

## AbstractID: 10151 Title: When do we need to consider motion management during treatment of mobile lesions?

**Purpose:** To evaluate the range of motion threshold, and its relation to the lesion size, requiring motion-managed treatment delivery for lung tumors.

**Method and Materials:** A lung patient CT scan with volume of both lungs  $\sim 5000 \text{ cm}^3$  was considered. Spheres with pre-specified radii were auto-contoured in one of the lungs as static PTVs (sPTV). Imposing motion on a spherical sPTV in the superior-inferior direction generated a cigar-shaped, motion-inclusive, PTV (miPTV). A single dynamic arc of  $230^\circ$ , 6 MV photons, was used for IMRT optimization. Three different prescription levels were considered – 60 Gy, 70 Gy, and 80 Gy. Each prescription required that 95% of the PTV (sPTV or miPTV) receives the prescription dose with standard deviation of the dose below 3%. For a given sPTV radius the range of motion was increased until OAR DVH constraints were violated. The OAR constraints were: dose to 1% of the cord less than 45 Gy, dose to 33% of the heart less than 45 Gy, and dose to 20% and 30% of the lungs less than 30 Gy and 20 Gy, respectively. Treatment plans for 8 different sPTV radii were generated for each prescription level. The ranges of tumor motion ranged from 0 to over 3 cm.

**Results:** Three look-up curves, outlining the sPTVs sphere sizes as a function of the range of motion, were generated. In addition, analytic fits to those curves were computed. The correlation coefficients for the fits were greater than 0.99 for all three curves. Similar data relating the absolute lesion volume as a function of the range of motion were also generated.

**Conclusions:** The motion management threshold of 0.5 cm found in the literature is reasonable, although in some cases, depending on the original static sPTV size, it might be too restrictive.