AbstractID: 9489 Title: Comparison of spatial resolution properties for three cone-beam CT systems using an aluminum wire phantom

Purpose:
To evaluate and compare the spatial resolution properties of three different cone beam CT systems using an aluminum wire phantom.

Method and materials:
A wire phantom was constructed to evaluate and compare different cone-beam CT systems for their spatial resolution. The phantom contains 12 aluminum wires of various sizes (51, 76, 102, 127, 152, 178, 203, 229, 254, 279, 305, and 356 μm in diameter) suspended in air in the axial direction and positioned along a 7.2 cm diameter circle around the rotating axis. The wire phantom was imaged with cone-beam CT systems using three different detectors: an aSi/aSe flat panel detector (Anrad FPD14), an aSi/CsI flat panel detector (Varian PaxScan 4030CB) and a CCD/CsI detector (Hamamatsu C4742). Images were acquired in both continuous and pulsed x-ray modes and in various binning modes (1×1, 2×2, 3×3 and 4×4). 300 projection images were acquired over 360° for each scan. Feldkamp's filtered backprojection algorithm with a pure ramp filter was used for 3D reconstruction.

Results:
Careful examination of the reconstructed images shows that wires as small as 100 μm were resolved with Anrad and Varian detectors. However, despite the smaller pixel size of the Anrad detector, images obtained with the Varian detector showed slightly better quality. It was found that binning did not affect the visibility but degraded quality was observed with increased binning size. Due to motion blur, images obtained with continuous x-rays showed lower spatial resolution.

Conclusions:
It was found that the spatial resolution of cone-beam CT system does not solely depend on detector's resolution. Using pulse mode X-ray shows a better performance in cone-beam CT system than continuous mode.

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