

AbstractID: 10613 Title: Effects of Lung Tumor Motion on Rapid Arc Treatment Technique

**Purpose/Objective:** To determine the error due to lung tumor motion on dose distribution delivered by Rapid Arc (RA) treatment technique, a procedure also known as volumetric modulated arc therapy.

**Materials/Methods:** An indigenously developed dynamic phantom was set in linear sinusoidal motion in cranio-caudal direction with amplitude of 2cm and at a frequency of 15 cycles/minute. A RA treatment plan was optimized for and delivered to the phantom containing a simulated target and critical organs. The treatment plan was executed for 30 fractions to the dynamic phantom, started at random initial breathing phases. GAF-Chromic films embedded in the moving phantom in the coronal plane at the isocenter level were used to capture the dose distribution.

**Results:** (i) ROI as PTV: When the daily dose distributions were compared against the static distribution, dose variation of 10% to 20% was observed near the field edges and 5% to 10% dose difference was observed elsewhere. Similar results were observed when comparing the dose distribution averaged for 30 fractions against the static distribution. (ii) ROI as CTV (simulated target): It is observed that on a day-to-day basis the standard deviation of the dose to a given pixel could be as high as 4.5% to 6.5%. Also, the mean, median, and modal dose varies inter-fractionally with a standard deviation of 5.62%, 5.61%, and 5.73% respectively. When comparing the averaged dose distribution with the static distribution, dose variation ranging from 5% to 10% was observed. Also, the mean, median and modal doses were reduced by 6.35%, 6.45% and 6.87% respectively, compared with static distribution.

**Conclusion:** Our study indicates that, if respiratory management techniques were not implemented, RA procedures for lung cancer treatment can result in underdosage, so this error should be measured and accounted for as part of the patient specific quality assurance.