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# Dosimetric Comparison of Arms Up versus Arms Down Positions for Lung SBRT

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**Abstract**
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## Abstract

Objective: Reproducible patient positioning is integral to the safe and accurate delivery of radiation therapy. Commonly, lung patients are simulated with their arms up (AU) to improve dose conformality by utilizing lateral gantry angles. However, the AU position can be uncomfortable and difficult to maintain, especially in the early stage lung SBRT patient cohort, who tend to be older and less physically fit. For these patients, the physical discomfort from the AU position can lead to decreased accuracy in patient positioning and possibly treatment delivery. We sought to evaluate any potential dosimetric differences between simulating and treating SBRT lung patients in the standard AU position versus a more comfortable arms down (AD) position.

Methods: A random sample of 15 patients undergoing lung SBRT on a noncoplanar robotic radiosurgery platform were selected. Patients were originally simulated, planned, and treated in the AD position. For ease of comparison, all treatments were replanned to 50 Gy (10 Gy x 5 fractions) regardless of tumor location. For each patient, a new plan was then generated subtracting out the arms to reproduce the commonly used AU simulation position. Dosimetric quantities such as PTV/CTV coverage, PTV conformality index (CI), organ at risk (OAR) maximum doses, and other commonly accepted OAR dose/volume constraints were compared. Paired t-tests of various plan metrics were calculated and select outcomes are summarized in the accompanying table, with a <0.05 threshold of significance.

Results: All plans were able to achieve adequate target coverage without violating any standard OAR constraints. There was no statistically significant differences observed for plans calculated in the AD versus AU positions for PTV V50Gy, CI, lung V20Gy, esophagus D0.03cc, chest wall V30Gy, proximal bronchus D0.03cc, and distal bronchus D0.03cc. There was a statistically significant difference observed for the cord 0.03cc and cord 0.35cc doses in favor of the AD position, though in all cases the cord constraints were met. The median cord D0.35cc was 481cGy for AU verses 243cGy for AD. The median cord D0.03cc was 535cGy for AU verses 268cGy for AD.

Conclusion: There is no major dosimetric difference between treatment plans generated in the AU and AD positions. The exception was cord dose metrics, which showed a favorable decrease in median D0.03cc and D0.35cc in the AD position. Given the increased ease of positioning, which we believe leads to improved reproducibility and ultimately accuracy of treatment, we believe that simulating and treating patients in the AD position can be advantageous for lung SBRT treatments.