AbstractID: 9427 Title: NURBS-Based Head and Eye Dosimetry Models for Ocular Radiosurgery

Purpose: Age-related macular degeneration (AMD) is a leading cause for vision loss for people over the age of 65 in the United States. There are a number of treatments used to help slow and in some cases stabilize the process of AMD, but these require frequent invasive injections into the eye. This paper presents a potential radiotherapy treatment used to destroy the leaky vasculature while minimizing dose to surrounding tissues, allowing for combination therapy to treat AMD.
Method and Materials: An adult male head phantom was modeled with Rhinoceros 4.0 using ICRP Publication 89 reference values. The head phantom was voxelized and modeled using the MCNPX radiation transport code with a photon beam treatment operated at 100 kVp. Doses to the macula target, lens, optic nerve, brain, thyroid, and salivary glands were tabulated using MCNPX at 8 beam angles. These angles can be characterized using a spherical 3D polar coordinate system with the macula at the origin, the z-axis as the axis of vision, a radius of 13 cm, a polar angle of 30 degrees, and azimuth angles in 8 increments of 45 degrees.
Results: For each beam angle, the doses to the organs of interest were several orders of magnitude less than the 8 Gy dose to the macula target and significantly lower than the thresholds for serious implications.
Conclusion: The preliminary results bode well for the proposed radiotherapy treatment. Dose Volume Histograms (DVH) will be tabulated using MCNPX so that the maximum dose to localized portions of each organ of interest can be determined. The safest beam angle for treatment will be determined from the results of this study.