AbstractID: 13999 Title: Investigation of critical ocular structure doses using a 3D plaque simulator model

Purpose: Ophthalmic plaque brachytherapy is a widely used treatment for ocular melanoma with the goal of eradicating the tumor while retaining as much useful vision as possible. However, treatment complications following RT can occur. Increasing the precision of dosimetry could reduce the likelihood of radiation complications for sensitive ocular structures, such as the fovea centralis, optic nerve and lens. The purpose of this study is to investigate the accuracy of the 3D plaque simulator software (Astrahan et al, IJROBP, **61**:1227-42, 2005) using dose distribution measured in pigs that were implanted with eye plaques to study and evaluate radiation-induced complications in sensitive ocular structures.

Method and Material: High sensitivity Harshaw TLD-100H (1/8" x 1/8" x 0.035 cm) measurements were performed for the left-eye of six pigs implanted with 14 mm gold-backed plaques with I^{125} seeds. A strip containing five sets of paired TLDs was prepared and approximately placed at similar anatomical locations for each eye. Point A was placed nearest to the eye plaque, Point E the furthest, with the strip running along the equator of the eye. The TLD sets in each strip were placed approximately 10 mm apart. The Plaque Simulator software was configured to calculate the dose around the eye for the same points.

Results: For the points in low dose gradients (E, D and C), the agreement between TLD and calculated dose are generally within 10% given a 2 mm uncertainty of the TLD placement. However, for the points that are close to the plaque (A and B), large discrepancies were observed due to the rapid dose falloff and the uncertainty of TLD placement.

Conclusion: The 3D eye plaque simulator software is a useful tool to monitor and predict doses for critical ocular structures in eye plaque treatments.