

**AbstractID: 12845 Title: Automated measurement of water equivalent path length of a patient based on a computed radiography in total body irradiation**

**Purpose:** In total body irradiation (TBI), it is necessary to archive a uniform dose over the midline of a patient's whole body by using a compensator such as a water compensator. However, it would be tedious and time consuming to measure the water equivalent path lengths (WELs) of a patient in each x-ray trajectory for producing a water compensator. Therefore, the purpose of this study was to develop an automated method for measurement of the WELs of a patient based on computed radiography (CR) in the TBI.

**Method and Materials:** The basic principle of our proposed method was to estimate the WELs of patients based on two relationships; i.e., the first one between the phantom thickness and the absorbed dose; and the second one between the pixel value in a CR image and the absorbed dose in a water-equivalent phantom. First, the relationship between the CR pixel value and the phantom thickness was obtained by taking CR images with changing the phantom thicknesses from 1 cm to 40 cm at a source-to-target distance of 500 cm. Next, the relationship between the phantom thickness and the absorbed dose was measured by using a chamber in the same geometry as taking CR images. Finally, the relationship between the CR pixel value and the absorbed dose was determined. For validation of the proposed method, the WELs of an anthropomorphic torso phantom in x-ray trajectories were estimated by the proposed method, and were compared with gold standards calculated from a computed tomography image of the phantom.

**Results:** The mean error in the WELs between the gold standard and the proposed method was  $12.0 \pm 9.7$  mm.

**Conclusion:** The preliminary results suggest that the proposed method would be useful for measuring the WELs of a patient in producing a water compensator.