TRUE FIDELITY™

The voice of customers

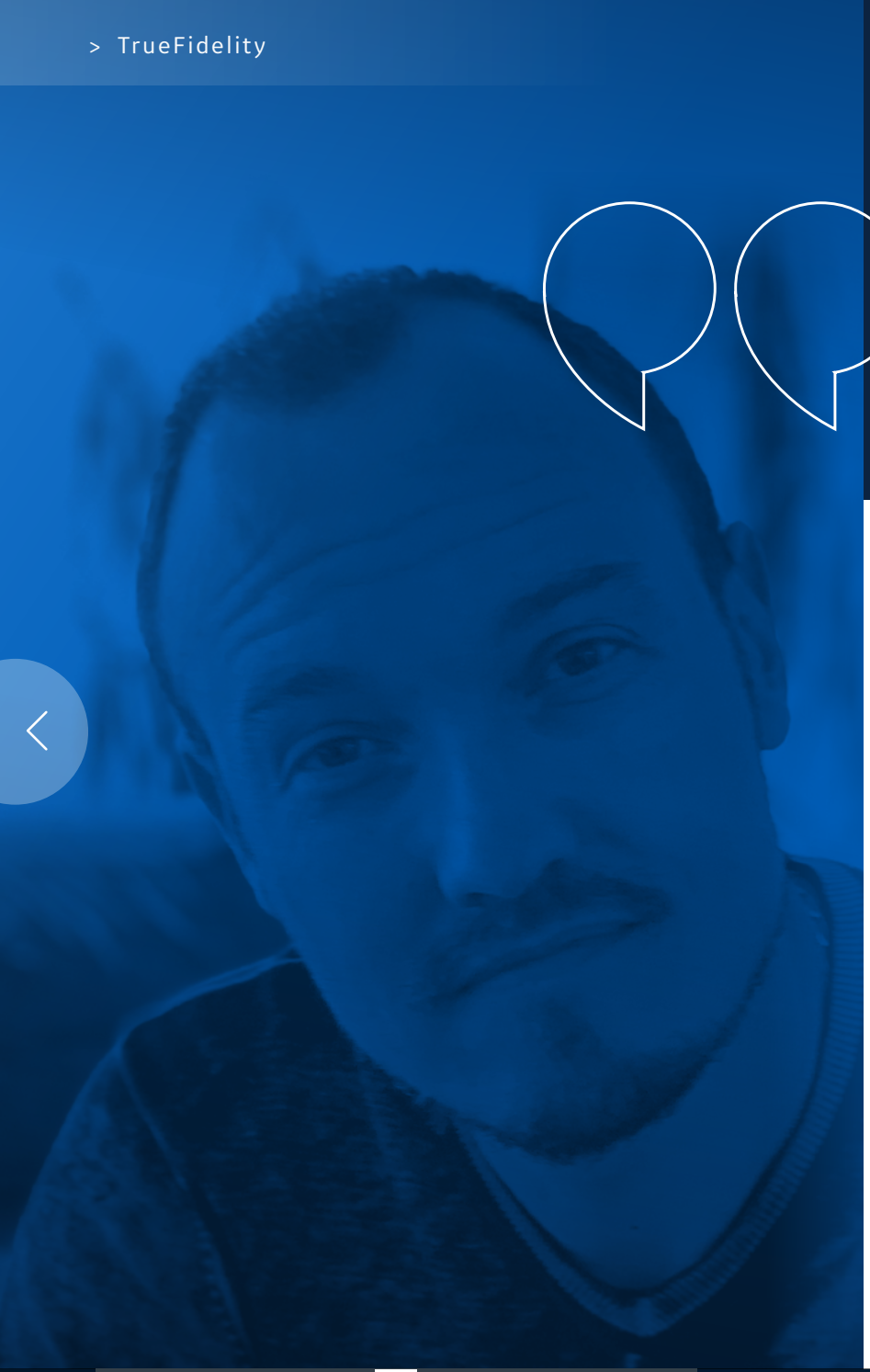
CUSTOMER TESTIMONIALS

INFOGRAPHICS

A FUTURISTIC TAKE ON TRADITIONAL IMAGE RECONSTRUCTION

For years, low dosage was the benchmark for image quality to which every CT image was held. We helped set the standard for low-dose imaging back in 2008 with an iterative reconstruction technology capable of lowering doses by 50 percent.

Over the years, the benchmark has changed. While dosage is still important, radiologists are looking for an image texture reminiscent of the text-book quality images they studied in medical school. To that end, we have introduced deep learning image reconstruction, that we feel is the future of image quality. It uses artificial intelligence to turn image texture back to "traditional-looking" maintaining the low dose of iterative reconstruction.



DR. FRANÇOIS KLEIN

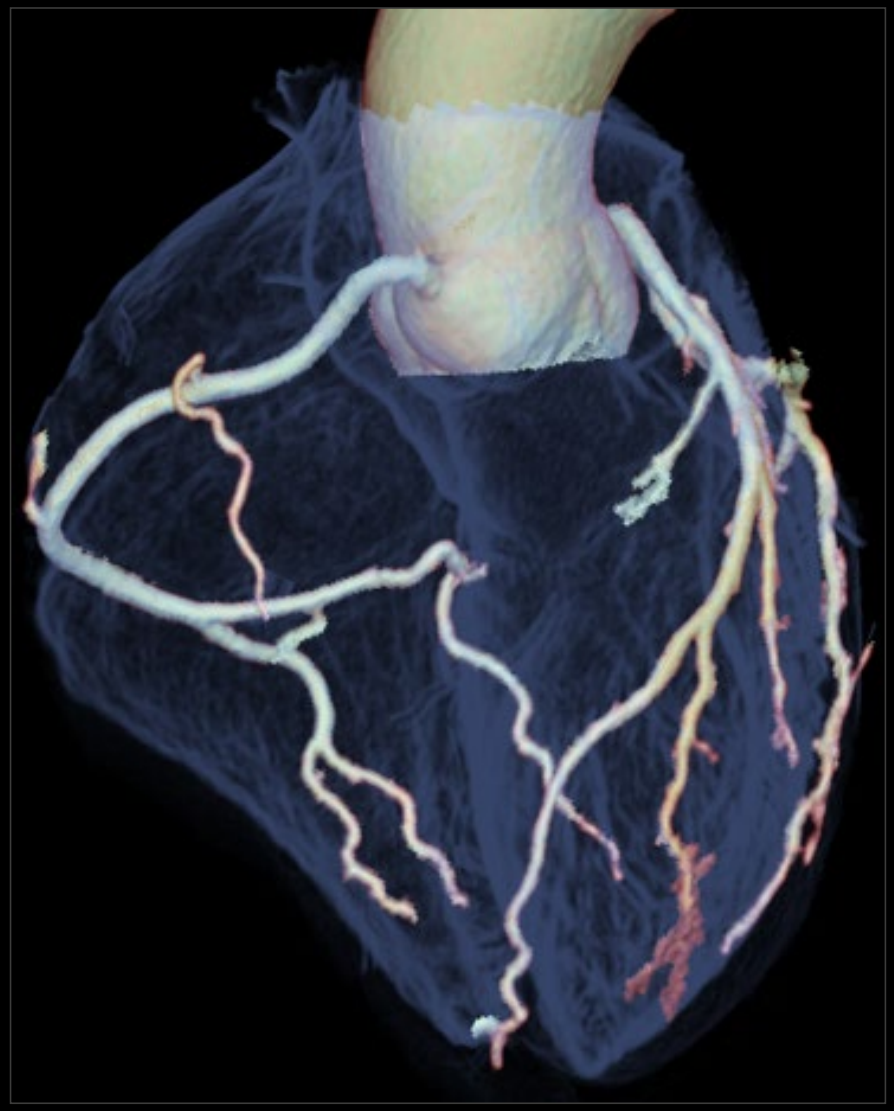
Radiologist - Department Head - Private Practice Millénaire - Montpellier, France

