

## AbstractID: 8453 Title: Bioanatomic MR Imaging for Characterization of Brain Tumor and Radiation Response in the Rat Brain

**Purpose:** To examine the efficacy of bioanatomic magnetic resonance imaging (MRI) in brain tumor characterization, and the implications for radiation therapy (RT) treatment planning and assessment of treatment response. **Method and Materials:** Brain tumor models were created by implanting human high-grade glioma cells into immunodeficient rats. Once the tumors reached a specified target size, animals underwent Gamma Knife™ Stereotactic Radiosurgery (GK SRS, 15-18 Gy to the 50 % isodose line). During tumor growth and after irradiation, animals underwent serial MR evaluation (dynamic susceptibility contrast, DSC-MRI) to quantify changes in cerebral blood volume (CBV) throughout the brain regions containing the tumor. Upon completion of the experiment, CBV data were compared with conventional MR imaging data and histology to evaluate the usefulness of the additional biological information with respect to target volume delineation and response to irradiation. **Results:** A DSC-MRI perfusion protocol was successfully developed to accurately quantify blood volume changes within the brain. During tumor progression, active areas of tumor growth showed increased CBV, while areas of developing necrosis demonstrated decreased CBV. Large intra-tumor CBV heterogeneities were visible in the late stages of unirradiated tumors and within a week of those irradiated with GK SRS. In both cases CBV data provided biological information regarding tumor behavior, which was not elucidated by the corresponding anatomical images. **Conclusion:** This work illustrates the potential of bioanatomic MRI for improving brain tumor radiation therapy. Most current high-grade glioma RT techniques focus solely on anatomical images, which often neglect biological information when determining target volumes. By incorporating DSC-MRI into the therapy planning and response assessment procedures, changes in CBV could be used to better understand tumor behavior. This could eventually lead to a more accurate way to determine conformal target volumes, and a more sensitive method for monitoring the therapeutic response.