

AbstractID: 2593 Title: Prediction and Optimization of Stereo tactic frame placement for collision avoidance in Gamma Knife Radio Surgery

Purpose:

To develop a positioning assistive device (PAD) and system that optimizes the use of gamma knife stereo tactic frame placement before treatment in avoiding frame-collimator collisions during treatment.

Method and Materials:

Prior to stereo tactic frame application, pretreatment MRI or CT images are used for tumor localization. The PAD system has been designed and constructed to predict the optimal frame placement coordinates. The PAD device is used to assist in applying the stereo tactic frame, utilizing optimized frame placement coordinates, with respect to a fiducial marker placed on a phantom prior to scanning.

The PAD device has been constructed using high grade plastic curved to accommodate a cervical collar on its inner surface and a steel block and rod system to its outer surface. The block and rod system consists of a horizontal (y-axis) and a vertical (z-axis) rod with a 90 degree bend at the top (x-axis). The two rods are attached via a block with two oblique holes each taped with a screw to allow for adjustment along the respective axis. The x-axis portion has a block with a dovetail grove to allow attachment of the stereo tactic frame.

The block and rod system allows for translation and rotation about each axis enabling six degrees of freedom in a compact design. This ensures that the placement of the stereo tactic frame is level and accurate.

Results:

The PAD system has been found to optimize frame placement and predict frame/collimator collisions. PAD allowed for accurate and reproducible frame applications.

Conclusion:

The PAD system will allow the neurosurgeon the ability to apply the stereo tactic frame to the patient in a more accurate and reproducible way. PAD does lead to easier treatment planning, faster treatment delivery, and reduced patient stress. Demonstration of the device will be presented.