

AbstractID: 2785 Title: Is cone beam CT suitable for dose verification?

Purpose: To evaluate the influence of cone beam CT (CBCT) on dose calculation accuracy and check if CBCT is suitable for the daily dose verification of patient treatment.

Method and Materials: A CT-calibration phantom was first used to calibrate both conventional CT (GE Discovery-ST) and CBCT (Varian Trilogy OBI system). CT and CBCT images of the calibration phantom, an anthropomorphic phantom and a lung patient were then acquired for this study. The HU profiles along two orthogonal lines were acquired and compared for both CT and CBCT. CT and CBCT images were then imported to a treatment planning system (Varian Eclipse). Treatment plans were generated based on both CT and CBCT and the resultant dose distributions were compared based on isodose curves, dose profiles and DVHs. The various factors causing the dosimetric inaccuracy in CBCT-based planning were analyzed.

Results: Even though the same calibration was used for both CT and CBCT-based planning, the difference in the HUs between the CT and CBCT was found to be clinically significant. The discrepancy was most pronounced in the regions close to the phantom surface, with the maximum difference reaching 400 HUs. For the same planning condition (geometric setups, energy, MU, and dose calculation algorithm), ~3% dose difference was found in the two planning schemes for the phantom. For the lung case, the maximum dose discrepancy was found to be ~7% due to the motion artifacts in CBCT.

Conclusions: Although CBCT provides useful volumetric anatomy information for patient positioning verification, when used for dose calculation, it could introduce clinically unacceptable dosimetric errors. The quality of current CBCT should be improved in order for it to be used routinely for dosimetric verification calculation.