

AbstractID: 7552 Title: Monte Carlo Simulation to Assess Organ Dose from Coronary CT Angiography (CTA) Exams Using Patient-Based Voxelized Models

Purpose: Technical advances in CT have led to an increase in the number of coronary CT angiography (CTA) exams being performed. These exams often use low pitch values to accomplish retrospective cardiac gating, which results in increased radiation dose. This study aims to estimate the dose to breast and lung tissue from a multidetector coronary CTA exam using voxelized models derived from actual patient anatomy spanning a range of sizes.

Method and Materials: Nineteen voxelized models of female patient anatomy were created based on image data from clinical CT exams. Breast tissue was contoured by a radiologist, then glandular and lung tissue were automatically segmented. Previously validated Monte Carlo models of 16 and 64 slice scanners were used taking into account source spectra and path, filtration, collimation, and geometry. Simulated CTA exams used manufacturer-recommended acquisition parameters and accounted for overscan. Organ dose was calculated for the glandular breast and lung tissues.

Results: Glandular breast dose estimates for the nineteen patient models ranged from 7 to 73 mGy, with an average of 47 mGy. Lung dose estimates ranged from 22 to 63 mGy, with an average of 46 mGy. Dose to both organs was significantly greater for smaller patients. Dose on the 16 slice scanner was higher than the 64 by approximately 14% for breast and 10% for lung, a difference not attributable to pitch or mA.

Conclusion: Radiation dose to the breast and lung in CTA imaging was estimated using models of actual patient anatomy, scanner specifics, and acquisition protocols. Organ dose was significantly larger for smaller patients, suggesting the need for patient size-dependent tube current settings for CTA exams.