AbstractID: 5409 Title: Effects of kVp setting and radiation dose on calcification visibility in cone beam CT

Purpose: To investigate how the kVp setting and radiation dose affects the detection of microcalcifications in cone beam CT (CBCT).

Materials and Methods: Calcium carbonate grains, ranging from 200-212 to 355-425 micron, were used to simulate microcalcifications. The simulated microcalcifications from the same size were arranged to form a 5×5 microcalcification cluster. Each cluster was embedded between two slices of a stacked lunch meat and positioned at the center of each slice of the lunch meat. The lunch meat was then imaged with an experimental CBCT system, which employs a 30 × 40 cm2 a-Si/CsI based flat panel detector with a pixel size of 194 microns. 300 projection images over 360 degrees were acquired in the non-binning mode at two kVp setting (60 and 80 kVp) and various doses (4.2, 6, 12, 18, and 24 mGy). The projection images were reconstructed with the Feldkamp algorithm. After that, 767×767×9 volume data were extracted from the CBCT reconstructed images for each MC size group and each dose level as well as each kVp. The images were sequentially displayed on a review workstation with a 1600×1200 CRT monitor and reviewed by six readers independently. The order of the images was randomized for each reader. The readers were asked to count the number of visible microcalcifications. The ratios of the visible microcalcifications were averaged over all readers. Student t-test was used to compute the p values.

Result:
For 80 kVp, the images acquired with 4.2 mGy performed similarly to those acquired with 6 mGy ($p > 0.05$) for each MC size. Additionally, the images acquired with 18 mGy performed similarly to those with 24 mGy ($p > 0.05$) for most MC sizes.

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