

AbstractID: 3436 Title: The Analysis of Confounding Factors in Volume Reconstruction of 3DCRT with Spiral Mode CT Simulation

Purpose: This study is to analyze the difference in reconstructing volume by using phantom model between various settings of axial-mode and spiral-mode computed tomography (CT) simulator for three dimensional conformal radiotherapy.

Method and Materials: Three phantom balls with different diameters (5.1, 9.9, 12.2 cm) were scanned by a single-row detector CT simulator. The volumes of all phantom balls were reconstructed in the same system. The exactly calculated phantom ball volumes were the baselines as compared to the volumes by the conventional axial CT reconstruction. The reconstructed volumes from the axial-scanning-mode were compared with the corresponding settings of the spiral-scanning-mode in CT simulation, with four different Hounsfield thresholds, three different pitches (1, 1.5 and 2), and four different slice intervals (1, 2, 3 and 5 mm).

Results: The larger slice width and HU threshold were associated with larger difference between the exactly calculated volumes and reconstructed volumes in axial CT mode. The volume losses were more than 5% for small phantom ball in all axial CT settings. The lowest HU threshold and slice width of less than 5 mm were needed to maintain the volume loss of less than 5% in medium and large balls. As compared to axial scanning, spiral scanning offered the volume reconstruction loss of less than 5% in almost all settings. The exceptions existed in the small phantom ball with the slice interval of 5 mm, spiral pitch of 1.5 and 2 at 50 HU, and slice interval of 5 mm, spiral pitch of 2 at 0 HU.

Conclusion: Slice interval, spiral scanning pitch and HU threshold were the factors with the impact on the accurate estimation of volume reconstruction by spiral CT simulator. Spiral CT mode was feasible in most scanning settings with the acceptable volume reconstruction accuracy threshold of more than 95%.