

## AbstractID: 5336 Title: Comparative in vitro study of cell survival following IMRT and acute dose delivery

**Purpose:** To investigate cell kill from IMRT fields compared to acute dose delivery.

**Method and Materials:** Survival was assayed in vitro for three cell lines: Chinese hamster V79 fibroblasts, human cervical carcinoma SiHa and colon adenocarcinoma WiDr. An actual head and neck seven field dynamic IMRT plan produced for Varian iX, 120 Millennium MLC linear accelerator was used. The calculated IMRT dose (Cadplan, Palo Alto) to the point of irradiation in the acrylic phantom was 2.1Gy. This was verified by measurements with an IC10 ionization chamber. Two IMRT dose delivery scenarios were explored: 1. normal delivery, irradiation time of 5min 10s, and 2. IMRT delivery with a 5min break for MLC re-initialization after three fields were delivered, irradiation time of 10min. For comparison the same dose of 2.1Gy was delivered by parallel-opposed pair (POP) in 75s, 20s beam-on time per beam. Survival data were obtained in the dose range up to 10.5Gy to establish the linear-quadratic survival curves.

**Results:** An increased cell survival following irradiation with IMRT fields was observed for all cell lines. V79 cells showed the smallest increase:  $0.833 \pm 0.018$  (95% confidence limits) from POP compared to  $0.860 \pm 0.040$  for IMRT with MLC re-initialization. This increase was very pronounced for the radiosensitive SiHa cell line:  $0.390 \pm 0.046$  for POP irradiation compared to  $0.591 \pm 0.080$  from IMRT requiring MLC re-initialization. Although variable between cell lines, projections made for a 30 fraction treatment showed substantial reduction in cell kill.

**Conclusions:** We observed an increase in cell survival from IMRT fields compared to acutely delivered dose. This increase was persistent, but not always statistically significant. Projections for a fractionated treatment showed that consequences of this increased cell survival are substantial with a very large variation between cell lines. This projection, however, does not account for features present in vivo, for example reoxygenation and reassortment.