

Purpose: In our clinic we utilize a frameless localization system for external beam radiosurgery. The system utilizes a biteblock with fiducials, and an infra-red camera for setting up and monitoring patient position prior to treatment. The purpose of this work is to investigate and quantify the accuracy of the system. .

Method and Materials: A phantom with integrated targets and fiducials was utilized to test the positional accuracy of the system. After mounting the phantom to the treatment couch or a BRW floorstand, relative positions reported by the camera system were compared to digital couch position readouts and vernier readings from the floorstand. MV images recorded with an EPID were used to evaluate the absolute accuracy of isocenter positioning. After repeated localization of a spherical target, images were taken at different gantry and couch angles similar to the Winston-Lutz test. The digital images were analyzed to determine the accuracy of the target placement in a circular field by measuring the distance between the field center and the target center.

Results: The relative positional accuracy of the camera based system was determined to be less than 0.4 mm over a 50 mm range of travel in the three orthogonal directions of couch motion and less than 0.1 degrees in couch rotation. Data showing the correlation between camera reported position, floorstand position and digital couch position are presented. The EPID based measurements show absolute accuracy of positioning a target at the isocenter is < 1 mm.

Conclusion: A frameless fiducial and infra-red camera based patient positioning system is used for stereotactic treatments in our department. The positional accuracy of the camera based system was verified and found to be sufficiently accurate for stereotactic treatments.