Purpose: The purpose of this study is to evaluate the feasibility of kilo-voltage cone-beam CT (CBCT) images that are obtained with the Varian On-Board Imager in dose calculation at each radiation therapy.

Methods: CBCT images are commonly degraded by scattered radiations originating in the patient's body, and so the CT numbers of the CBCT images depend on data acquisition conditions and the patient size. However, the anatomical shape of each organ is not likely affected by scattered radiations, and so we used only the shape of major organs such as lungs and bones in the CBCT images, and replaced these CT numbers with those of the multi-slice CT (MSCT) images that were used for dose calculation in a treatment planning. As regards this alternative CT number we adopted the median of MSCT numbers in a segmented region of a major organ each corresponding to that in the CBCT images. We evaluated the validity of our segmented region (SR) method with images of eight patients with lung diseases. The number of irradiation beams was four. In this evaluation we used the distance-to-agreement (DTA) and \(^{\gamma}\) analysis, and the dose-volume-histogram (DVH) analysis.

Results: The pass rates of the DTA analysis (2mm) and \(^{\gamma}\) analysis (2mm, 2\%) between the dose distributions calculated with our method were 90.4±6.0\% and 99.1±1.1\%, respectively. The results of the DVH analysis showed that the differences in doses (average, maximum and minimum) for a target volume were 1.3±0.5\%, 0.9±0.8\% and 3.4±3.0\%, respectively. These results showed that our method was acceptable in the calculation of a dose distribution.

Conclusion: We evaluated the dose calculation method with a combination of CBCT and MSCT images. This method could yield an accurate dose distribution and achieved an easier verification of radiation therapy on each treatment day.

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None