AbstractID: 13225 Title: The Effects of Neurosurgical Titanium Mesh on Radiation Dose in the Gamma Knife

Purpose: To investigate the impact of titanium neurosurgical mesh and bone cement on Gamma Knife dose distributions. **Methods and Materials:** Radiation properties of several meshes and bone cement were evaluated using a Theratron Co-60 teletherapy unit. The mesh that caused the largest perturbation of the beam was then studied in the Leksell Gamma Knife. A head phantom was constructed using a plaster skull and ballistics gel. A section of the skull was removed and replaced with mesh. Two plans were created in the Leksell GammaPlan treatment planning software, one comprising a single 18 mm diameter shot centered at 2 cm below the surface of the phantom, and one 5cm below the surface. The plans were delivered to the phantom with bone and with mesh for a total of four deliveries. Dose profiles were measured in the coronal plane along with surface dose using GafChromic film, analyzed using RIT and ImageJ. **Results:** For the shallow lesion at 2cm depth, the measured maximum dose with the mesh was 5% less than the measured dose with the intact skull. For the lesion at 5 cm depth, the measured maximum dose with the mesh was 2% less than the measured dose with bone. At the surface immediately above the mesh, there was a 70% increase in dose. **Conclusion:** This work is significant in evaluating the need to modify a Gamma Knife SRS treatment plan when titanium mesh is present. For shallow lesions near the mesh, there is an associated a 5% reduction in maximum dose, and a 1 mm reduction in the 50% isodose diameter. These values decreased to 2% and 0 mm at 5 cm depth. However, for either depth, the dose at the mesh surface was increased by 68%, due to backscatter from the mesh.

Conflict of Interest (only if applicable):