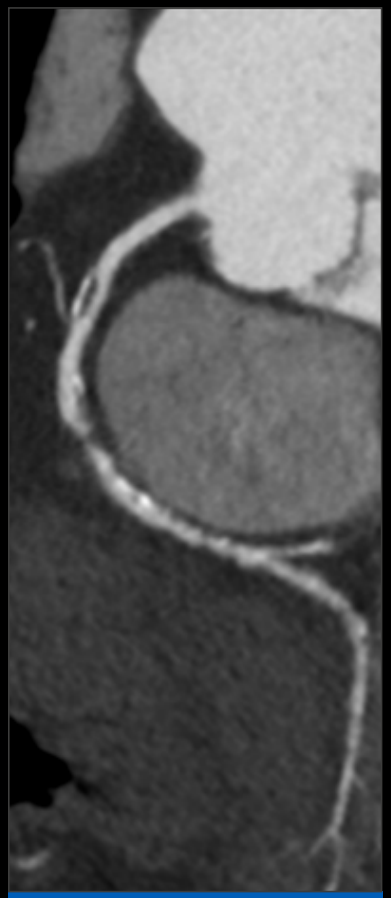
Working on 2 GE Healthcare CT, used a Revolution™ CT for five years, upgraded to Revolution Apex™ in August 2020.
Specialist in cardio-thoracic imaging.
1950 CCTA performed in the department in 2020.

Our first impression watching TrueFidelity images was of astonishment at the impressive effect on the image quality of the abdomen, and the sharpness and homogeneity of fat. On cardiac acquisitions, the homogeneity of the contrast of vessels, with the decrease of noise in the image, allowed routine use of 70 and 80 kV, leading to improved resolution in contrast and improved reliability in stenosis quantification.
After a comparative study of 100 CCTA performed respectively on the old generation Revolution CT and the new Revolution Apex with TrueFidelity, we found a 35% decrease in dosimetry (in patients of all sizes with an average BMI of 26.9).

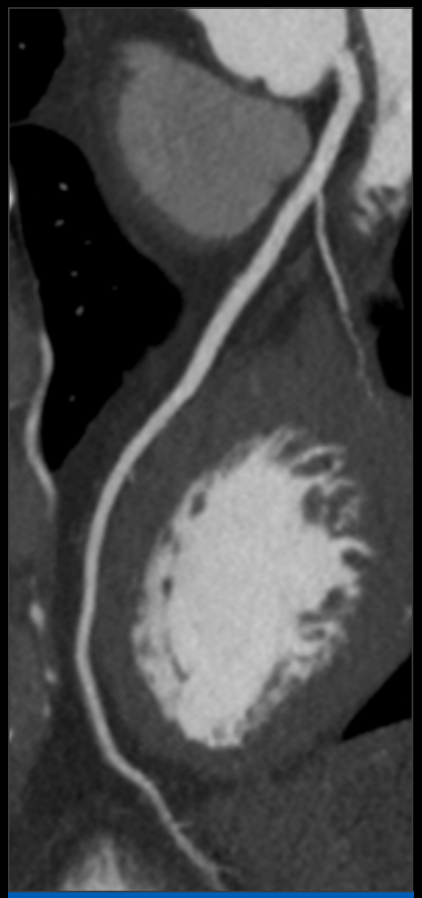
Clinical benefits

- ✓ ***Noise reduction***
- ✓ ***Dose reduction***
- ✓ ***Better homogeneity of liver tissue and abdominal fat tissue***





Good differentiation between intravascular iodine, calcifications and soft plaques.



Homogeneous enhancement with minimum noise level.

DR. RONNY BUECHEL

Department of Nuclear Medicine, University Hospital Zurich, Switzerland

Multimodality non-invasive cardiac imaging such as CT, SPECT, PET, and MRI, including hybrid imaging.

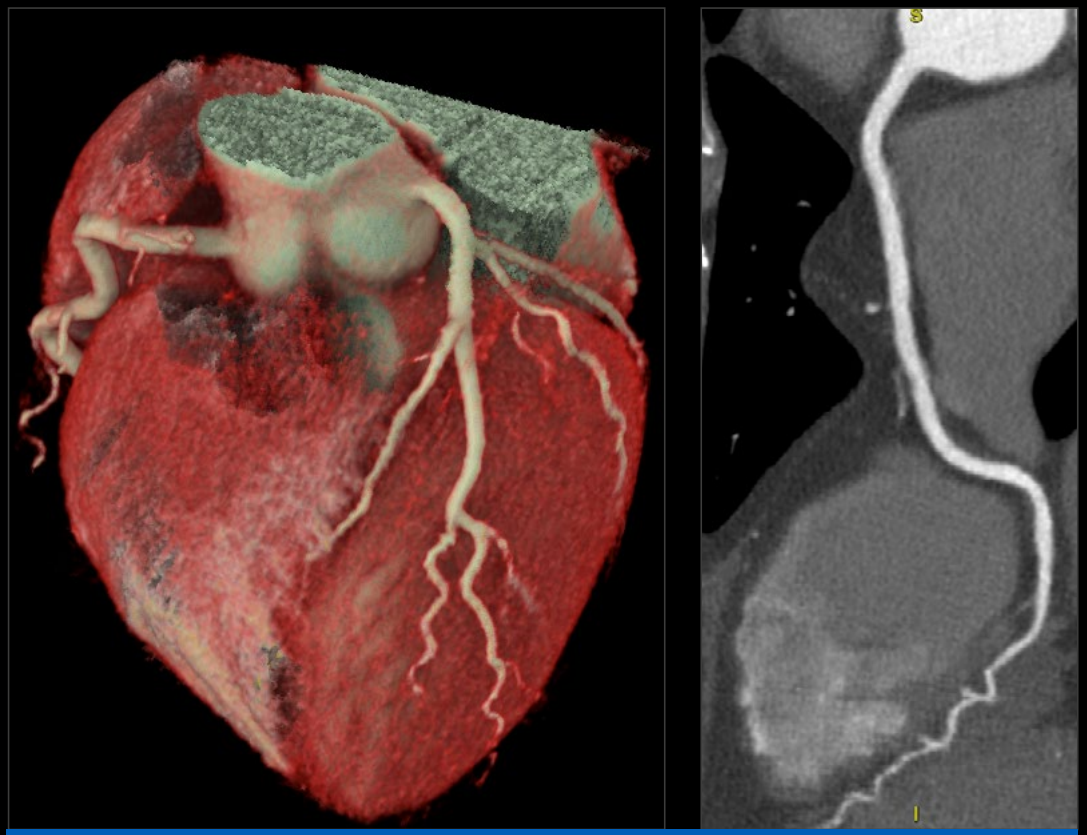
When performing CCTA at very low radiation, you need to increase the level of iterative reconstruction to compensate for the noise, but this comes at the expense of image clarity. TrueFidelity, however preserves the details, allowing for more accurate plaque and vessel delineation. Overall, I feel this improves reading confidence.

