AbstractID: 1407 Title: Measurement of Total Clinical Accuracy for an Image Guided Radiosurgery System

As Stereotactic Radiosurgery systems incorporate image guidance for patient alignment and registration it becomes more difficult to separately measure the localization, mechanical targeting and planning errors.

From a clinical perspective the relevant targeting error is the total clinical error which includes error in localization, mechanical alignment and planning. This total accuracy is the key factor in the determination of treatment margin. It is therefore more efficient to directly measure total clinical accuracy than to measure the individual components and then infer total accuracy.

We present the direct measurement of total accuracy using an anthropomorphic head phantom loaded with a 31.75 mm target ball and orthogonal pieces of radiochromic film. A series of accuracy measurements are performed on all new CyberKnife systems to remove residual systematic targeting error as part of the commissioning process. We present test results for the new CyberKnife system installed in Miami in December 2003. Six total accuracy measurements were made, which include three target locations within the phantom and use both the anatomical and fiducial registration modalities of CyberKnife.

Before correcting CyberKnife for systematic error, the targeting offsets on each axis (anterior, left, superior) were (-1.42, -0.11, 0.10) mm, with standard deviation (0.15, 0.50, 0.47) mm. After correcting the targeting offset to compensate for systematic error, two more tests were performed as a check, one for fiducial and one for anatomical tracking. The results had total radial error of 0.40 mm and 0.59 mm, respectively. These results show that CyberKnife is capable of sub-mm targeting accuracy.