

**Purpose:** Tetrahedron Beam Computed Tomography (TBCT) circumvents some problems of cone beam CT (CBCT) but still shares the same approximate reconstruction artifact with FDK algorithm. Recently, iterative image reconstruction has been widely employed in diagnostic CT scanners in order to suppress noise and reduce imaging dose. In this study we developed an iterative TBCT image reconstruction algorithm which is able to mitigate the cone beam reconstruction artifact as well as reduce image noise.

**Methods:** Simultaneous algebraic reconstruction technique (SART) image reconstruction algorithms were developed based on our TBCT benchtop geometry. The algorithms were tested using both numerical and physical phantoms. The projection matrix was calculated using a distance driven method. Noise levels in reconstructed images were quantified. The approximate image reconstruction artifact at larger cone angle was evaluated.

**Results:** With the same numerical and real scanned projection data, SART algorithm produces similar spatial resolution as the FDK algorithm. The cone artifact was significantly reduced as compared with FDK algorithm. The noise levels were reduced 16-20% by the iterative algorithm at different regions of the images.

**Conclusions:** Iterative reconstruction algorithm further improves the image quality of the TBCT system. TBCT system with SART image reconstruction algorithm potentially may be used as a mobile CT scanner for diagnostics.

**Funding Support, Disclosures, and Conflict of Interest:**

This work is partially supported by NIH grant 1R21CA130330-01A1 and DOD Prostate Cancer Research Program W81XWH-07-0083.