AbstractID: 8156 Title: Automated estimation of a tumor region and its displacement on EPID cine images without implanted markers in lung stereotactic body radiotherapy

**Purpose:** The purpose of this study was to develop a method for automated estimation of a lung tumor region and its displacement on an electronic portal imaging device (EPID) during lung stereotactic body radiotherapy (SBRT) without implanted markers.

**Method and Materials:** Our method for automated estimation of the tumor region and its displacement was based on a template matching technique with cross-correlation coefficient between a target template image and each consecutive portal (CP) image, which was acquired in cine mode with the EPID in each treatment. Each target region was segmented in the first EPID cine image, which was referred to as the reference portal (RP) image, based on a multiple-gray level thresholding technique and a region growing technique, and then a target template image was extracted as "a tumor template". The displacement vector of a target was determined from the position in which the target template image took the maximum cross-correlation value within the CP image. EPID images with $512 \times 384$ pixels (pixel size: 0.56 mm) were acquired in a cine mode at a sampling rate of 0.5 frame/sec by using x-ray energies of 4, 6, or 10 MV on linear accelerators. We applied our proposed method to EPID cine images of 12 cases (ages: 51-83, mean: 73) with a non-small cell lung cancer.

**Results:** For 12 cases, the target displacements obtained by our method agreed with those determined by the manual method by a mean correlation value of 0.839. Each tumor region segmented by our proposed method was overlapped by 60% on average with that determined by the manual method.

**Conclusion:** This preliminary result suggested that our proposed method may be useful for estimating of displacements of target positions without implanted markers in lung SBRT.