

AbstractID: 5377 Title: Evaluation of Image quality in Megavoltage Digital Tomosynthesis

Purpose: We report on the characteristics of Megavoltage Cone Beam Digital Tomosynthesis (MVCB DTS) and its potential clinical application for imaging of pulmonary lesions.

Method and Materials: MVCB CT refers to the reconstruction of a 3D image from a set of 2D projections, acquired using a medical linear accelerator equipped with an electronic portal imaging device (EPID). A typical MVCB CT scan is acquired over a 200 degrees arc. In the case of MVCB DTS, the angular range is limited to reduce the acquisition time. This limited angular range affects the image quality of the reconstructed tomograms. To study the image quality as a function of the angular range, phantom measurements were performed and data from a head and neck patient were analyzed. The image quality was analyzed in terms of effective slice thickness, shape distortion and contrast sensitivity. MVCB DTS of the lung was performed on patients, with localized and diffuse lesions.

Results: The image quality and the capability to distinguish overlaid structures decreases with decreasing angular range: a 20 degrees arc DTS results in a slice thickness of 2.7cm (vs. 1mm), a ratio of the vertical to lateral diameter of a sphere of 0.15, and a reduced contrast sensitivity. The acquisition is faster than MVCB CT. It takes 5-10 seconds for arcs of 20-40 degrees, compared to 45 seconds for a 200 degrees arc. In lung images, the faster acquisition results in a reduced blur due to the respiratory motion.

Conclusion: This study indicates some potential advantages of DTS for imaging lung patients in the treatment position. Compared with EPID, DTS provides 3D information and better soft tissue contrast. Compared with CBCT, DTS allows shorter acquisition times, compatible with breath holding.

Conflict of Interest (only if applicable): Research sponsored by Siemens OCS.