

AbstractID: 4847 Title: Accuracy Assessment of a Non-Invasive Image Guided System for Intra-Cranial Linac Based Stereotactic Radiosurgery

Purpose:

To assess the total system accuracy of a non-invasive image guided technique for intra-cranial radiosurgery.

Method and Materials:

To test the system three fiducials were placed in a Rando head phantom in cerebellar, mid-brain and lateral-frontal locations. A stereotactic mask system by Brainlab was used for immobilization. Positioning was based on the Novalis Body system consisting of two kV x-ray cameras with amorphous silicon detectors and an IR tracking system calibrated to the treatment isocenter. CT scans were acquired using a slice thickness of 1.25 mm. For each scan the phantom was positioned in the immobilizer and an attachment with IR-reflective spheres was added. Using the Brainscan 5.31 treatment planning system, the IR markers were localized and an isocenter placed on each fiducial. Plan information was exported to the Novalis Body computer. The phantom was initially positioned using the IR tracking system. X-ray images were obtained and an automatic 6-D bony fusion performed. Shifts calculated by the fusion were performed under guidance of the IR system. Port films were taken and the deviation between the center of the fiducial and the treatment isocenter was evaluated.

Results:

A total of 57 phantom setups were performed (19 for each anatomical location). The measured mean total system error magnitude was 0.73 mm with a standard deviation of 0.29 mm. The positioning accuracy for the lateral frontal fiducial was found to be slightly inferior to the other two with a mean error magnitude of 0.96 mm compared to 0.60 mm and 0.64 mm for cerebellar and mid-brain respectively.

Conclusion:

In all cases the radiosurgery accuracy requirements specified in AAPM Report #54 were met or exceeded. This system provides equivalent accuracy to conventional invasive frame based radiosurgery and can substantially improve both patient comfort and treatment planning workflow.