

AbstractID: 11828 Title: The Effect of Embolization Glue on Gamma Knife Radiosurgery of Arterio-Venous Malformations

Purpose: Gamma Knife stereotactic radiosurgery in combination with embolization or alone is a widely recommended treatment option for patients with arterio-venous malformations (AVM) with estimated near 90% cure rate. A recently published report suggested that the failures to obliterate the AVM nidus were caused by up to 15% dose reduction in the target volume due to the effect of the embolization materials used prior to the Gamma Knife radiosurgery. This work aimed to resolve the issue. **Method and Materials:** 1) The apparent linear attenuation coefficients for 120keV to 140keV x-rays in the embolized regions were retrieved from CT scans for several patients with AVM malformations. Based on these coefficients and our virtual model of Gamma Knife with basic ray tracing, we obtained the pathlengths and densities for the embolized regions. The attenuation of Co-60 beams was then calculated for various sizes and positions of AVM embolized regions and the number of beams used for treatment. 2) Published experiments for several high atomic number materials were used to estimate the effective Co-60 beam attenuation coefficients for N-butylcyanoacrylate (doped with high Z) and Onyx (ethylene-vinyl alcohol copolymer doped with tantalum) used in the AVM embolizations. The dose reduction during Gamma Knife radiosurgery was calculated based on the Co-60 energy attenuation coefficient. **Results:** Based on apparent CT (keV) attenuation coefficients, one may conclude that the cumulative effect of the glue would decrease the dose delivered in Gamma Knife radiosurgery from -8 to -15 %. However, using the true attenuation coefficient for Co-60 energies in the dose calculation leads one to conclude that there is 0.2% dose reduction per beam and less than 0.01-0.2% dose reduction in total. **Conclusion:** Dose reduction due to attenuation of the Co-60 beam by the AVM embolization glue material is negligible.

Conflict of Interest (only if applicable): none.