In short, we demonstrated that TrueFidelity reduces noise by up to 40% in CCTA scans when compared to ASiR-V. However, it also yields superior image quality and provides non-inferior diagnostic accuracy when using invasive coronary as a standard of reference. The latter is of crucial importance because we want to make sure we do not lose any diagnostic information when striving towards lower radiation exposure. On the other hand, if you are already performing low-dose CCTA, you can benefit from increased image quality, which may directly impact diagnostic confidence.*

After having had the chance to test the new reconstruction algorithm for several weeks and after systematic validation against a previous iterative reconstruction algorithm (ASiR-V), my team and I almost immediately switched to TrueFidelity reconstruction for clinical routine.

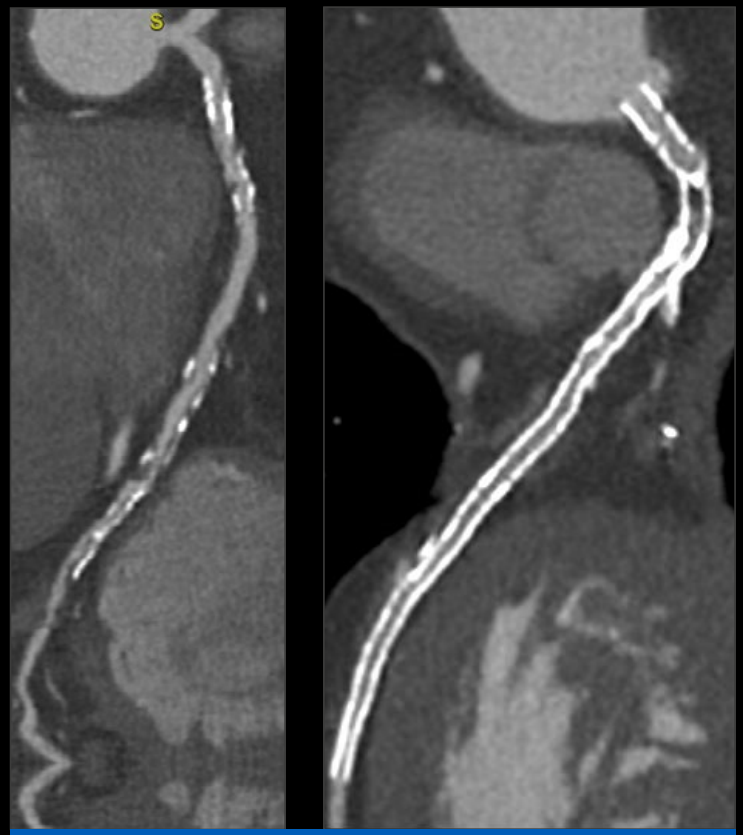
** The views and opinions expressed are those of the speaker and do not necessarily reflect the official policy or position of GE Healthcare or General Electric.*

CCTA @ 80 kV – DLP 42 - CTDI 2.6



We have demonstrated that TrueFidelity allows for a 40%* reduction in image noise as compared to ASiR-V. Of course, the logical consequence is to reduce radiation dose exposure by the same amount - while preserving good image quality. We are currently validating this next step.

LAD *RCA*



TrueFidelity preserves details, allowing for more accurate plaque and vessel delineation. Overall, I feel this improves reading confidence.

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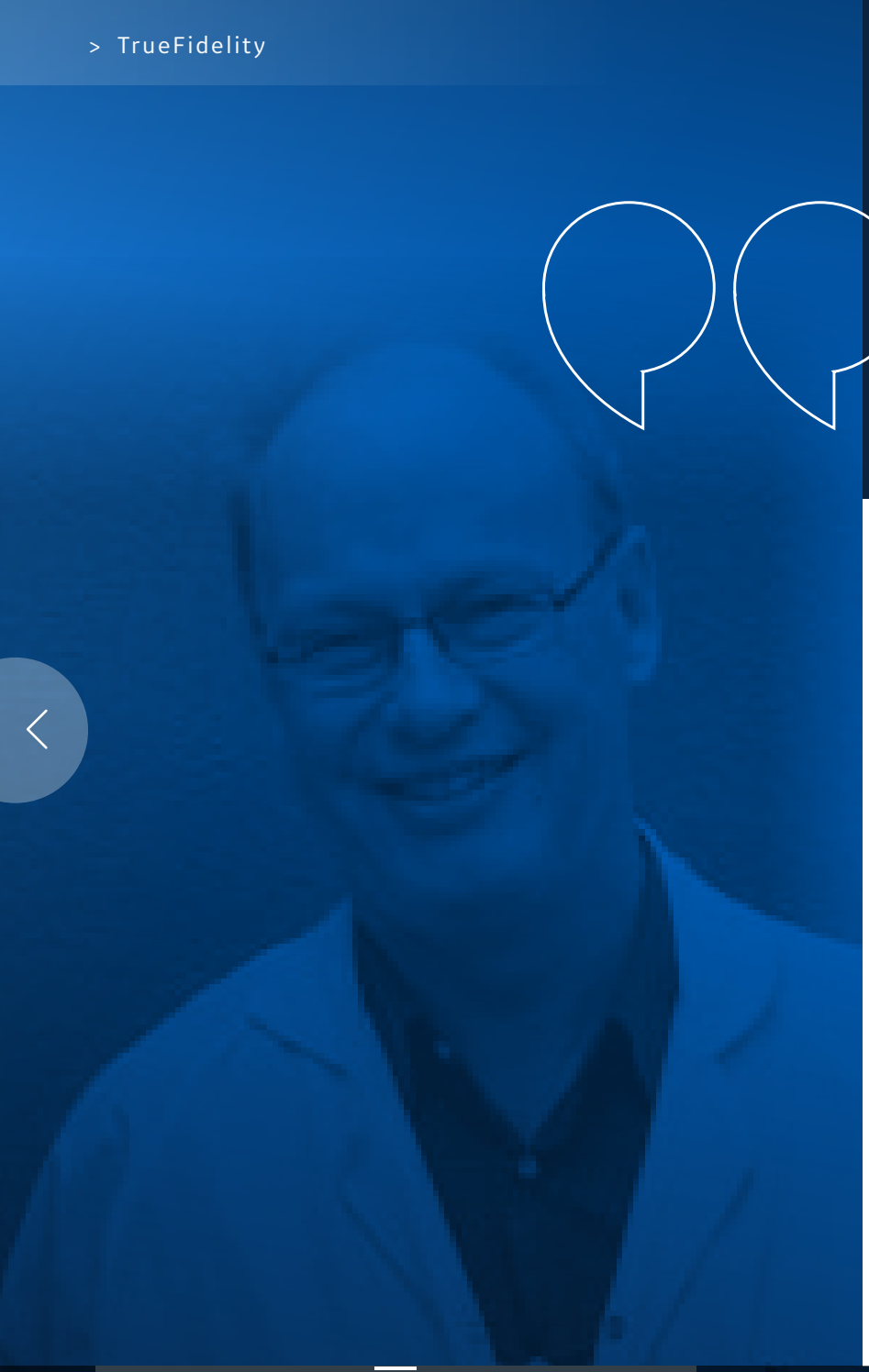


