AbstractID: 11094 Title: Dynamic Anthropomorphic Eye Phantoms for Targeting and Dose Verification of a Novel Ophthalmic Radiosurgical Device

Purpose:
Age-related Macular Degeneration (AMD) is the leading cause of blindness in people over 65 in the U.S. It is a neovascular disease that can result in profound and rapid loss of central vision and has been shown to be susceptible to radiotherapy. A 100kVp tabletop stereotactic radiosurgical (SRS) device has recently been developed to treat AMD. Here we evaluate a new set of anthropomorphic eye phantoms for verifying the targeting and dosimetric accuracy of the device.

Method and Materials:
A series of eye phantoms were developed to match human eyes in size and shape. The phantoms are made of Solid Water, have a post at the cornea to attach to the clinical fixation assembly, and at the retina have a cutout with fiducial posts that support the precise mounting of laser-cut pieces of radiochromic film. After irradiation of the phantom, a flatbed scanner and image analysis software are used to assess the accuracy of beam targeting using the fiducial holes in the film. Multiple "treatments" were repeated on stationary phantoms to assess system precision and accuracy. A dynamic eye was also created by attaching set of stepper motors to a phantom. While irradiating the phantom, the motors were driven with clinically-measured human eye motions to simulate actual treatment and test the automatic beam shut-off of the system when motion exceeded an established threshold.

Results:
Phantom measurement precision of 0.1mm was achieved. Static repeated delivery of the therapy showed a system precision of 0.2mm and an accuracy of 0.4mm. Analysis of films irradiated while the eye phantom was being driven with clinically-measured human motion verified the gating algorithm was capable of protecting radiosensitive structures.

Conclusion:
The eye phantoms demonstrate that a specialized ophthalmic SRS device can accurately target the back of the eye.

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