

AbstractID: 7387 Title: Accuracy of Cranial Co-planar Beam Therapy with BrainLab ExacTrac Image Guidance

Purpose: To evaluate the positional accuracy (displacement between planned and delivered dose distributions) of cranial co-planar beam treatments for image guided stereotactic radiation therapy with Novalis.

Methods and Materials: Positional accuracy was investigated using a CIRS anthropomorphic head phantom loaded with 6.35cm x 6.35cm sections of EDR2 film oriented to measure dose in the three principal planes. BrainScan was used to develop a treatment plan consisting of seven equally spaced coplanar mMLC beams that conformed to irradiate a 2-cm diameter by 2-cm long PTV. Prior to delivery phantom misalignments were imposed in combinations of ± 8 -mm offsets in one or more of the principal directions. ExacTrac X-ray corrections were applied 1–3 times until the reported alignment was within 0.4mm/0.4° in all 6 degrees of freedom based on X-ray to DRR image fusion prior to treatment delivery. Phantom positions were tracked by the Novalis IR system. The delivered dose distribution was measured with a precision of ± 0.3 mm. Measured and calculated dose distributions were registered using 4 fiducial rods in the phantom.

Results: Based on the 70% dose contour, the displacements of the delivered from the planned dose distributions ranged from 0.7 to 1.3mm, -0.4 to 0mm, and -0.6mm to 0.5mm in Posterior-Anterior, Right-Left and Inferior-Superior directions respectively. For the 80% dose contour, the displacements of the delivered from the planned dose distributions ranged from 0.8 to 1.8mm, 0.1 to 0.8mm, and 0.1 to 1.1mm, respectively. Final displacements were independent of initial misalignments.

Conclusions: Using recommended Novalis calibration procedures, the ExacTrac X-ray image-guidance system used in our clinic can deliver cranial dose distributions within 1.3mm of the planned dose distributions when initial misalignments are within ± 8 mm in the three principal directions. 80% isodose contours can have up to 1.8-mm errors.

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