PROF. JEAN-NICOLAS DACHER

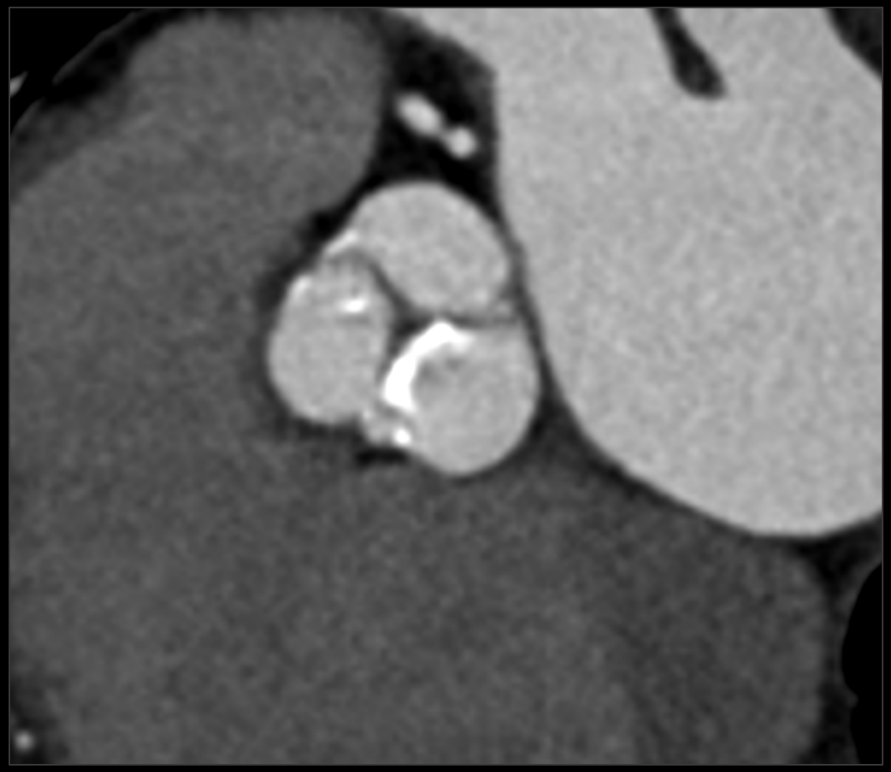
Professor of Radiology and Medical Imaging, University Hospital of Rouen, France

Cardiac radiologist with a special interest in coronary and valvular heart disease.
Revolution CT user upgraded to Revolution Apex in November 2020.

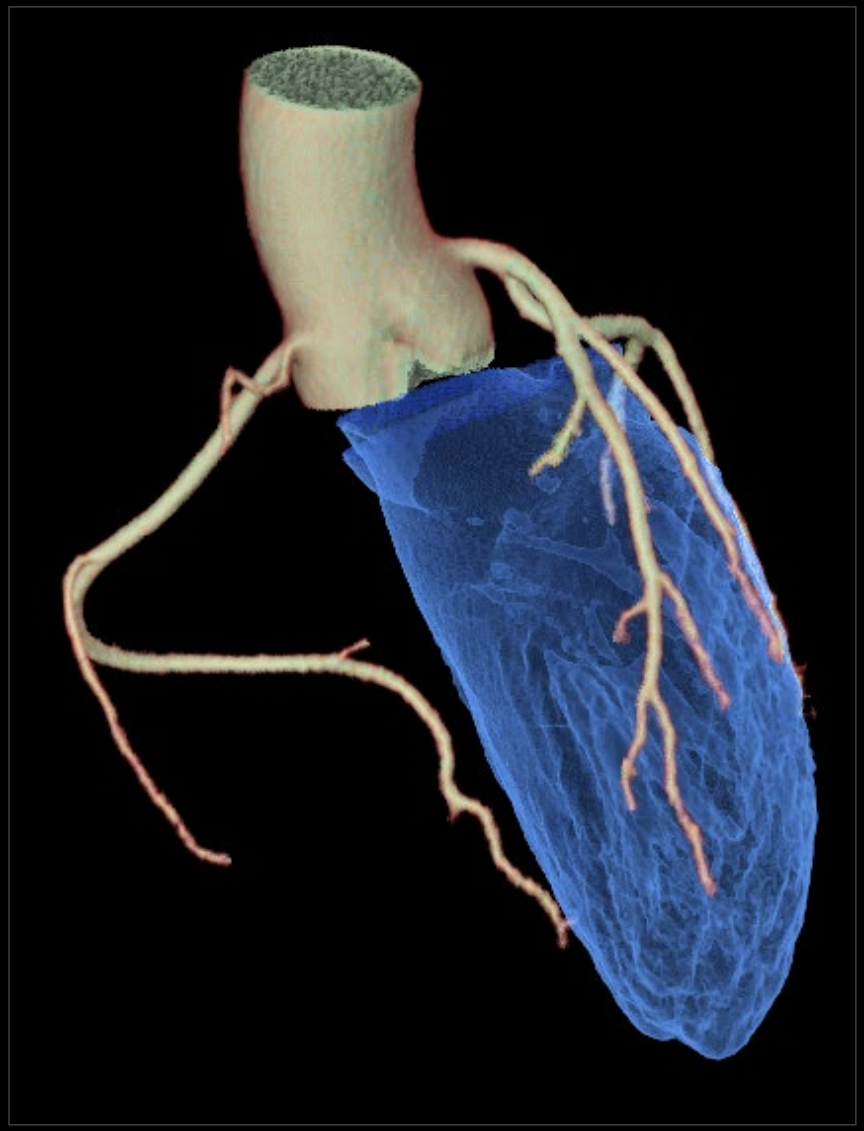
After the era of iterative reconstruction, a new era has emerged which is reconstruction by deep learning (deep learning, TrueFidelity). We use it routinely and have completely done away with previous iterative reconstructions.

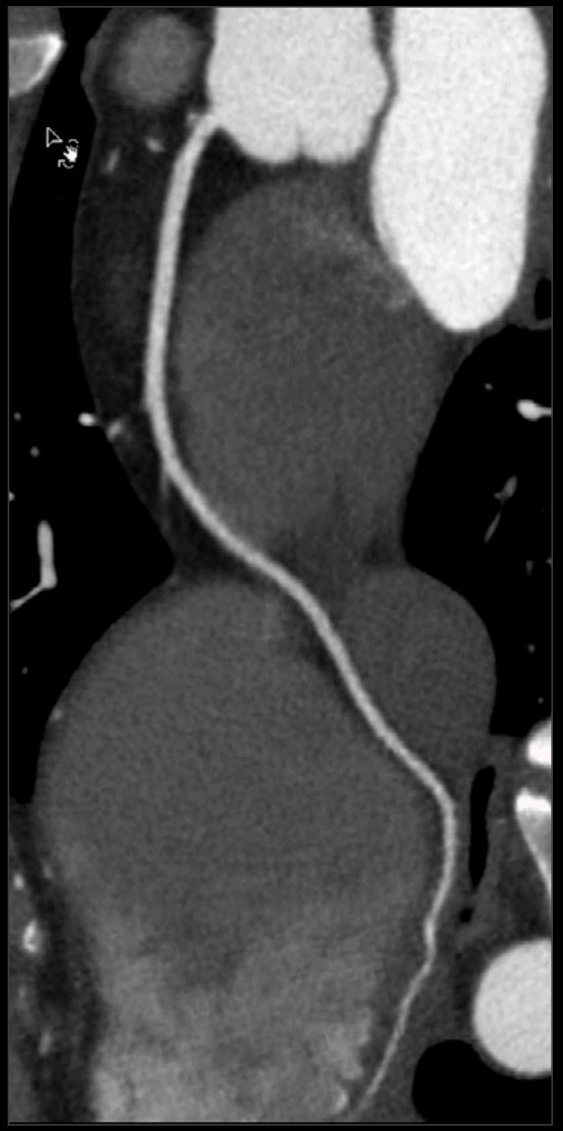
The image (TrueFidelity at the "high" level) is of optimal quality and allows perfectly interpretable curvilinear and endoluminal reconstructions. A very important element seems to us to be the quality of the TrueFidelity reconstructions of calcified structures whether these are coronary arteries or valves, typically in the context of aortic stenosis.

