AbstractID: 13429 Title: Experimental Evaluation of Dose Calculation Using Mega-Voltage Cone Beam CT with MOSFET Detector in an Anthropomorphic Phantom

Purpose: Recently, dose calculations using mega-voltage cone beam CT (MVCBCT) images have been reported. The dose volume histograms of the dose plan using MVCBCT images have been already compared to those of kilo-voltage CT (kVCT) for clinical cases. In the reposts, comparisons of the plan dose were made, however, experimental dose verification has not performed yet. In this report, we experimentally evaluated the usefulness of the dose calculation using MVCBCT images.

Method and Materials: First, we corrected the uniformity of CT number on MVCBCT images. Next, dose verification was performed in a homogeneous PMMA phantom. Dose at multiple points were calculated using corrected MVCBCT images and kVCT images. Then, the calculated dose was evaluated with a MOSFET detector. Finally, we performed similar dose verifications in an anthropomorphic phantom. To consider the positional accuracy and precision of the detector in the phantom, another series of measurement was repeatedly performed 3 times.

Results: The relative dose differences between the calculated dose and the measured dose were obtained up to 3.2 % for both images in the PMMA phantom. The dose differences for corrected MVCBCT images agreed with those for the kVCT images within 1 %. Therefore, we confirmed the usefulness of proposed uniformity correction for MVCBCT images. On the other hand, for dose verifications in the anthropomorphic phantom, the average of the dose differences was 5.2 % for the corrected MVCBCT images and 4.3 % for the kVCT images. We can explain the differences by measurement error and setup error of the MOSFET detector. Reproducibility was up to 1.4 % among the series of measurement using the detector.

Conclusion: The dose calculations using the corrected MVCBCT images agreed well with those using the kVCT images in the anthropomorphic phantom. We will apply the dose calculation using MVCBCT images to clinical situation.