Gy difference of maximum dose for the spinal cord, -1.2% of V55 for the esophagus, 1.0% of V50 for the heart, -2.8%, -3.5%, -3.4%, and -2.8% for V5, V10, V20, and V30 of the total lung, respectively. The mean doses to highly functional lung regions F50 and F90 (defined as the lung regions with perfusion levels above 50 and 90 percent of the maximum perfusion level in the lung, respectively) were reduced by 2.6 Gy and 3.1 Gy in the SPECT_Plan compared to those in the nonSPECT_Plan, respectively. V5, V10, V20, and V30 for F50 lung were reduced by 4.1%, 5.9%, 6.0%, and 5.4%, and by 5.4%, 9.3%, 5.7%, and 7.0% for F90 lung, respectively.
Conclusion: Dose painting by numbers using SPECT image with IMRT could reduce doses to highly functional lung region for lung cancer patients, thus may improve treatment outcome.