

AbstractID: 9262 Title: A New Cone-Beam CT Daily QA Phantom for Stereotactic Radiosurgery

Purpose: In Stereotactic Radiosurgery (SRS), sub-millimeter accuracy for patient setup is necessary. We developed a phantom for SRS using CBCT for patient alignment. **Method and Materials:** The phantom is a semi-spherical shaped acrylic with the dimension of 11 cm diameter and 12 cm height. It consists of four sections: hollow cone-shaped top, house-made large water level, metal target supporter with 15 mm diameter stainless steel ball target and hollow cone offset between radiation and mechanical axis of the CT canner. The bottom of the phantom is attached to a frame that can be placed on treatment table of the linear accelerator. The phantom was scanned by using diagnose CT and exported to the ADAC Pinnacle planning computer. The phantom is then aligned by using lasers and CBCT images are taken. The image correlation was carried by comparing external contours of the phantom itself and two contours of the chamber in the phantom. **Results:** The geometrical accuracy of the stereotactic radiosurgery system using the CBCT as secondary double check was investigated over 8 different gantry angles and table rotations, and their average uncertainty is approximately 0.5 mm in three major orientations with maximum 0.8mm errors. Four physicists were asked to do image fusion, intra-user variations were less than 0.25mm. The dosimetric uncertainties of 75% isodose volumes were also evaluated. Between planning computer and film irradiation, the uncertainties were less than 1 mm in three major axis. **Conclusion:** The CT and CBCT images can be correlated with 0.5mm steps. The daily QA phantom was very effective to investigate any systematic errors including CT images, planning procedure, geometrical uncertainty of CBCT, and gantry flex of the linear accelerator. The unique geometrical features of the phantom provide minimum intra-user variations with 0.5mm uncertainty, which is comparable to the setup uncertainty of the laser.