



# Solving the High Image Quality with Low Radiation Dose Paradox



What is the primary concern that physicians have regarding the use of CT systems versus other modalities? Dose.

Across the world, there is a general clinical consensus to lower the patient's exposure to radiation dose, particularly during CT scanning. Yet, reducing the dose on existing CT systems often had a negative impact on image quality.



Figure 1a. Non-HDCT

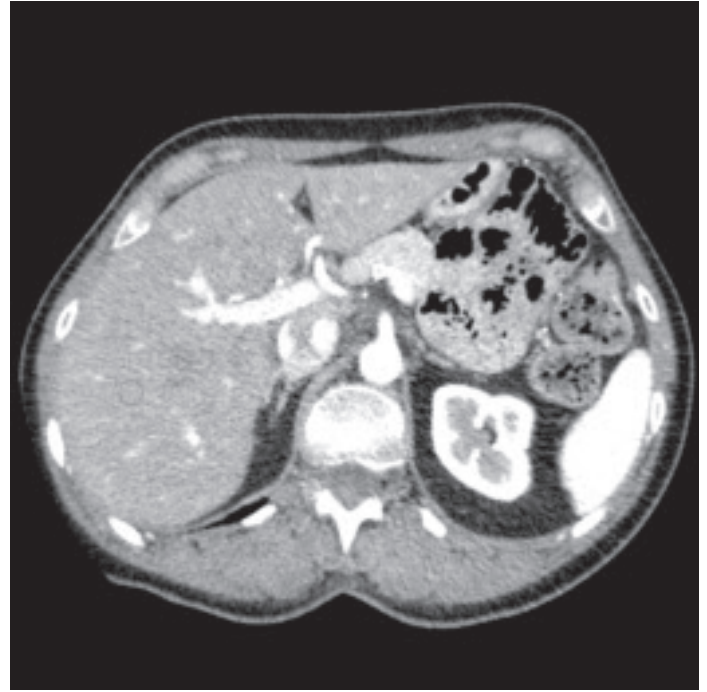


Figure 1b. Discovery CT750 HD

With the introduction of the Discovery™ CT750 HD and the LightSpeed® VCT XTe\* GE Healthcare provides a new opportunity for clinicians to significantly reduce dose without affecting image quality. A new reconstruction technique, Adaptive Statistical Iterative Reconstruction (ASIR), enables reduction in image noise and improvement in low contrast detectability (LCD) and image quality.

By reducing the image noise in CT images, ASIR decreases dose across the entire body by up to 50% for Discovery CT750 HD, and up to 40% for LightSpeed VCT XTe\* allowing you to manage dose without sacrificing image quality. The Discovery CT750 HD scanner also delivers up to 40% improvement in LCD and improves the image quality at 50% lower dose.

The R&D path to lower dose began nearly eight years ago. As GE grappled with the issue of how to lower dose, GE engineers, scientists, and external research partners examined different approaches to image reconstruction. According to Jiang Hsieh, Chief Scientist, GE Healthcare, they discovered that the model-based iterative reconstruction (MBIR) algorithm approach showed great promise by significantly increasing image quality, but it took too long for practical clinical use.

“We all knew that we were onto something important,” says Hsieh, “so we began to evaluate how we can obtain the benefits of ASIR while simultaneously reducing the time element.” As Hsieh and his peers examined the algorithm, they determined the greatest amount of time was consumed during modeling of the system optics. Therefore, they focused their efforts on the statistical portion of the algorithm.

The result is ASIR: a new algorithm that decreases reconstruction time and reduces image noise for the cumulative effect of improving image quality.

ASIR doesn’t stop there. “By reducing noise, ASIR enables clinicians to also reduce tube current (mA) without impacting image quality,” adds Hsieh. “The crux of our design philosophy surrounding ASIR was to reduce noise, decrease the reconstruction time, and lower the dose – and accomplish this with greater image clarity.”

These comparison images above (Figures 1a and 1b) are from the same patient scanned at different mA values, 251 and 161 respectively. All other scan parameters were the same. The Discovery CT750 HD image at 161 mA delivers the same noise measurement in standard deviations as the non-HDCT image. This is a dose saving of approximately 36%.

\*A premium LightSpeed VCT configuration.

The images in Figure 2 are both from the same HDCT data set. The image on the left does not have ASIR applied. The image on the right was reconstructed using 50% ASIR.

This last image set (Figure 3) demonstrates the application of 50% ASIR; note that there is no loss in anatomical detail and the anatomical integrity of the image is maintained.

