Quantitative Evaluation of TrueFidelity (Deep Learning Image Reconstruction) for Gemstone Spectral Imaging (GSI).

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METHODS:

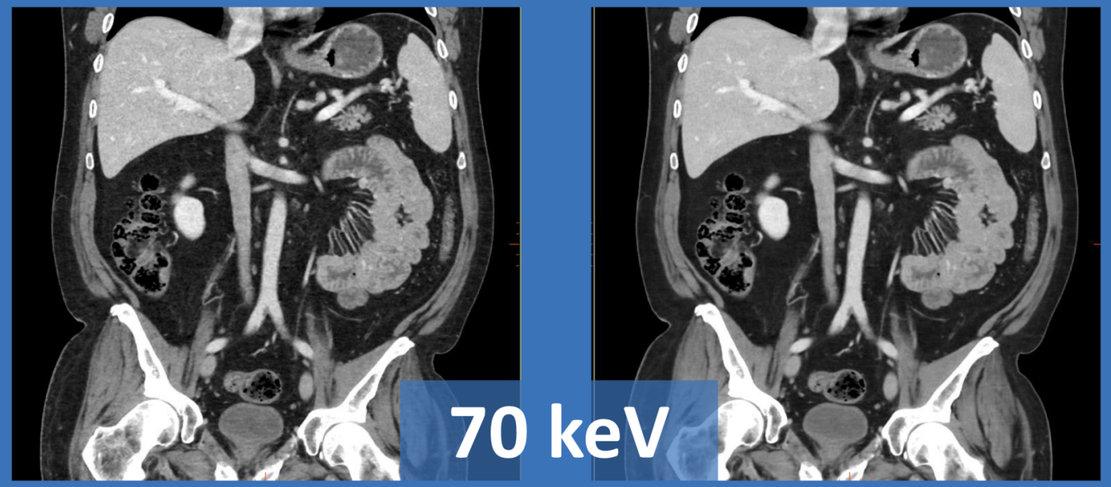
The GSI acquisitions used GE Revolution CT systems (GE Healthcare, Waukesha WI). The system offers noise reduction via an iterative reconstruction method (ASIR-V). In this abstract we compare a Deep Learning Image Reconstruction method applied to GSI data, wherein the denoising occurs on the water and iodine basis data so that all decomposition materials are possible. For the purpose of this comparison purposes ASiR-V 50% (mid-high range of clinically prescribed settings) was compared with DL-H (High setting).

1. **Noise Measurements**: Catphan® 600 with the CTP579 oval body annulus comparing pixel standard deviation in images reconstructed from the same raw data (3 systems with 7.63mGy), at 0.625 mm with DLIR-H and ASiR-V 50%.
2. **Image Resolution**: The Revolution CT Quality Assurance phantom was scanned using GSI on 3 systems (CTDIvol of 25.6 mGy). Image console analysis of the high contrast spatial resolution was performed, from image thick of 5mm with std kernel.
3. **MD Accuracy**: MD accuracy was measured using a Gammex Multi-Energy CT phantom with various inserts, using GSI MD images reconstructed with DLIR-H and ASiR-V 50%, with image thickness of 5mm.

RESULTS:

- The image resolution matched (see center), the MD accuracy matched (see right), and the noise was significantly reduced using DLIR for GSI.

DLIR for GSI, enables reduced noise for clinically relevant settings, with equivalent spatial resolution and MD accuracy.



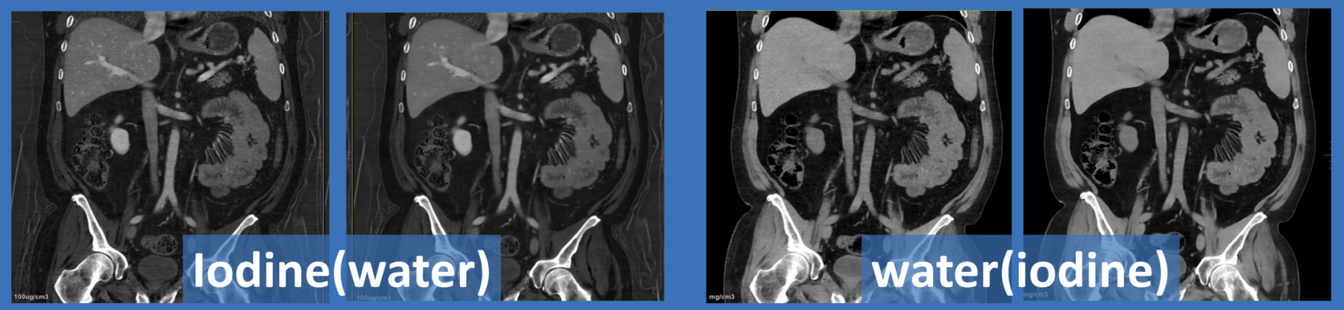


Image Resolution

70 keV

$$\frac{MTF_{50}\ DL{-}H}{MTF_{50}\ AR50} = 1.05$$

$$\frac{MTF_{10}\ DL{-}H}{MTF_{10}\ AR50} = 1.00$$

Image Noise

70 keV $\frac{\sigma\ DL{-}H}{\sigma\ AR50.} = 0.62$

water $\frac{\sigma\ DL{-}H}{\sigma\ AR50.} = 0.71$

iodine $\frac{\sigma\ DL{-}H}{\sigma\ AR50.} = 0.58$

MD Accuracy

Matched well for a Range of materials to within 5%

Additional Details if you are interested:

Table Description : Details on the scan mode, dose, and comparison values of MD Accuracy.

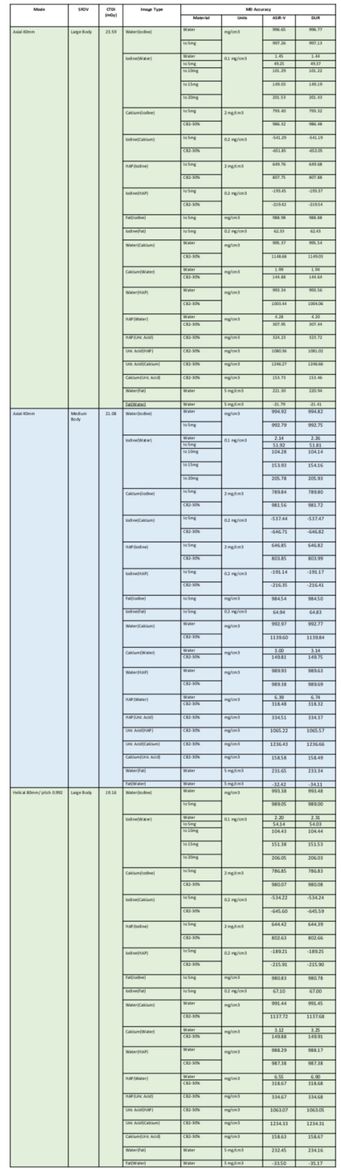


Figure Description : Coronal image comparison, 3mm thickness into the plane from 0.625 thick native images. ww/wl (70keV 400, 40 HU), (iodine 15.0, 5.0 mg/ml), (water 250, 1020 mg/ml).