AbstractID: 11228 Title: Multi-slice CT versus cone beam CT for breast imaging: radiation dose distributions with Monte Carlo simulation

**Purpose:** To use Monte Carlo simulation method to investigate and compare the overall radiation dose and dose distribution for breast imaging using multi-slice CT and cone beam CT (CBCT) techniques.

**Method and Materials:** CBCT images of a breast specimen have been combined with multi-slice CT images of a patient chest to form a 210×206×110 model for a patient lying in prone position with both breasts freely protruding downward. Image segmentation was applied to separate the images into areas for adipose tissue, soft tissue, muscle, air and bone. Rep78 was used to compute the spectra for 120 and 80 kVp x-rays with a HVL of 4.65 and 4.08 mm Al, respectively, for simulating multi-slice CT and CBCT, respectively. A collimator was added to simulate the x-ray fan beam used in multi-slice CT and a half-cone beam for CBCT. To simplify the simulation, the table was assumed to shift by one fan beam width after the gantry makes one full rotation. $2\times10^7$ photons were used to calculate the dose for multi-slice CT with DOSXYZnrc and $1\times10^9$ photons for CBCT scan of the same breast phantom. The results of the dose calculations were rescaled for 240 mAs and 25 mAs, respectively.

**Results**: The results of Monte Carlo calculations for multi-slice CT indicated that dose levels in the heart and bone structures were about twice as high as those in the breasts. The breast dose from multi-slice CT was from 0.8 to 2 times as high as those in cone beam breast CT.

**Conclusion:** Results from our Monte Carlo calculations indicated that breast doses were found to be higher with a typical multi-slice CT scan of the chest. An additional dose problem for multi-slice CT is full exposures to the rest of the chest, incurring high radiation doses in the heart and bone structures.