AbstractID: 3114 Title: Dosimetric Properties of Respiratory-Gated Intensity Modulated Arc Treatments

Purpose: We investigated the dosimetric effects of gating on Intensity Modulated Arc Treatments.

Method and Materials: One method to address respiratory motion during radiotherapy is 4DCT in conjunction with gated treatment. In the treatment of a solitary lung nodule or liver metastasis, intensity modulated arc therapy (IMAT) provides desired dose distributions. Here, we determined the dosimetric errors from delivering gated IMAT under a variety of conditions, including monitor units (MU), dose rate (MU/min), and direction of gantry rotation. We employed Varian Real Time Monitoring system for the gated delivery on a 2100C/D accelerator. To test the accuracy of the radiation delivery system, we used a static solid water phantom (IMRT phantom, MedTec). We chose a lateral 90° arc to stress test the gantry rotation delivery against gravity. Film dosimetry and point dose were performed. We delivered 30MU and 270MU treatments and used Kodak XV and EDR2 films respectively. RIT software was used to perform film dosimetry and analyses. Point doses at the isocentre were measured using a Scanditronix RK ion chamber (0.12cc). Dose distributions from gated deliveries are compared to non-gated deliveries, normalized by the dose at isocenter. Amplitude gating was used with a 25% duty cycle.

Results: With gating, we measured ≤1.5% change in dose at the isocentre. From film dosimetry, we observed beam transverse asymmetry in the gated delivery. Dose error > 3% was measured away from the isocentre using gated IMAT when the gantry is rotating at its maximum speed (295°/min). Errors less than 3% were measured when gantry rotates at or slower than 200°/min under clinical conditions.

Conclusion: Gate IMAT treatments yield consistent output at the isocentre but accumulate beam symmetry errors. These errors are proportional to the gantry rotational speed which can be reduced to below 3% by lowering the delivery dose rate.