

AbstractID: 7168 Title: Analysis of the Respiratory Motional Effect on the Cone-beam CT Image

Purpose: To evaluate the respiratory motional effect on the cone-beam CT (CBCT) image quality in the region of inhomogeneous structures.

Method and Materials: A phantom system was constructed in order to simulate respiratory motion. One part of the system is composed of a moving plate and a motor driving component which can control the motional cycle and motional range. The other part is solid water phantom containing a small cubic phantom (2 cm x 2 cm x 2 cm) surrounded by air which simulate a small tumor volume in the lung air cavity. CBCT images of the phantom were acquired in 20 different cases and compared with the image in the static status. The 20 different cases are constituted with 4 different motional ranges (0.7 cm, 1.6 cm, 2.4 cm, 3.1 cm) and 5 different motional cycles (2, 3, 4, 5, 6 sec). The difference of CT number in the coronal image was evaluated as a deformation degree of image quality.

Results: The relative pixel intensity values as a compared CT number of static CBCT images were 71.07% at 0.7 cm motional range, 48.88% at 1.6 cm motional range, 30.60% at 2.4 cm motional range, 17.38% at 3.1 cm motional range. The tumor phantom sizes which were defined as the length with different CT number compared with air were increased as the increase of motional range (2.1 cm: no motion, 2.66 cm: 0.7 cm motion, 3.06 cm: 1.6 cm motion, 3.62 cm: 2.4 cm motion, 4.04 cm: 3.1 cm motion).

Conclusion: This study shows that respiratory motion in the region of inhomogeneous structures can degrade the image quality of CBCT and it must be considered in the process of setup error correction using CBCT images.