

AbstractID: 4645 Title: Feasibility and accuracy of using cone-beam computed tomography (CBCT) scans for stereotactic radiosurgery (SRS) planning and dose verification

Purpose: To evaluate the feasibility and accuracy of using on-board imager (OBI) cone-beam computed tomography (CBCT) scans for stereotactic radiosurgery (SRS) planning and dose verification.

Method and Materials: The simulation CT scan and OBI CBCT scan of a Rando head phantom were imported into a commercial SRS treatment planning system, BRW-coordinate localized and co-registered. A simulated clinical target volume (CTV), planning target volume (PTV) and critical organs were contoured on the simulation CT scan and transferred to the CBCT scan. A SRS treatment plan with 10 static conformal fields was created using the simulation CT volume. Beam parameters of this CT plan were also imported into a second treatment plan using the CBCT volume. Dose volume histogram (DVH), mean dose, monitor unit (MU), and equivalent depth of the CBCT plan were compared with those of the CT plan, with and without the inhomogeneity correction.

Results: The DVH of CTV, PTV and critical organs for these two plans were indistinguishable without inhomogeneity correction. The MU and equivalent depth of the CBCT plan were on average 0.2 % (standard deviation (SD)=0.4%) higher and 0.3% (SD=1.3%) lower, respectively, than the CT plan. Although the DVH of these two plans were comparable with inhomogeneity correction, significant discrepancy was observed for the MU (mean=1.4% and SD=1.3%) and equivalent depth (mean=5.3% and SD=3.9%) due to the lower Hounsfield numbers of the CBCT scan. However, when the CT plan was applied to the CBCT volume, mean doses to PTV and critical organs were only slightly (1.2% and on average 1.0% with SD=3.2%, respectively) higher than those of the CT plan.

Conclusion: The OBI CBCT scans can be used for SRS planning and dose verification. More accurate Hounsfield number calibration is needed for inhomogeneity correction.