AbstractID: 14119 Title: Automated Self-Test provides routine QA for a narrow-field, low-energy X-ray, ophthalmic SRS system

Purpose:
A narrow-field, low energy, stereotactic radiosurgery (SRS) device (the "IRay") designed specifically for the treatment of wet age-related macular degeneration is being evaluated in a European clinical trial. Because of precise targeting requirements for ophthalmological SRS, a new QA method has been designed to automate the evaluation of system alignment, targeting, and kerma consistency. This poster describes that method.

Method and Materials:
The IRay delivers up to 24 Gy in three 100kVp, 4mm-diameter beams that converge on the retina with a source-axis distance of 150mm. The beams are delivered inferiorly in a fashion that avoids the patients lens and optic nerve, requiring submillimeter targeting precision. The eye is stabilized with a suction-enabled lens assembly (the "I-Guide") that has retroreflective fiducials used by the imaging system for targeting and eye motion assessment. A self-test fixture has been designed that incorporates similar fiducials for automatic alignment, a scintillant strip for direct imaging of the X-ray beam, and an ion chamber for kerma measurements.

Results and Discussion
Using the retroreflective fiducials, the IRay is able to repeatably and accurately target the fixture. This is critical not only for targeting assessment, but also for accurate kerma measurements which are difficult in a narrow field with a finite-sized detector. Once targeted, software automatically evaluates and enforces several critical parameters including X-ray to targeting laser coaxiality (< 100 microns), robotic motion, imaging system alignment (better than 100 microns), X-ray targeting (within 300 microns), and air kerma consistency (within 3%). Other system tests are performed, including lighting, communication, and dose-timer checks.

Conclusion:
Performing comprehensive QA on a narrow-field, low-energy SRS unit requiring submillimeter precision is non-trivial. An automated method of evaluating alignment, targeting, and kerma consistency allows regular (even daily) assessment to provide confidence that all systems are performing within specification.

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