AbstractID: 5367 Title: Dosimetric effect of cupping artefact in MVCBCT images of the head and neck region

Purpose: To quantify the dose calculation accuracy achievable with 3D anatomical images obtained by Megavoltage Cone-Beam Computed Tomography (MVCBCT) for the head and neck region (H&N).

Method and Materials: MVCBCT images of inserts of different density immersed in water were obtained. This allowed the tuning of the parameters used for the image reconstruction. A MVCBCT number versus material density curve was also extracted for dose calculation purposes. MVCBCT images of a Rando phantom head were then acquired on a linac treatment couch with two different gain image calibrations and in two different positions relative to the room isocenter. Voxel-based and band-pass filter cupping artifact reduction methods were applied on all MVCBCT images. Images of the same phantom were also obtained with a kVCT. All images were transferred to a treatment planning system and dose calculations performed with various beam configurations. The dose differences obtained with the kVCT images and the MVCBCT images were analyzed using a gamma index function.

Results: At best, 96.1% and 98.8% of the dose points calculated with the MVCBCT images were within the dose calculated with the kVCT image by [2%, 2 mm] and [3%, 3 mm], respectively. The worst cases observed had fractions of 87.7% and 96.3% of the dose points that agreed within [2%, 2 mm] and [3%, 3 mm], respectively. The cupping artifact reduction methods tested did not significantly improve the dose calculation for most cases.

Conclusion: With proper calibration, dose calculations with MVCBCT images in the H&N region are feasible with an accuracy of [3 %, 3 mm] or less. The cupping artifact for H&N imaging does not lead to important dose calculation errors. Dose calculation with patient MVCBCTs and treatment plans are ongoing.

Conflict of Interest: Research sponsored by Siemens OCS.