Purpose: The purpose of this work was to quantify the dose received by the normal/critical structures during lung stereotactic body radiation therapy (SBRT) when registered with respect to the tumor.
Methods: For this retrospective work, 16 lung SBRT patients were treated with total dose of 50 Gy in 4 fractions. Cone-beam CT was done for all fractions and registered with planning CT for target localization. Isocenter shifts were determined from the differences between the boney and tumor alignments. Once the isocenter shifts were determined for each fraction, doses were recalculated based on the new isocenter and summed over all four fractions to compare against the planned normal/critical tissue dose. The normal/critical structures evaluated were total and ipsilateral lung, spinal cord, and esophagus. Two data sets were collected from this work. The first data set was the collection of isocenter coordinate shifts in all three Cartesian coordinates. The second data set was the doses to the normal/critical structures from the planned and recalculated doses.
Results: The study showed that while the maximum isocenter coordinate shifts in any direction could be as much as 1.60 cm, the normal/critical structure dose variations between the original plans and the simulated plans showed almost no change. The average V20 difference for total lung, ipsilateral lung, and esophagus were 0.01%, -0.03%, and -0.35%, respectively. For spinal cord, the maximum and mean dose differences were -0.08 Gy and -0.02 Gy, respectively.
Conclusions: Target localization using daily CBCT with soft tissue registration was appropriate for minimizing the dose to the normal/critical structures without the need to re-plan due to the changes in the tumor position. For tumors located close to a critical structure, it is advised that a daily CBCT is used to determine appropriate isocenter shifts.