3460

Comparing the Discrepancy of the Setup Errors According to the Reconstruction Resolution

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Cone-beam computerized tomography (CBCT) was integrated with a linear accelerator in order to check and correct the setup errors. The setup error could be corrected by adjusting the translated and rotated deviations between the CT simulator images and CBCT images before treatment. Three resolution types of CBCT images were reconstructed from the projection data: low, medium, and high. In general, the projection data were reconstructed of high resolution. High resolution reconstruction took 3 minutes more than medium resolution. To compare the discrepancy of the setup errors according to the reconstruction resolution, 56 CBCT projection data were selected from 3 organs, spine, lung and prostate, in 6 patients. The image registrations were performed between the CT simulator image and medium resolution CBCT image, and between the CT simulator image and high resolution CBCT image. The registration was performed in the following order. The region of interest (ROI) of each patient was manually selected. The ROI discrepancy between the CT simulator image and CBCT image was roughly adjusted by the physicist, after which the two images were matched by bony anatomy. The final result was checked and accepted by the physicians. In the comparison results, all translation discrepancy vectors except three were less than 1mm. All rotational discrepancies of each axis except two were less than 1 degree. The translation discrepancies between the different CBCT resolutions were acceptable because the overall accuracy of CBCT was about 1 mm. It was very difficult to decide the acceptable range of rotational discrepancies because the range may have changed according to the target shape. However, a discrepancy of 1 degree was judged to be acceptable. In most clinical cases, the medium resolution CBCT image was as good as the high resolution CBCT image.

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