Another very important element of this new equipment is the possibility of reducing the volume of contrast product as well as the injection rate, which is always very appreciated by the patient (typically 45 cc to 4 cc/sec of contrast product at 350 mgI/ml flushed with 50 ml of physiological serum for a coroscanner).

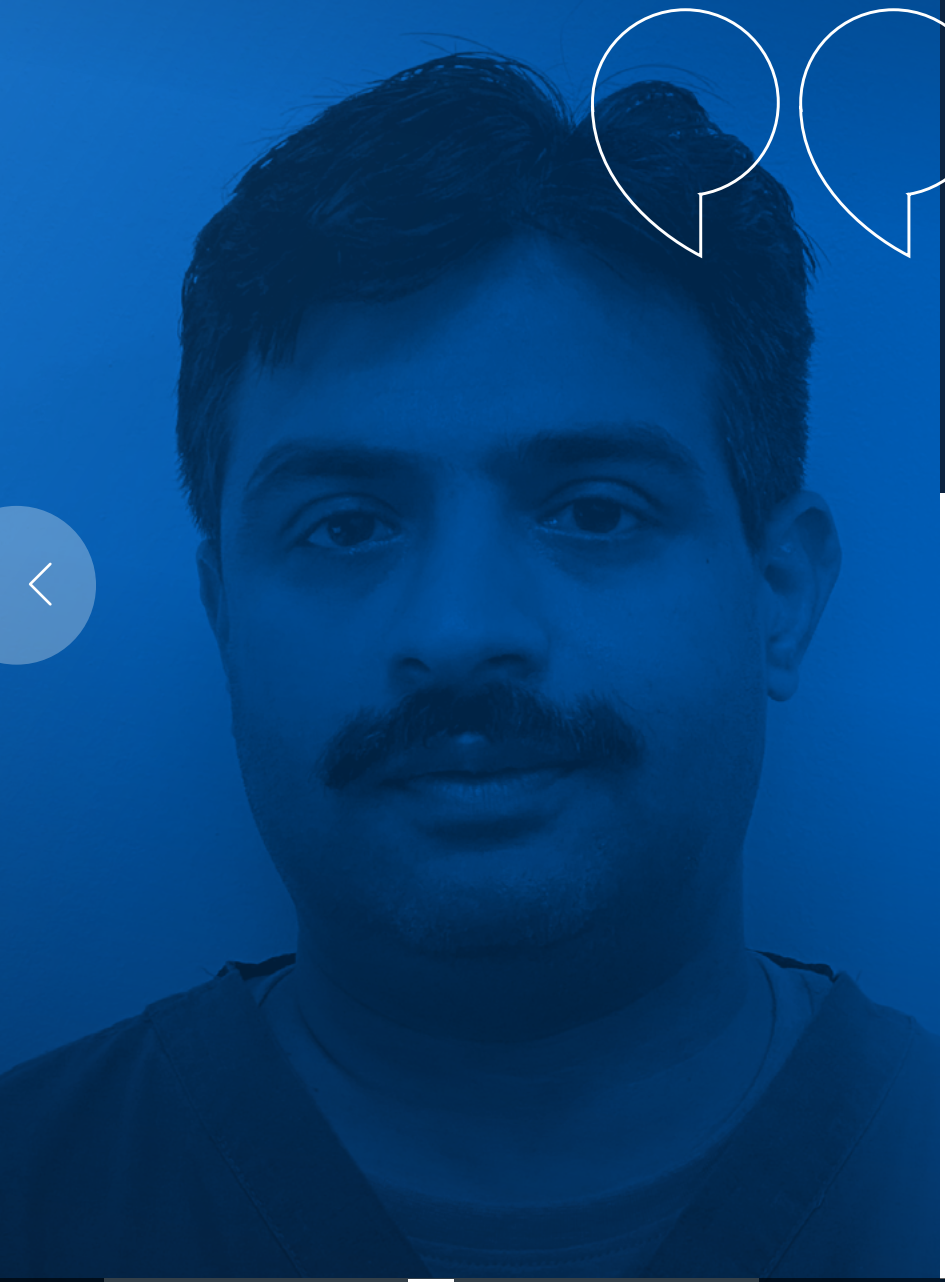


100 kV Auto settings TAVI:
Better image quality with lower kVp allows lower contrast dose thanks to TrueFidelity reconstruction.





70 kV auto settings
40 cc iodine
Better image quality with lower kVp allows lower contrast dose thanks to TrueFidelity reconstruction.



DR. SRIRANJ KANNOLY

Consultant Cardiologist – Princess of Wales Hospital, Bridgend, Wales, United Kingdom

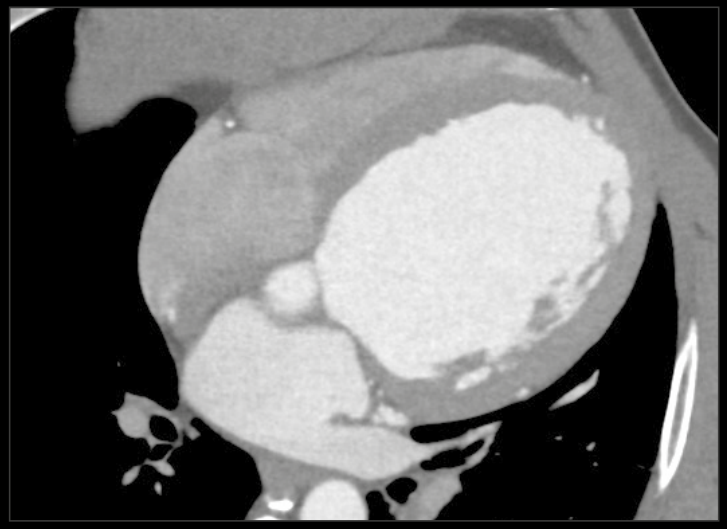
Working on Revolution Apex with TrueFidelity and Revolution CT - upgraded to TrueFidelity AI image reconstruction in December 2020.

The Princess of Wales Hospital is part of the Cwm Taf Morgannwg University Health Board and provides health services to 450 K people.

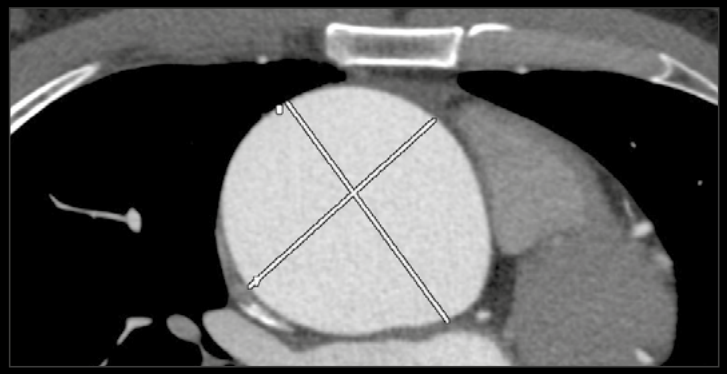
Pre-Covid-19, the Hospital was treating about 450 Cardiac cases per year. In 2020, with the installation of the Revolution Apex, we have been able to establish a full TAVI service.

TrueFidelity Cardiovascular CT images created using the deep learning image reconstruction is truly impressive!!

We are now able to obtain cardiac images of outstanding quality without any compromise in scan time or radiation dose. The sharpness and texture of images has significantly improved our confidence in reporting challenging cases, thereby contributing to delivery of optimal patient care and improved clinical outcomes.



The sharpness and texture of images has significantly improved our confidence in reporting on challenging cases.



Revolution Apex CT TrueFidelity imaging enabled us to obtain diagnostic quality images of the aorta and coronary arteries in a 'One Stop' single examination with a radiation dose less than a standard invasive catheter coronary angiography.

