

AbstractID: 8897 Title: Accurate Dosimetric Characterization of a Novel
¹²⁵I Eye Plaque Design

Purpose: Eye plaques provide a good alternative to enucleation for ophthalmic tumors. The majority of eye plaques in the U.S. use ¹²⁵I brachytherapy seeds in a Collaborative Ocular Melanoma Study (COMS) standardized design. The plaques are 3 mm thick and uncomfortable to the patients, dosimetrically having localized hot spots. Implant Sciences developed 1 mm thick ¹²⁵I eye plaques using ion-implantation techniques. Dosimetric characterization of prototype plaques using radiochromic film and a silicon diode is reported.

Method and Materials: Prototype 16 mm ¹²⁵I eye plaques consisted of titanium-encapsulated hemispheric quartz substrates with an ¹²⁵I layer at the inner surface, and a gold backing. Dosimetry was performed using GAFCHROMIC XR-T and EBT film in a specially designed Solid Water “eye” phantom inserted into a 30 cm x 30 cm x 23 cm full scatter Solid Water phantom, as well as using a Scanditronix stereotactic diode in a water tank. Films were sandwiched between 1 mm thick phantom inserts perpendicular to the plaque’s central axis. The diode was used for point measurements along the central axis and scans across the plaques. The films and diode were calibrated using a calibrated I-Plant 3500 ¹²⁵I seed in Solid Water and water respectively, applying the TG-43 formalism.

Results: Dose distributions in planes perpendicular to the central axis of the plaques were radially isotropic and uniform. Film results, reproducible within 4%, agree well with silicon-diode measurements. At 5 mm depth, measured dose rates are between 50 and 200 cGy/hour.

Conclusion: Implant Sciences’ ion-implantation technique enables manufacturing of thin ¹²⁵I eye plaques with optimal dose distributions and clinically-useful dose rates. GAFCHROMIC film in a Solid Water phantom and the stereotactic diode in water are convenient and reproducible dosimeters for ¹²⁵I eye plaque dosimetry.

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