

AbstractID: 10361 Title: Spatially Fractionated Radiation Therapy (GRID) on Implanted Tumors Using a Small Animal Conformal Radiation Therapy System

**Purpose:** To deliver spatially fractionated (GRID) radiation fields to murine tumors using a high precision small animal conformal radiation therapy device (SACRTD).

**Method and Materials:** The SACRTD is a “gantry” based image-guide system with a special collimating assembly that allows field sizes down to 0.5 mm in diameter at isocenter. The precise positioning of the target/beam is achieved by a six-degree of freedom robotic system (Adept Technology, Pleasanton, CA) which has positional repeatability of  $\pm 0.020$ mm in XYZ directions. The system can be used to deliver small GRID fields with varying open-to-close area ratios. Immunohistochemistry for DNA damage after 10 Gy to a 1cm depth GRID therapy was performed in B16 murine melanoma tumors. The GRID pattern consisted of an array of 7 beams of 1 mm in diameter at isocenter with center-to-center separation of 2 mm. Tumor growth rates and cell survival were assessed.

**Results:** The exit dose recorded by Gafchromic film confirmed that the GRID radiation pattern was delivered with high precision. Histology showed the radiation induced DNA strand breaks in the open regions of the GRID field. Approximately 55% of clonogenic cells in the B16 tumors were killed by the single GRID dose. Interestingly, mice receiving GRID alone did not have significant tumor growth delay compared to untreated tumors. However, in the group that received GRID therapy followed by Anginex anti-angiogenic peptide for 5 days there was a noticeable delay in tumor growth compared to tumors receiving 10 Gy GRID alone.

**Conclusion:** This preliminary biological study shows the usefulness and flexibility of the SACRTD to deliver precise radiation patterns to implanted tumors in small animals. The system facilitates *in vivo* radiobiological studies and promotes translational research in radiation oncology.

**Conflict of Interest (only if applicable):** None.