AbstractID: 5623 Title: Proton lung Sterotactic body radiotherapy treatment method

Purpose: Photon Sterotactic body radiotherapy has shown a great advantage over conventional treatment for stage I NSCC. Lung SRT has been limited by targets proximally to critical structures. Proton beam therapy can reduce the dose to the healthy tissue. Use of 4DCT introduces a great advantage in delineating the moving target and account for tissue motion in proton beam path. However, design of compensator is a critical factor for dose coverage in 4DCT.

Method: We investigated the use of Free Breathing (FB), Maximum Intensity Projection (MIP) and Average CT (ACT) image data sets to obtain the best technique for proton beam treatment delivery.
The target volume was the union of GTV on all phases contoured on MIP data set. Then MIP-GTV volume density was set to the average HU of the tumor to account for density variation due to motion on all data sets. The ITV was drawn by expanding 8 mm around the MIP-GTV. Apertures were designed by considering only beam penumbra and setup uncertainty. Distal and proximal distances and smearing were added to compensator design as described in reference (1). Compensators were designed on all three data using density corrected MIP-GTV.

Results: The plans were calculated on all data sets. We evaluated compensators that were designed in FB, MIP, and ACT. Dose comparison was done based on the ITV dose coverage. Plans with compensator designed in MIP or ACT produce insufficient dose coverage when calculated in FB.

Conclusion: The best coverage is obtained when compensator is designed in the MIP data set and plan is evaluated on ACT data set. The dose coverage was also verified on the inspiration and expiration phases of 4D data set using MIP compensator.

Reference:

1) M. Moyers, et.al. Int. J. Radiation Oncology Biol. Phys., Vol. 49, No. 5, pp. 1429-1438, 2001.