AbstractID: 8870 Title: The Effect of 4DCT and 3DCT image data set on dose calculation and optimization: preliminary results

The Effect of 4DCT and 3DCT image data set on dose calculation and optimization: preliminary results

Purpose: To investigate the effect of 4D CT image reconstruction and static helical CT data set (static) on dose calculation and optimization.

Methods: A typical breathing cycle was programmed into the CIRS moving tissue equivalent lung phantom which contained a 2 cm diameter target. 4D CT data scans were acquired on the LightSpeed 4-slice CT (General Electric, WI). The Maximum intensity projection (MIP), average intensity projection (AIP), minimum intensity projection (MinIP) was reconstructed. Two 3D helical scans were also acquired (1) with the phantom moving and (2) with phantom static. Treatment plans were generated on Pinnacle 7.6 to study the effect of different electron densities (pixel value) at the tumor edge predicted by the 5 image sets. The same dose constraints and gantry angles were used to generate plans. The fluence maps for each gantry angle were compared.

Results: Both the MIP and the 3D static target produced similar relative intensity maps, where a more homogeneous fluence distribution was observed. The fluence ratio for the center of the target to the edge of the target is greater for the AIP. i.e greater fluence gradient.

Conclusion: Planning using MIP or AIP of a 4DCT plays a role in the final dose distribution delivered to the patient. Planning using the MIP will produce a more homogenous delivered dose to the lesion regardless of tumor location, whereas the AI will deliver a higher dose to the lesion at the end of the tumor trajectory. Further investigation is needed to study the impact of the distance of target movement on the final dose distribution obtained via 4D CT.