37 year-old male
Gated thoracic aorta and ungated abdomen and pelvis with single bolus of contrast
100 kVp
DLP267 BMI 29

DR. FRANÇOIS LEGOU

Radiologist MD, Centre Imagerie du Nord, Saint-Denis and CHU Henri Mondor Hospital APHP – Créteil, France

Abdominal (oncology) and cardiac imaging CT and MR RF. Arrived at CCN in 2019 and at CHU Mondor in 2021.

Our first impression was amazing, a real change in clinical routine care without time consuming. Exams were more pleasant to read, more restful, less tiring.

I saw a real impact in oncology imaging, especially in the liver and I found a better conspicuity for metastasis.

This is a revolutionary development for CT with a real decrease of radiation exposure, about 50-60% on each modality, even with GSI.

This technology was adopted immediately by all colleagues and radiographers. We were able to adapt our protocols very quickly to standard or GSI acquisitions.

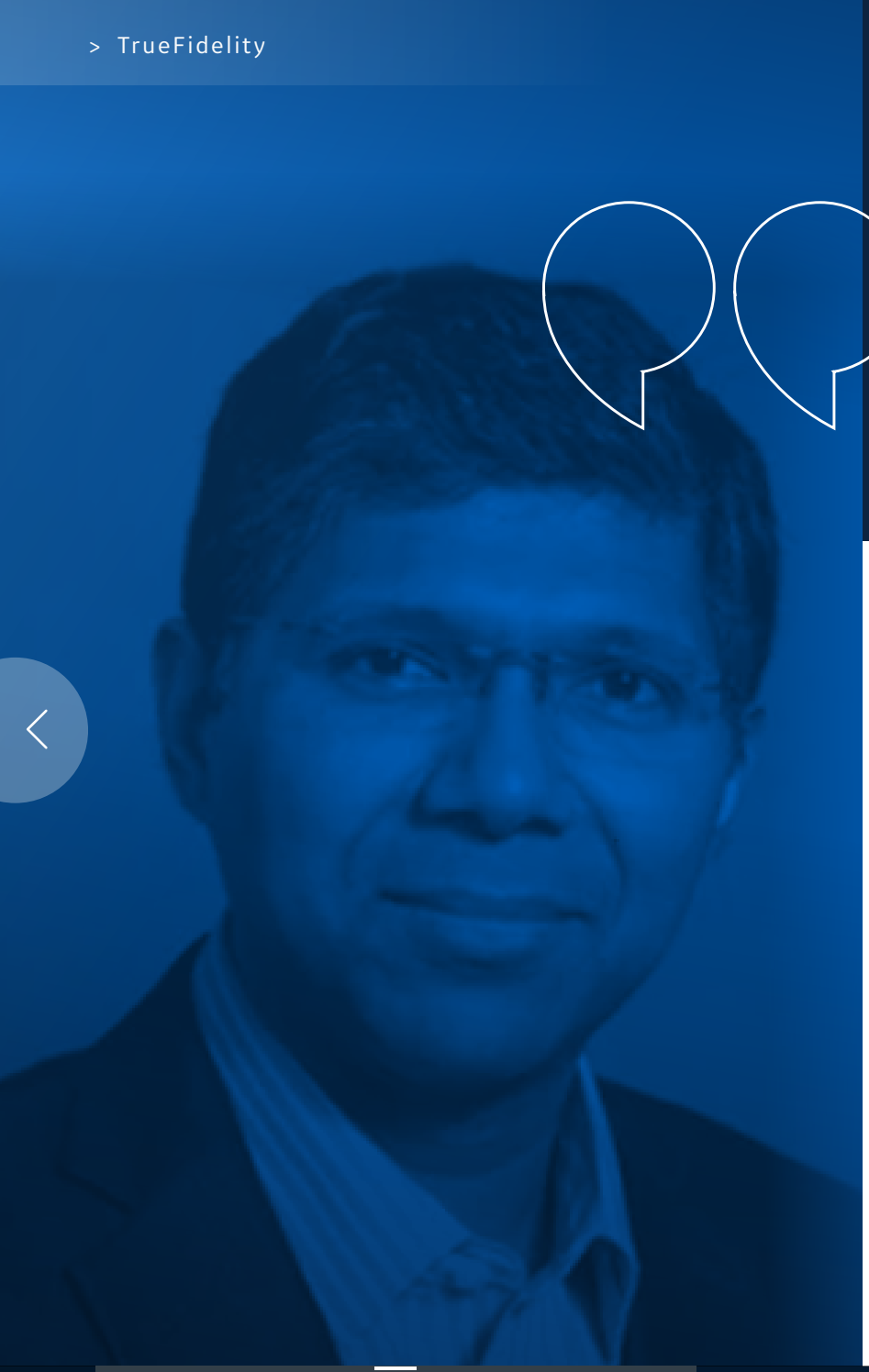
Arterial 45 keV

Iodine (Water) material decomposition

TrueFidelity is the new Revolution for CT: Best image quality, and a real decrease in radiation exposure.
The association with spectral imaging is a huge development and provides all the benefits of GSI technology: iodine map, bone edema, tissue characterization.
It is now easy to analyze mono chromatic images even at very low keV. It is now a routine clinical treatment.

For example, this is a clear image of renal carcinoma, 65 year-old man with a horseshoe kidney.

Iodine (Water) material decomposition



DR. SRI IYENGAR

Consultant Radiologist MBBS, MS (General Surgery), FRCS (Glasgow) FRCR (UK) Frimley Health NHS Foundation Trust, UK

We have two Revolution CT scanners in the department, one at the cold site and one in the acute site. The department serves a population of around 350 K and provides acute and general imaging across all modalities. TrueFidelity Image Reconstruction has been upgraded on one of our Revolution CTs.

TrueFidelity improves tissue definition in patients with high BMI especially within the mediastinum, retroperitoneum and neck areas where conventional reconstruction algorithms tend to struggle. This becomes even more relevant and important in studies where images are acquired without contrast enhancement or in follow-up studies where radiation dose reduction strategies are likely to be used.

