AbstractID: 13003 Title: Estimation of lateral scatter kernels in EPID and water equivalent phantom for dose verification in stereotactic lung radiotherapy

Purpose: Lateral scatter kernels (LSKs) of an electronic portal imaging device (EPID) and a water equivalent phantom are essential data for estimating the three-dimensional dose distributions in lung cancer patients who receive stereotactic body radiotherapy. The LSKs are used for converting portal images to portal dose images. The purpose of this study was to investigate a method of estimating LSKs of the EPID and water equivalent phantom, and then compare the LSKs between experimental measurements and the Monte Carlo (MC) method.
Method and Materials: The experimental LSKs were derived from the differentiation of the signal (mean pixel value or absorbed dose) as a function of equivalent circular radius of irradiation area. Mean pixel values in a region of interest of the EPID and absorbed doses in the water equivalent phantom were measured for estimating the LSKs of the EPID and water equivalent phantom, respectively, by changing the irradiation area of 3x3 to 20x20 cm^2. For evaluation of the experimental method, the theoretical LSKs were obtained based on the Monte Carlo method by simulating the same geometry of the experimental set-up including the EPID and water equivalent phantom. Two x-ray energies of 6 and 10 MV were employed respectively, at a medical linear accelerator in conjunction with an EPID.
Results: The experimental method overestimated the LSKs of the EPID and water equivalent phantom compared with those of the Monte Carlo simulation method. The full width half maximum values at 6 and 10 MV of the theoretical LSKs were 0.166 and 0.193 cm for the EPID, respectively, and 0.177 and 0.211 cm for the water equivalent phantom, respectively.
Conclusion: We should continue to investigate the experimental and theoretical methods for estimation of LSKs of the EPID and water equivalent phantom for dose verification in stereotactic lung radiotherapy.