

AbstractID: 14030 Title: Preliminary performance evaluation of CBCT Image reconstruction from reduced projection data by TV-minimization

**Purpose:**

Kilovoltage CBCT has become a useful clinical tool which provides in-room image guidance for radiation therapy. Frequent use of CBCT also raises patient safety concern, because tomographic images are obtained by reconstruction from projection data acquired at hundreds of angular views, which may accumulate to an un-negligible amount of radiation dose. It is therefore desired to develop a low-dose CBCT imaging technique that requires smaller amount of projection data while can still yield images sufficing clinical needs. In this work, we have applied a new TV-minimization algorithm to reconstruct CBCT images from a fraction of the amount of projection data currently used and have evaluated the image quality according to established quality-assurance procedures.

**Materials and methods:**

We have acquired real projection data of a CATPHAN phantom using a clinical on-board imaging system (Varian Medical Systems, Palo Alto, CA). We then applied the TV-minimization algorithm to reconstruct images from subsets of the full, 628-projection data set. The subsets contain from 360 down to 60 projections. We then examined the reconstructed images by calculating a number of metrics, including spatial resolution, contrast linearity, and low-contrast resolution, and compared the results to the established quality-assurance (QA) standards.

**Results:**

The images reconstructed by use of the TV-minimization algorithm from the reduced data sets appeared to be comparable to the images reconstructed from the full data set by the FDK algorithm. In addition, the tested image-quality metrics can satisfy the QA requirement for images reconstructed from as few as 100 projections.

**Conclusion:**

The TV-minimization algorithm can yield CBCT images from reduced projection data without significant sacrifice of image quality. The images reconstructed from about 100 projections may be potentially useful for clinical applications according to QA results.