

Poster #: 29

Title of Abstract: Comparison of Dose From Single Energy and Dual Energy Multi-Detector Computed Tomography Examinations in the Same Patient Screened for Hepatocellular Carcinoma

Institution: Cleveland Clinic

Authors: Andrei S Purysko, MD; Mark E Baker, MD; Andrew N Primak, PhD; Erick M Remer, MD; Nancy A Obuchowski, PhD; Binu John, MD; Brian R Herts, MD

Modality: CT

Organ System: GI

Intro: Despite the increase number of reported applications for dual-energy (DE) imaging with multidetector computed tomography (MDCT), there is scarce data regarding radiation dose compared to single-energy MDCT examinations.

Purpose: To compare differences in dose and noise level between single- (SE) and dual-energy (DE) MDCT scans in patients screened for hepatocellular carcinoma.

Methods Used: 59 adults undergoing HCC screening with 3-phase CT (unenhanced, arterial and portal-venous phases) were scanned on both SE (Sensation 64, Siemens Healthcare) and DE CT scanners (Flash, Siemens Healthcare) on different dates. SE scans performed using 120kVp, and DE scans at 100kVp and 140kVp, with mAs adjusted to match the estimated CTDIvol of the SE scan. The CTDIvol and DLP were recorded. Effective diameter (ED) and size-specific dose estimate (SSDE) were calculated using AP and transverse dimensions from CT radiographs. Hounsfield unit and standard deviation were recorded from ROIs in liver, retroperitoneal fat, IVC, and aorta. Paired t-tests were used to compare BMI, weight, and ED. Distributions of outcome variables (dose and noise) were examined using Q-Q plots and Shapiro tests.

Results of Abstract: Subject BMI and weight highly correlated with the ED ($r=0.75$ and 0.87) and did not differ between scans. CTDIvol and SSDE were significantly lower for all phases on DE compared to SE scans (p -values <0.001). On DE scans, the mean CTDIvol and SSDE were 8.6 and 8.2mGy, respectively, for unenhanced and arterial phases, and 8.8 and 8.5mGy for the portal venous phase. On SE scans, the mean CTDIvol and SSDE were 12.6 and 12.7 mGy for unenhanced and arterial phases, and 13.5 and 13.7mGy for the portal venous phase. Mean noise was not significantly different for DE and SE scans for both the liver and RP fat ($p=1.0$), but was significantly lower for DE scans for IVC (22 vs. 23.2; $p=0.025$) and aorta (25.2 vs. 26.2; $p=0.008$).

Discussion: Dose with the MDCT DE scanning protocol was significantly lower when compared to SE examinations, with either similar or lower noise levels.

Scientific and/or Clinical Significance? DE scanning protocols can be an alternative to decrease dose in patients undergoing HCC screening who require repetitive imaging.

Relationship to existing work This study agrees with the conclusion of phantom based studies that suggest that DE protocols can be performed without radiation dose penalty to patients.

N/A