In summary, ASIR is an advanced reconstruction algorithm that, when used in combination with a lower mA, can deliver up to 50% less dose to the patient on the Discovery™ CT750 HD and up to 40% less dose to the patient on the LightSpeed® VCT XTe,\* yet still maintain equivalent image quality without a loss in spatial resolution or anatomical integrity. ■



Figure 2a. CT750 HD without ASIR

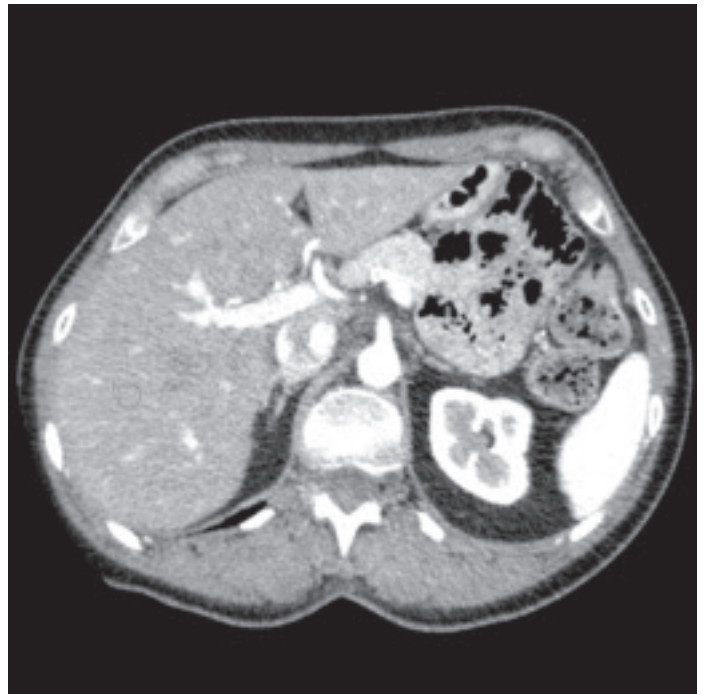


Figure 2b. CT750 HD with 50% ASIR

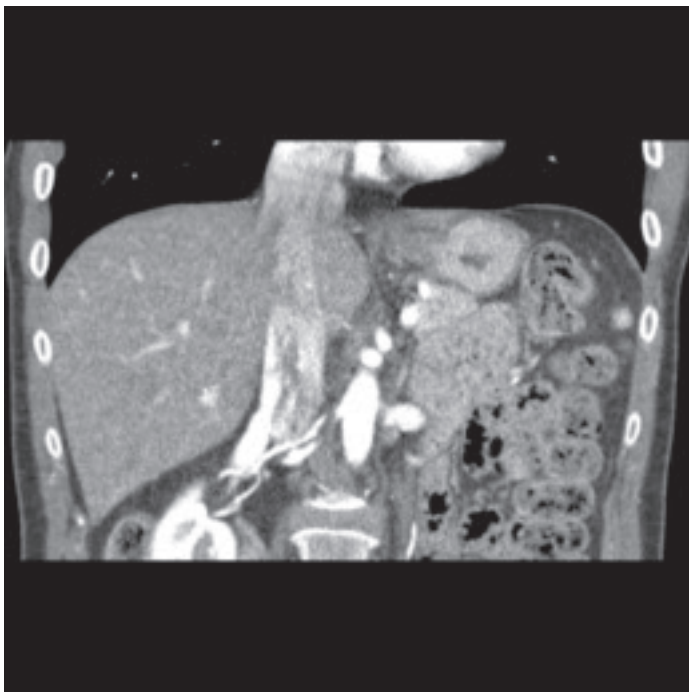


Figure 3a. CT750 HD without ASIR

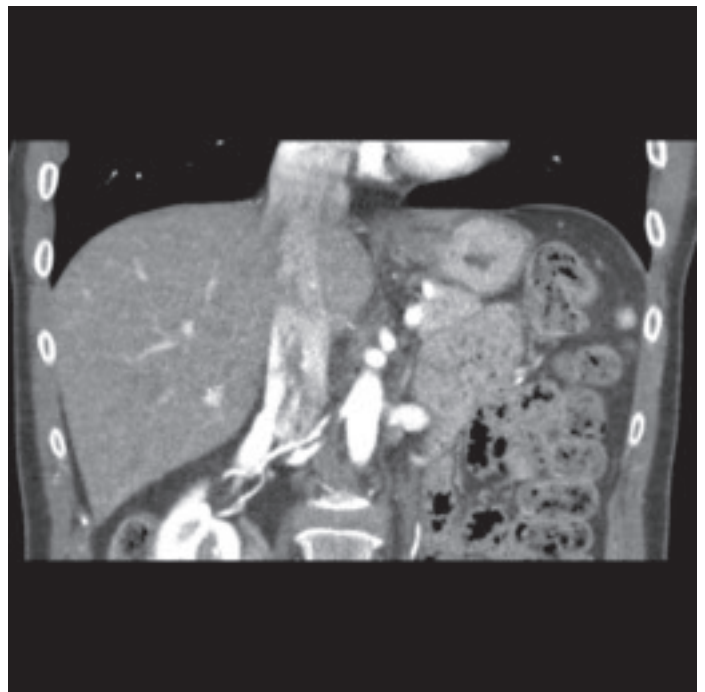


Figure 3b. CT750 HD with 50% ASIR