

Endovascular delivery of Guglielmi platinum detachable coils is used routinely as an adjunct therapy for embolization of intracranial aneurysm, but is often followed by recanalization and recurrence. In situ low-dose beta radiation has been shown to help in reducing recanalization after coil embolization and may improve long-term results of this treatment. Ion implantation is a coating process which results in minimal leaching. The calculation tool was adapted from VMDOSE, a multi-purpose dose calculation software based on the MIRD formalism with S values evaluated at the voxel level. To account for the attenuation of the β radiation by the high Z platinum material, a modified dose-point-kernel for P-32 was used based on EGSnrc Monte Carlo simulations around small spheres with diameters comparable to that of the wire struts (150-300 μm). An attenuation factor between 20-40% was determined for distances between 0-3 mm from the platinum wire and was incorporated in our model. Aneurysms are modeled as spheroids with minor axis a and major axis b determined experimentally from 2-D X-ray angiography images. Using these measurements, dose to aneurysm and to critical structures (e.g. chiasma, optical nerve) can be estimated as the coils are individually inserted, which allows corrective measure to be taken during the procedure (i.e. switch to non-radioactive coils) if necessary. Dose results for patients indicate that the therapeutic activity level of $18 \mu\text{Ci}/\text{cm}^3$ determined from previous studies can be reached safely without exceeding the maximum safety level of 200 Gy at the wall of the aneurysm.