

**Purpose:** To investigate the feasibility of cone-beam computed tomography (CBCT)-based treatment planning.

**Methods:** HU of material disks in Catphan, HU profiles for homogeneous and inhomogeneous phantoms, and HU values in different tissue areas of brain, thorax and prostate patients were compared in CBCT and CT images. Plans with one beam based on CBCT and CT of phantoms and patients were compared using MU/cGy values and isodose distributions. For patient cases, 3D plans and IMRT plans based on CT images were generated, and then verification plans based on CBCT were generated. The isodose distributions and dose values at the isocenter were compared between two plans.

**Results:** HU values of CBCT are very close to those of CT in Catphan. However, HU profiles of homogeneous and inhomogeneous phantoms in CBCT show inhomogeneous distribution compared to those in CT with large scatter. Large scatter contribution becomes greater in patient cases. The lung or fatty tissue appears with even lower HU values in CBCT than in CT. Resulting MU/cGy differences are generally within 2%, but a beam passing through a significant amount of the lung or bone shows 2 – 3% of MU/cGy difference. The isodose distributions of CBCT-based verification plans and CT-based plans for brain and prostate patients are very similar with the dose values less than 2% different. The dose value is about 4% higher in CBCT-based verification plan than in CT-based plan for the thorax patient and the isodose distributions in the high dose area inside of the lung shows disagreement between the two plans.

**Conclusion:** This study validates CBCT-based treatment planning by comparing with the gold standard CT-based treatment planning. CBCT-based plans could be used for most cases. However, beams should be selected with a consideration to avoid a large part of lung.

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