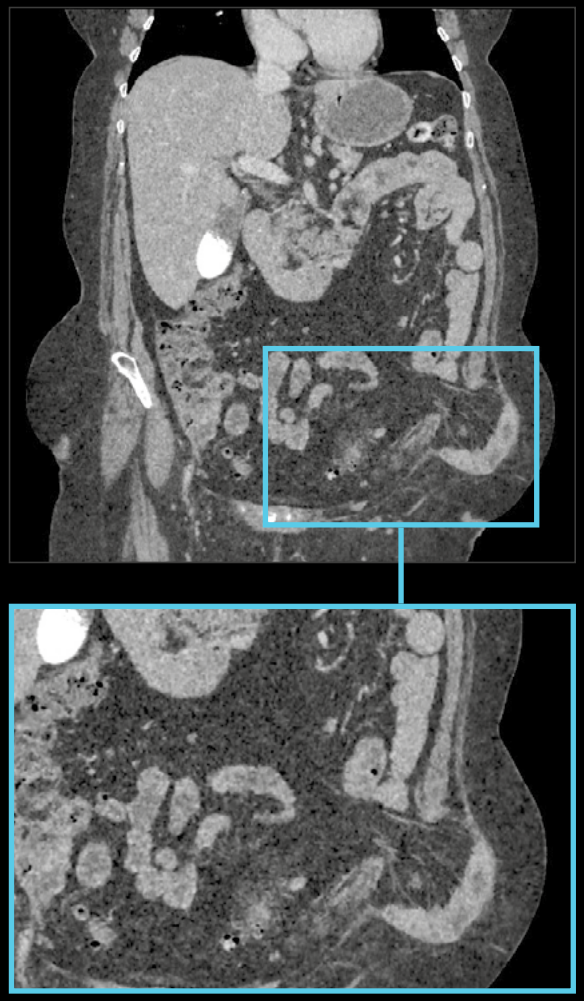


Image: 1a ASiR-V 50% 0.625 mm Standard Algorithm

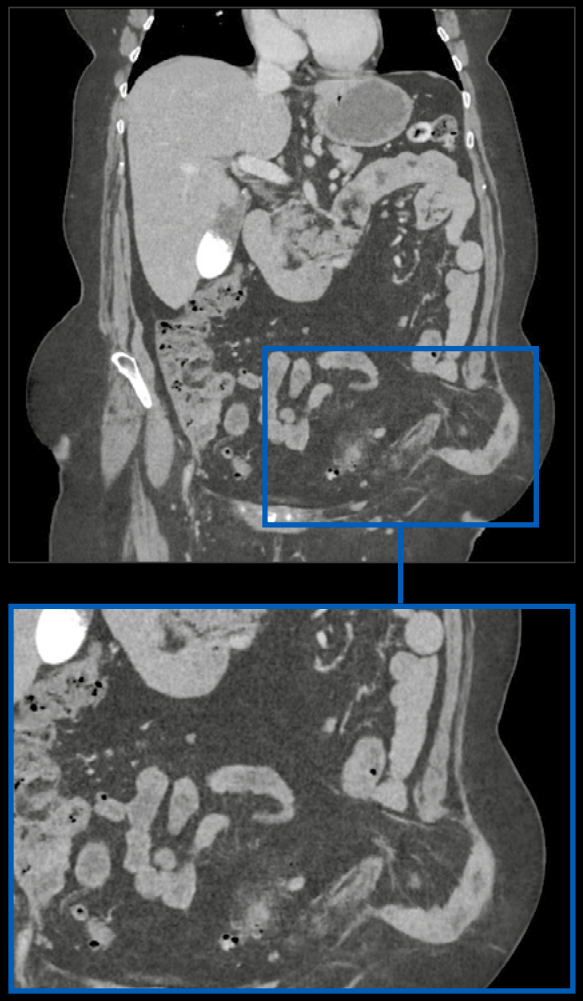


Image: 1b TrueFidelity DLIR – H 0.625 mm Standard Algorithm

My first impressions of TrueFidelity reconstruction is the images had significantly lower image noise and better contrast differentiation. The anatomical structures also appear to have sharper and clearer margins.

I see the greatest advantage and boost in image quality are in patients with higher BMI. (Images 1a & b)

Implementing new technology is often a challenge but colleagues have taken up TrueFidelity without any significant concerns.
There have been regular comments on improvement of image quality.
There was some initial concern regarding image quality in CT heads, however this has not proven to be an issue once colleagues had reviewed multiple studies.

The image quality is also better in patients undergoing low-dose follow-up imaging or younger patients where lower image quality was accepted to limit radiation exposure. (Images 2a & 2b)

In cardiac imaging there is improved image noise and contrast differentiation. There is an improvement in the image quality in patients with high calcium burden or stents.

With regards to thoracic imaging, I see improvement in the quality of CT pulmonary angiograms all the way down to the subsegmental vessels. The differentiation of mediastinal structures, especially in lymph nodes, is also significantly better in patients undergoing monitoring for cancer treatment.

So far we have not reduced radiation doses in favour of improved image quality: This is the next and natural step in the process of adoption of TrueFidelity.

