AbstractID: 5153 Title: A QA device to perform end-to-end spatial accuracy tests of target irradiation in stereotactic radiosurgery.

Purpose:

To ensure the sub-millimeter accuracy of Radiosurgery treatments, it is imperative to evaluate and monitor the errors associated with the whole treatment process. We have designed a QA Phantom that makes it possible to perform such accuracy testing.

Method and Materials:

Our plastic phantom was designed such that it can be mounted in the same stereotactic frame which is fixed on the patient during imaging and irradiation. Small targets at several locations in the phantom can be interchanged depending on the imaging modality used for imaging. Targets made out of Cu are used for CT imaging, or a drop of dilute copper sulfate in a small absorbent medium for MRI.

The phantom in the frame and the localization box with the fidutial system is imaged simulating a patient. The images are reconstructed in the treatment planning system and the irradiation set up data for the targets are used for positioning the phantom in the radiation unit. During the irradiation the target is replaced by Gafchromic film, the exact location of the target is marked on the film with a pinhole that was designed to mark the film at the same location as the imaged target. By irradiating the phantom with small cross section beams focused at the target a spot is created on the film. The accuracy of the irradiation given at the target location is evaluated by the deviation of center of the spot on the film from the pinhole.

Results & Conclusions:

Several end-to-end tests were performed for our Gamma Knife unit to demonstrate overall accuracy of the process. Our phantom provides a direct test of the variation in the target irradiation as resulted by possible variations introduced in all the stages of the process of the stereotactic treatment such as imaging, treatment planning, and radiation delivery.