AbstractID: 11190 Title: GATE Simulations of CTDI100c for Various Phantom Shapes, Sizes, and Compositions

Purpose: The purpose of this study was to investigate $CTDI_{100c}$ (computed tomography dose indice at center) for various phantom shapes, sizes, and compositions by using GATE (geant4 application for tomographic emission) simulations. **Method and Materials:** GATE simulations were performed for various phantom shapes (cylinder, cylindroid, and hexagonal prism PMMA phantoms) and phantom compositions (water, PMMA, polyethylene, polyoxymethylene) with various diameters (1-50 cm) at various kVp (80, 100, 120, 140 kVp) and mAs (100, 200, 300, 400 mAs) levels. **Results:** The $CTDI_{100c}$ values of cylinder, cylindroid, and hexagonal prism phantom at 140 kVp, 200 mAs resulted in 20.1, 24.3, and 22.1 mGy, respectively. The cylindroid phantom may be needed to estimate CTdose, because it's shape is closer to that of human body than cylinder and hexagonal prism PMMA phantom. The effect of phantom composition to $CTDI_{100c}$ was studied for water, PMMA, polyethylene, polyoxymethylene. For all phantom compositions, $CTDI_{100c}$ values were nonlinearly increased, linearly increased, and nonlinearly decreased as a function of kVp, mAs, and diameter, respectively. Among those compositions, $CTDI_{100c}$ values for water as a function of kVp, mAs, and diameter were changed most rapidly which indicating that $CTDI_{100c}$ values using PMMA could be underestimated and overestimated compared to those measured with water. **Conclusion:** In conclusion, the results of GATE simulations demonstrated that $CTDI_{100c}$ was able to be characterized for various phantom shapes, sizes, and compositions so that we may be able to investigate for estimating CTDIs in realistic applications.