

Adaptation of an Optically-Guided Stereotactic Localization System for Clinical Use in Conformal Therapy and IMRT

A number of emerging radiation therapy modalities, such as stereotactic radiotherapy, conformal therapy and IMRT, require better anatomical localization than has traditionally been achievable. A system for use in the treatment of brain and head & neck tumors has been adapted from a commercially available stereocamera system designed for stereotactic radiotherapy. An optically guided localization system from Sofamor Danek (Memphis, TN) was installed in a vault equipped with an Elekta SL20 linac with multileaf collimator. A tertiary, circular collimator (5 to 50 mm diameter) could be attached to the gantry if desired. This system uses two infrared emitting sources and cameras to stereotactically locate a biteblock-mounted fiducial array and to guide the therapist in positioning the patient so that the target center coincides with the radiation isocenter. With the aid of the manufacturer, this system was adapted for direct use with our in-house 3D treatment planning system (Prism) for planning of arbitrary tumor types and shapes. For stereotactic radiotherapy purposes, a manufacturer-supplied treatment planning system was also available. A set of procedures was devised in which no invasive headring was necessary, nor were any specific or proprietary reference systems required. Measurements were performed to determine the effects of target localization, patient positioning, gantry sag, and couch rotation on the accuracy and precision of the system. The overall accuracy was determined to be 2 mm, and the precision 1 mm.