AbstractID: 12614 Title: Non-coplanar helical tomotherapy for stereotactic body radiation therapy of lung cancer

Purposes: To study the potential dosimetric gains from non-coplanar helical tomotherapy (HT) in improving stereotactic body radiation therapy (SBRT) of lung cancer.
Methods and materials: Non-coplanar helical arcs were created by introducing a couch yaw in the CT image and contours. Treatment plans were subsequently generated on a patient with a total lung volume of 3722 cc. PTVs (43 cc) were placed at upper, middle and lower lobes of the right lung, and the upper and middle lobes of the left lung, respectively. 60 Gy was prescribed to the 95% of PTV. Seven non-coplanar arcs ranging from -30^{o} to 30^{o} were optimized at each location using HT software. Final plans were composites of these individual arcs. Conformality (*Rx*) and percentile volume of the lung receiving radiation dose of *x* Gy (*Vx*) and doses to heart and chest wall were evaluated.
Results: Non-coplanar arcs did not reduce R_{50} but significantly reduced R_{10} and R_{20} by 10-35% and 7-23%, depending on the number of noncoplanar arcs and location of the tumor. V_{20} of lung stays constant with the number of the non-coplanar arcs. V_{10} is reduced by 17-35% for tumors located on the left lung. V_5 is reduced for all tumor locations by 10-30%. Further optimization revealed that heart dose for the tumor located on the middle right lung can be reduced by 50-82% depending on the degree of couch yaw. The chest wall volume receiving 30Gy or higher is reduced for all tumor locations, most significantly for tumors on the left lung with a highest reduction of 77% comparing with coplanar plan.
Conclusions: Non-coplanar HT arcs reduce the volume of lung receiving low dose in a SBRT treatment without compromising other dosimetric metrics. They also reduce doses to the heart and chest wall when tumor is in the proximity.