AbstractID: 5177 Title: Respiration phase-based cone-beam computed tomography (CBCT) reconstruction

Title: Respiration phase-based cone-beam computed tomography (CBCT) reconstruction

Purpose: To develop a method to reconstruct CBCT data based on projection data acquired at a specific respiration phase.

Methods and Materials: The original projection data were acquired using an on-board imager (OBI) (Varian Medical Systems) over scanning angles from 0° to 360° with 0.5° interval. During the retrospective process, the diaphragm location on each projection image was identified by contrasting the surrounding anatomies. Based on the location of the diaphragm in different respiration phases, the projection data were categorized into respective subsets. Subsequently, the CBCT was reconstructed from the projection data in each subset, using a Feldkamp CBCT reconstruction algorithm.

Results: The CBCT was reconstructed based on a subset of projection data (single sampling) acquired at the end point of exhalation, which shows the least motion of the diaphragm. In addition, as an extension, the neighboring 1 or 2 projections were also included in the reconstruction scheme (multiple sampling). The preliminary results show that with a single sampling scheme, the reconstructed CBCT image quality is coarse but the implanted staple and bony structures are clearer. When multiple sampling schemes were used, the image quality is better but with increased blurring effect and motion artifact.

Conclusion: Compared with CBCT conventionally reconstructed for full scan images, the phase-based CBCT provided a sub-optimal option for clinical use. Although the image were imperfectly reconstructed due to the substantially decreased number of projections, a significant reduction of radiation exposure, improvement on blurring and motion artifacts is achieved. In the future, the synchronized respiratory signal (such as RPM signal) could be used to sort the projections for this purpose.

This study is partially supported by Varian research grant