AbstractID: 9227 Title: 4D-CT What Is It Good For?

<u>Purpose:</u> Retrospectively analyze a cohort of lung cancer patient's 4D simulation data and calculate the dosimetric impact of using a single respiratory phase CT image to design treatment fields. These fields are then mapped onto the extreme opposite respiratory phase to determine the change in <u>volume</u> (target, normal lung, etc.) and <u>dose</u> to the areas of treatment.

<u>Method and Materials</u>: A 40-slice Siemens SOMATOM® Sensation Open CT unit was utilized for the 4D acquisition of simulation data. The data was separated into ten (20%-100%-IN, and 0-80%-EX) respiratory phase bins for visualization of target motion. The 0% IN (inhalation) and 100% EX phases were contoured independently. The treatment fields were optimized on the 0% IN dataset to deliver 66 Gy, and minimized the surrounding critical organs. These fields were then mapped onto the 100%-EX (exhalation) bin, representing the opposite respiratory extreme, and subsequently re-calculated for the same volumes of interest. The dose volume histograms were exported into Excel for comparison of these two datasets.

<u>Results</u>: Most of the data showed a target dose reduction. Changes in the target volume (size), maximum and mean target doses, as well as the ratio of minimum target dose to prescribed dose were seen. The change in target volume on the two image datasets ranged from +3.6% to –24.6%, with a negative value being a decrease in contoured volume. The change in mean target dose ranged from –0.1% to –15.9%, with a negative value being a decrease in mean dose coverage. Similarly, the ratio of minimum dose to prescribed dose coverage ranged from –3.4% to –21.4%.

<u>Conclusion</u>: The results show the importance of using 4D image data to design treatment fields for lung cancer patients. Our knowledge of the target and normal anatomy motion continue to be paramount in designing treatment paradigms in the future.