

**Presenter:** Achille Mileto, MD

**Title of Abstract:** **Dual Energy CT in Hypervascular Liver Lesions: Selection of the Optimal Monochromatic Energy Level with Gemstone Spectral Imaging**

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**Modality:** CT

**Organ System:** GI

**Intro:** There is still uncertainty about the factors affecting the optimization of monochromatic imaging using dual energy CT datasets. This gap of knowledge may hamper implementation of monochromatic imaging in clinical practice.

**Purpose:** To investigate the optimal monochromatic energy level for hypervascular liver lesion detection using gemstone spectral imaging (GSI) dual energy CT.

**Methods Used:** IRB-approval was obtained and patient consent waived for this HIPAA-compliant, retrospective study. An anthropomorphic liver phantom in 3 sizes (small, medium, large) with iodinated inserts simulating low- and high-contrast hypervascular lesions was imaged with single source, fast kV-switching dual energy CT as well as with four single energy acquisitions (80 kVp, 100 kVp, 120 kVp, and 140 kVp). Radiation output was kept constant for all acquisitions. Additionally, dual energy CT was performed in 48 patients (30 men, 18 women; age range, 36-86 years; BMI range, 18.1-49.2 kg/m<sup>2</sup>) with hypervascular liver tumors. Monochromatic images were reconstructed for the dual energy datasets from 40 to 140 keV, with 10-keV increments. The effect of lesion iodine concentration and effective diameter on image noise and the tumor-to-liver contrast-to-noise ratio (CNR) was compared among the different datasets in both the phantom and patients.

**Results of Abstract:** Phantom and clinical data showed a dependency of both the optimal keV and CNR on body size. The lowest noise occurred at 70 keV for both small and medium phantom sizes, and 80 keV for large size.

The highest tumor-to-liver CNR occurred at 50 keV for both small and medium phantom size, and 60 keV for large size. There was a strong correlation between phantom and patients data for the optimal keV ( $R^2=0.92$ ). Tumor-to-liver CNR was significantly higher for low-contrast lesions using optimal keV compared to single energy images, for all phantom sizes ( $P<.0001$ ).

**Discussion:** The optimal keV selection for hypervascular liver lesion detection is strongly dependent on body size. Optimal keV images may improve the conspicuity of subtle hypervascular liver lesions, compared to single energy acquisitions.

**Scientific and/or Clinical Significance?** Body size needs to be considered for selection of the optimal monochromatic energy for hypervascular liver lesion detection.

**Relationship to existing work** Our phantom and clinical data demonstrate the effect of body size on the selection of the optimal monochromatic energy selection in hypervascular liver lesions.