

AbstractID: 9293 Title: Dosimetric consequences of patient setup decisions in image-guided procedures based on soft-tissue fiducials for imaging

Purpose:

The purpose of this work is to demonstrate the dosimetric consequences of patient setup and tracking technique decisions for 4D adaptive SBRT treatments.

Method and Materials:

Clinical fiducial tracking scenarios of 450 SBRT cases, 120 of them treated with 4D adaptive SBRT, were analyzed and classified into different case scenarios. A flowchart was created to systematically display each clinical tracking scenario and the decision options. Based on the flowchart, scenarios which could cause a deviation from delivered dose to planned dose were identified. For these situations, each tracking decision was evaluated for dosimetric impact by simulating the situation in treatment planning software using a patient CT and an artificially created elliptical tumor.

Results:

Only two clinical scenarios were identified as having dosimetric consequences. One scenario contains tumors which rotate significantly (>5 degrees) during the respiratory cycles. For rotations smaller than 5 degrees we saw no differences in the DVH than non-rotating tumors. For tumors with rotation angles larger than 6 degrees, the DVH shows increasing, but still small, tumor underdose. The second scenario with potential dosimetry changes was a small rotational change (<5 degrees) of the tumor position relative to the global patient position. Our calculations show that changing the global patient position to move the tumor into the treatment field did change the DVH, because the SSD and obliquity of incoming beams changes. A third tracking scenario was identified in which a repeat simulation is necessary.

Conclusion:

Fiducial setup and rotational tumor tracking decisions for SBRT treatments were classified. Dosimetric impact was studied for the two relevant class decisions. A class of patients which needed re-CT was identified. Our flowchart and dosimetry studies will help in the future to systematically identify and address soft-tissue fiducial tracking scenarios and choice of tracking technique for SBRT.