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Comparison of effective dose using constant conversion, SSDE and patient specific MC simulations in chest CT

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CT examinations are identified as the largest radiation dose/exam contributor to the population from medical imaging. The AAPM Report 204 advocated the use of Size Specific Dose Estimates (SSDEs) to dose estimation; however effective dose calculation using SSDE has not been validated. This work aims to determine whether the published k-factor for chest CT is valid using SSDE approach. 24 patients underwent clinically indicated chest CT exams, scanned with our institutional CT protocol. Patient data was categorized into 4 groups based on sex and BMI (large: >25 kg/m² and small: <25 kg/m²). Monte Carlo (MC) simulations were performed using patient data to estimate organ absorbed dose and calculate E via ICRP-103 methods (E-MC) and compared with E estimated with k-factor (E-k) and with SSDE/k-factor (E-SSDE). A significant difference was found between E-MC and E-k for small females (P<0.05). Differences in E-SSDE and MC-E were significantly different for all groups (P<0.05) except small females, where the difference between E-SSDE and E-MC was not significantly different (P>0.05). The range of difference between E-MC and E-k was +/- 0.8 mSv. Dose was underestimated by 45% for the smallest female (BMI-17.0). Data suggested that E-k is valid to estimate effective dose in chest CT for males between 17-32 BMI and females between 26-30 BMI. Small females were significantly underestimated using the E-k method by upto 45%. SSDE improved E estimates for small females. Use of the currently established k-factor of 0.014 mSv/(mGy-cm) is a valid method to estimate effective dose for males and large females in chest CT.

Biography

Yogesh Thakur completed his PhD at The University of Western Ontario in 2009. He is currently the Medical Physics Lead at Vancouver Coastal Health Authority and a Clinical Assistant Professor in the Department of Radiology at the University of British Columbia. He has published more than 15 papers in reputed journals, 1 book chapter, and peer reviewed manuscripts for numerous reputed journals. He is a member of the Canadian College of Physicists in Medicine, certified in Diagnostic Imaging and Mammography.

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