

Poster #: 28

Title of Abstract: ICRP103 effective dose vs DLP vs SSDE: which is a more clinically useful and sensitive tool for identifying radiation dose outliers?

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Modality: CT

Organ System: GI

Intro: Different radiation dose monitoring parameters are available and there is no definite clinical evidence related to the accuracy of one vs other.

Purpose: Comparing the ability of ICRP 103 effective dose (ED), dose-length product (DLP) and size-specific dose estimate (SSDE) to identify patients scanned with above-expected radiation dose.

Methods Used: Abdominopelvic CTs from July 2012 to March 2013 performed on 64-slice (Sensation 64, Siemens) scanners were reviewed. All scans were acquired using standard departmental protocol with tube current modulation. Parameters (mean mAs, kVp, scan length, effective patient diameter) and dose metrics (CTDIvol, ED, SSDE, DLP, organ doses) for these scans were extracted using commercial software (eXposure, Version 1). All patients who underwent the CT scan with doses \leq or \geq 2 standard deviations (SD) beyond the mean DLP, ED and SSDE were identified and assessed. The mid slice effective diameter was also manually calculated using $\sqrt{AP*Lat}$ (where AP=anteroposterior diameter and Lat=transverse diameter) for a subset of patients.

Results of Abstract: 1685 exams were included in the study. The mean DLP, ED and SSDE for these studies were

734.7 \pm 338.5mGy-cm, 13.2 \pm 6.4mGy-cm and 15.6 \pm 3.8mGy. The scans with dose \geq 2 SD [DLP 1411.6 (35; 6M, 29F); ED 25.9 (29; 12M, 17F); and SSDE 23.1 (47; 7M, 40 F)] or \leq 2 SD [DLP 57.8 (none); ED 0.5 (none); and SSDE 8 (4; 1M, 3 F)] were identified. The effective diameter for the subset of patients with dose \geq 2 SD of mean SSDE was statistically similar to the automated values ($p=0.34$). The 4 patients with \leq 2 SD of mean SSDE were very small patients. For dose \geq 2 SD, DLP (12/29) and ED (11/35) mostly identified patients with repeat series while the SSDE mostly identified patients scanned with arms by the side (24/47) or off centering (17/47) as the cause of high radiation dose. The organ specific ED for liver and urinary bladder demonstrated best correlation with ED (0.99, 0.98) followed by DLP (0.95, 0.97). SSDE showed the least correlation (0.86, 0.86) which dropped as the SSDE increased (for \geq 2 SD, correlation dropped to 0.26 and 0.32 for liver and bladder organ dose respectively).

Discussion: SSDE identified the largest number of patients with above-average radiation dose and is a more sensitive indicator of patient positioning and attenuation in the field of view. DLP and ED are more sensitive indicators of scan length.

Scientific and/or Clinical Significance? SSDE, DLP and ED are influenced by different scanning parameters, and should be used appropriately to study the influence of a particular parameter.

Relationship to existing work Significant

NA