

AbstractID: 5474 Title: An In Vivo Comparative Study of the MV and kV Cone Beam Computed Tomography Image Quality of a Lung Patient

Purpose: To compare image quality, reconstruction artifacts and tumor visibility for kV and MV cone-beam computed tomography (CBCT) scans reconstructed with the same algorithm.

Method and Materials: A protocol lung-cancer patient was set up in the identical treatment position for kV and MVCBCT using a Varian On-Board Imager CBCT and an in-house MVCBCT imaging system. For both scans the gantry made a 1-minute, 360° continuous rotation. For the MVCBCT, ~460 projection images were acquired at 6MV for ~13 MU; for kVCBCT ~600 projections were acquired using 125 kVp, 80 mA and 25-ms exposure time per projection, resulting in ~2cGy at isocenter. Reconstruction was performed using the Feldkamp back projection algorithm. Both scans were registered to the treatment plan CT. The visibility of three selected regions (bronchus, vertebrae, heart) is compared using the corresponding signal-to-noise ratio (SNR). The contrast ratio (CR) and contrast-to-noise ratio (CNR) at the tumor are also compared for ease of tumor identification.

Results: The SNR of bronchus, vertebrae and heart are 25, 34 and 33 respectively for MVCBCT while the corresponding values in kV scan are 17, 33 and 42. For tumor identifiability, CNR and CR are 11 and 2 respectively for MV scan, and 10 and 2 for kV scan. The CNR of the vertebrae in MV and kV cases are 2 and 6. Time to register the kV image is approximately 50% less than MV image. Similar breathing artifacts are present in both scans.

Conclusions: Both kV and MV scans deliver usable images. The tumor can be discriminated from the lung background. Higher bone contrast in kV scan helps to reduce time required to register the scan with the planning CT.

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