AbstractID: 6738 Title: Effect of subcutaneous fat on abdominal CT dosimetry: Monte Carlo study

Purpose: To investigate the effect of abdominal subcutaneous fat on organ and effective doses in abdominal computed tomography (CT) examination by using deformable hybrid anthropomorphic phantoms and MCNPX2.5.

Methods and Material: A hybrid anthropomorphic computational phantom representing a newborn reference patient was employed in this study to illustrate use of deformable phantoms for patient-specific dosimetry. The hybrid phantom is currently the most advanced computational phantom incorporating the best features of conventional stylized and voxel phantoms, which include parameter-based flexibility and improved anatomical realism, respectively. Based on the template phantom of which the abdominal circumference was 36 cm, two more phantoms having abdominal circumferences of 33 and 39 cm were generated by manipulating control points on the abdominal surfaces. Three phantoms were then incorporated into MCNPX2.5 code where helical fan beams from SOMATOM Sensation 16 helical multi-slice CT scanner were modeled. A CT collimator setting of 12 mm and a tube potential of 100 kVp, both commonly used in pediatric CT scans, were simulated for illustrative calculations. Absorbed doses for major organ doses were calculated in each of the three newborn phantoms. The normalized organ absorbed doses for a total of 9 major organs were calculated and compared to each other.

Results: As waist circumference increases, the thickness of abdominal subcutaneous fat increases correspondingly which causes a decrease in the organ absorbed dose for CT beams, especially, for the small intestinal wall (-5.8%) and kidney (-7.3%).

Conclusion: Even though the effect of fat thickness on organ dose was not significant in newborn phantom, higher correlation would be observed in older and larger phantoms. The authors are working on a series of pediatric phantoms so that a more systematic investigation on the effect of abdominal subcutaneous fat on CT dosimetry could be performed in the future.