

We investigated the magnitude of the intra- and inter-fractional error for implementing IMRT to breast and associate nodes. Further, the application of the non-ionizing surface imaging device as a daily breast patient positioning system was studied.

Electronic portal images were taken for 12 patients at least for 10 treatment days. During each day, an average of 8 to 9 images per field were acquired in the dose rate of 400MU/minute. We developed an image analysis toolbox to analyze 2931 images quantitatively. We calculated the standard deviation (σ) from intra- and inter-fractional error to estimate the appropriate PTV. For the daily patient positioning, FastSCAN Cobra was used, which projected laser light on the breast while the camera viewed the laser to record cross-sectional profiles. A reference image was taken during the CT simulation, and then images were taken in following days. Images were registered with respect to the tattoo marks on the patient. A software was developed to subtract daily images from the reference image, which was capable of displaying the three-dimensional geometric differences in color map.

The PTV margins required, which encompassed CTV in 95% of treatments, for intra-fractional error due to breathing were ranged from 2mm to 4mm. However, the PTV margins to compensate the inter-fractional error mainly from daily setup error ranged from 7mm to 31mm. The setup correction using the surface-imaging tool may limit the geometric difference within 6mm. The three-dimensional surface image may be used for the adaptive radiation therapy to correct the topological changes.