AbstractID: 3341 Title: Image-Guided Radiotherapy feasibility Study using Kilo-voltage Cone-Beam CT images for Patient Alignment Verification

Purpose: The objective of this work was to evaluate the feasibility to acquire the kilo-voltage (KV) cone-beam computer tomography (CBCT) images and to register the CBCT images with the conventional planning CT images for patient alignment verification.

Method and Materials: A Varian high precision accelerator with on-board KV imaging (OBI) system and CBCT was used in conjunction with a QA head phantom for patient setup position verification. In addition, the in-house image registration and verification software was used for the analyses of patient alignment accuracy. First, we acquired the same reference image data sets of the QA head phantom from the CBCT and the LINAC/CT-on-rails unit. The conventional CT image set was used as the planning CT images. Applied the translation and/or the rotation to the QA head phantom to imitate the daily patient setup variation and then, acquired the daily CBCT images.

Results: No differences were observed on the registration between the reference image sets obtained from the conventional planning CT and CBCT. Similar findings were also observed on the registration of the daily CBCT with the planning CT images when the translations were applied to the setup of the daily QA head phantom deviated from the planning QA head phantom setup. When the rotations were applied to the daily setup of the QA head phantom, the treatment target was registered well between the daily CBCT images and the planning CT images, but the difference of 1.3 mm was observed on the registration in the structure relatively far away from the target.

Conclusion: Phantom studies indicated that the daily pretreatment CBCT images should be suitable to use for patient alignment verification with the planning CT images.