44 year-old male Low Dose Renal Stone protocol – DLP 171 CTDI 3.36

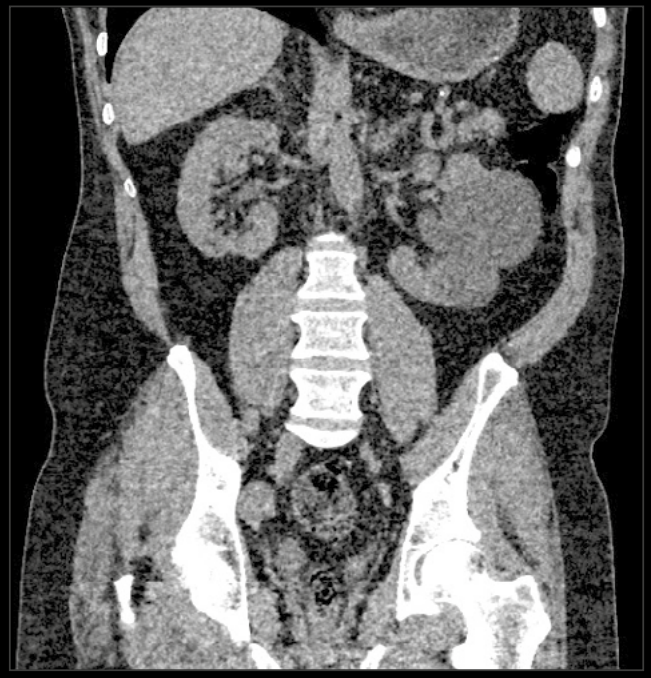


Image: 2a ASiR-V 50% 0.625 mm Standard Algorithm

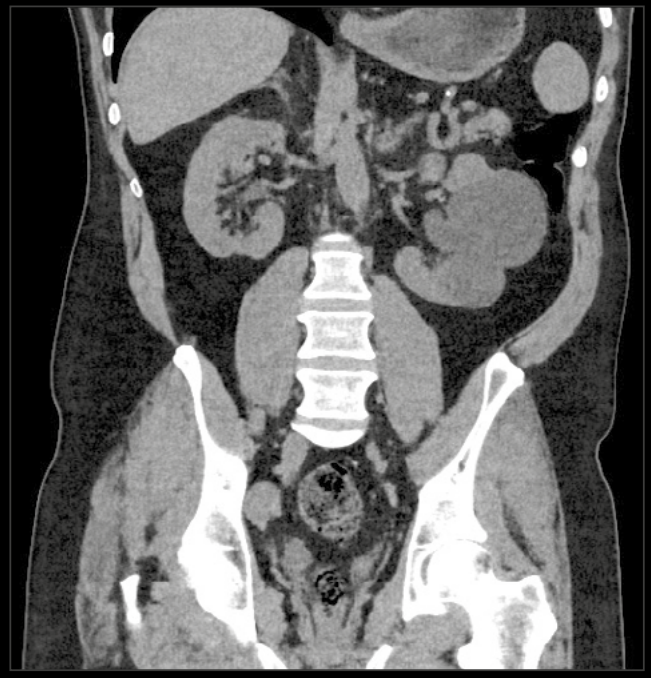
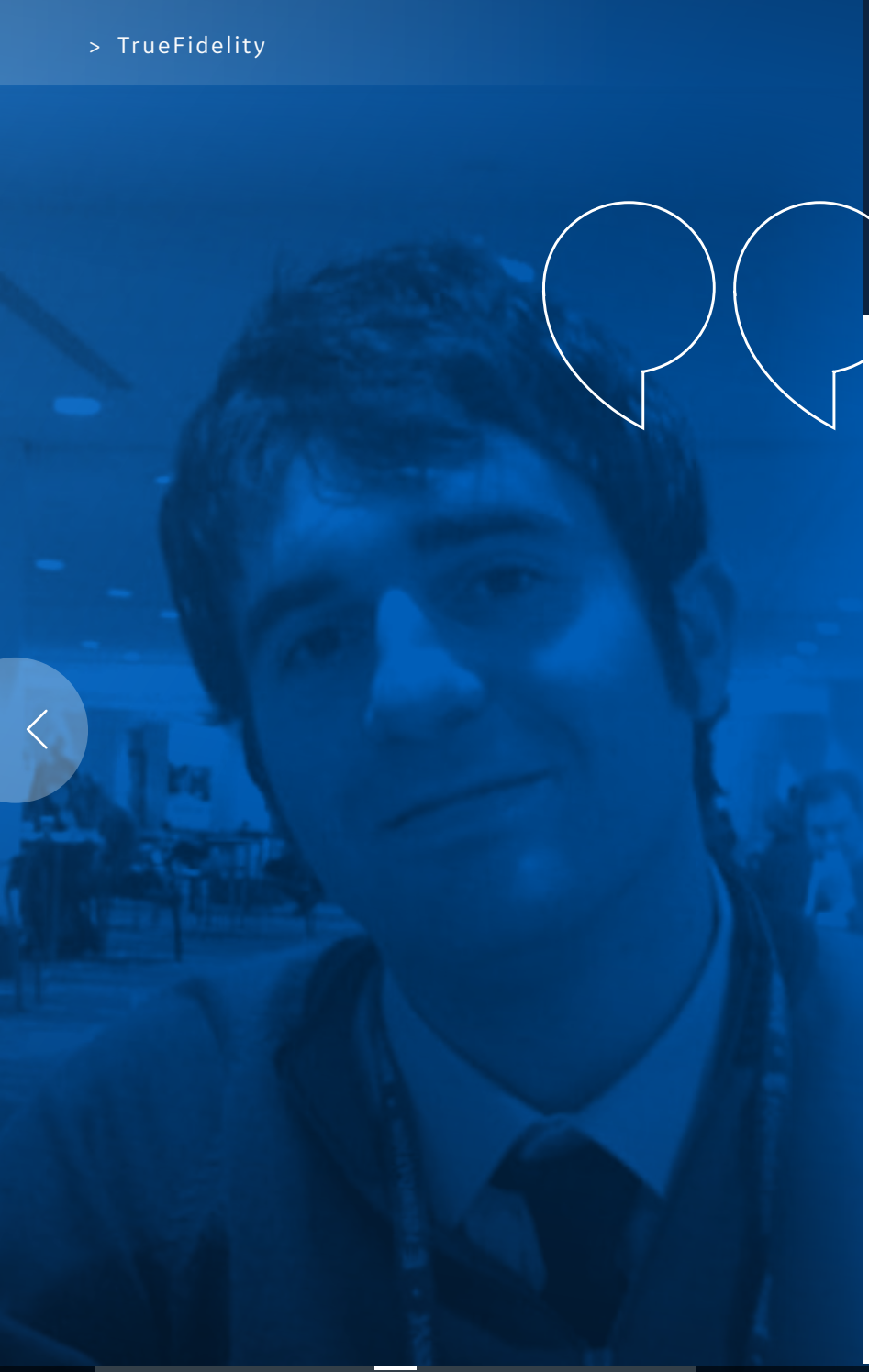


Image: 2b TrueFidelity DLIR – H 0.625 mm Standard Algorithm



DR. FABRIZIO LAMBERTI

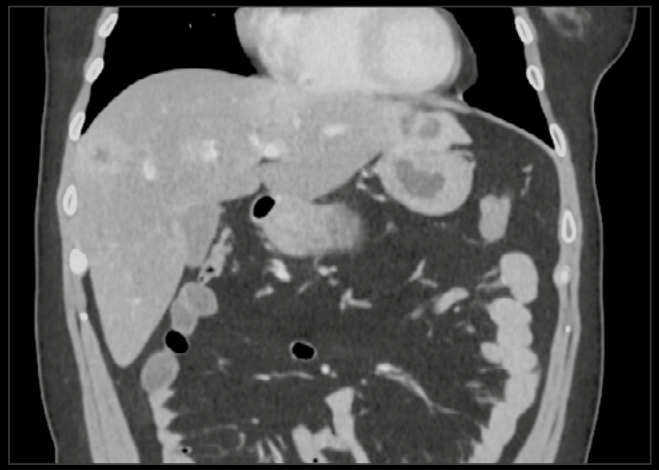
Radiologist, Istituto clinico de Blasi, Italy

My first impression was that I finally had images available that allowed me to make more confident and accurate diagnoses that were less affected by image noise. I have more confidence in evaluating the images and I can make my diagnosis faster.
My main interest is in abdominal parenchyma where noise may lend doubt to the presence or absence of alterations. I feel more confident in the diagnosis.
I do primarily oncology diagnostics and staging of tumors, greatly benefited from using TrueFidelity.
Thanks to this product, I no longer have problems with dose control because with TrueFidelity I keep the dosimetry level low and I can get diagnostic images. The big problem before was to decide whether to get good images or keep the dose low. Thanks to TrueFidelity I don't have this problem anymore and I kill two birds with one stone with lower doses on the one hand, and increased confidence in diagnosis on the other.

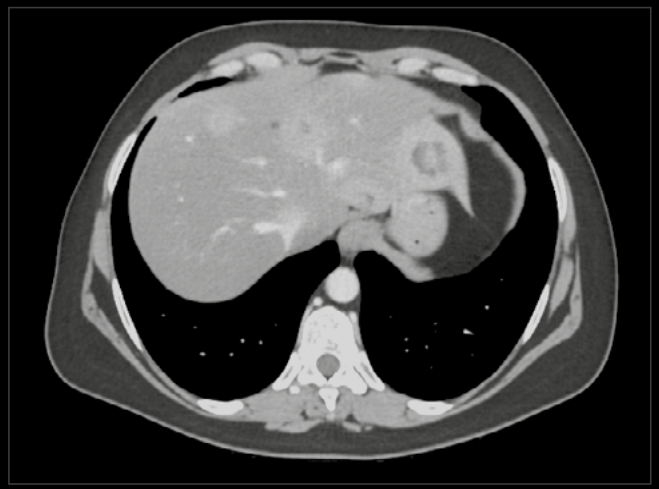
Already accustomed to GE imaging, no learning curve was required.
It was simple and straightforward for all three colleagues. We calibrated the protocols to get the image we liked best, but there was no learning curve. We have had continuous improvements with the help of specialists to get the best image possible. We are pretty smart and as soon as we realized the potential of the product, we took on on board straight away.

Other radiologist colleagues from other centers noticed the better image quality compared to the CT scans they use. They were complimenting me on the quality.

I am more confident in the image and I work faster. TrueFidelity gave me more confidence in diagnosis and I did not have to review the images 100 times, because they were clear, diagnostic, and exhaustive. Sometimes in the past the images were too noisy, for example, on liver parenchyma or brain metastasis, the noise sometimes hid findings or gave false positives and this forces you to stop and think. But with TrueFidelity the image is clear and diagnostic. It improves your detection of the finding and your characterization.



Portal phase



Brain Metastasis

DR. MARIE LEMERY-MAGNIN

Radiopediatrician, CHU Estaing Clermont-Ferrand, France

Pediatry General imaging, specialized in emergency.
2 General Electric CT: Revolution™ Frontier and Revolution CT upgraded in September 2020 with TrueFidelity.

The first approach for our pediatric exams was to assess the image quality of an exam performed in adults, with the impression that we are finally removing all the artifacts so frequently found in very low dose pediatric CT.

Then there was a very quick observation of the improvement in image quality, especially in the mediastinal and abdomino-pelvic regions, still at very low dosimetry.

Everyone got used to this new image very quickly, which was less noisy and with fewer artifacts. This increased our diagnostic confidence thanks to enhanced image reading.

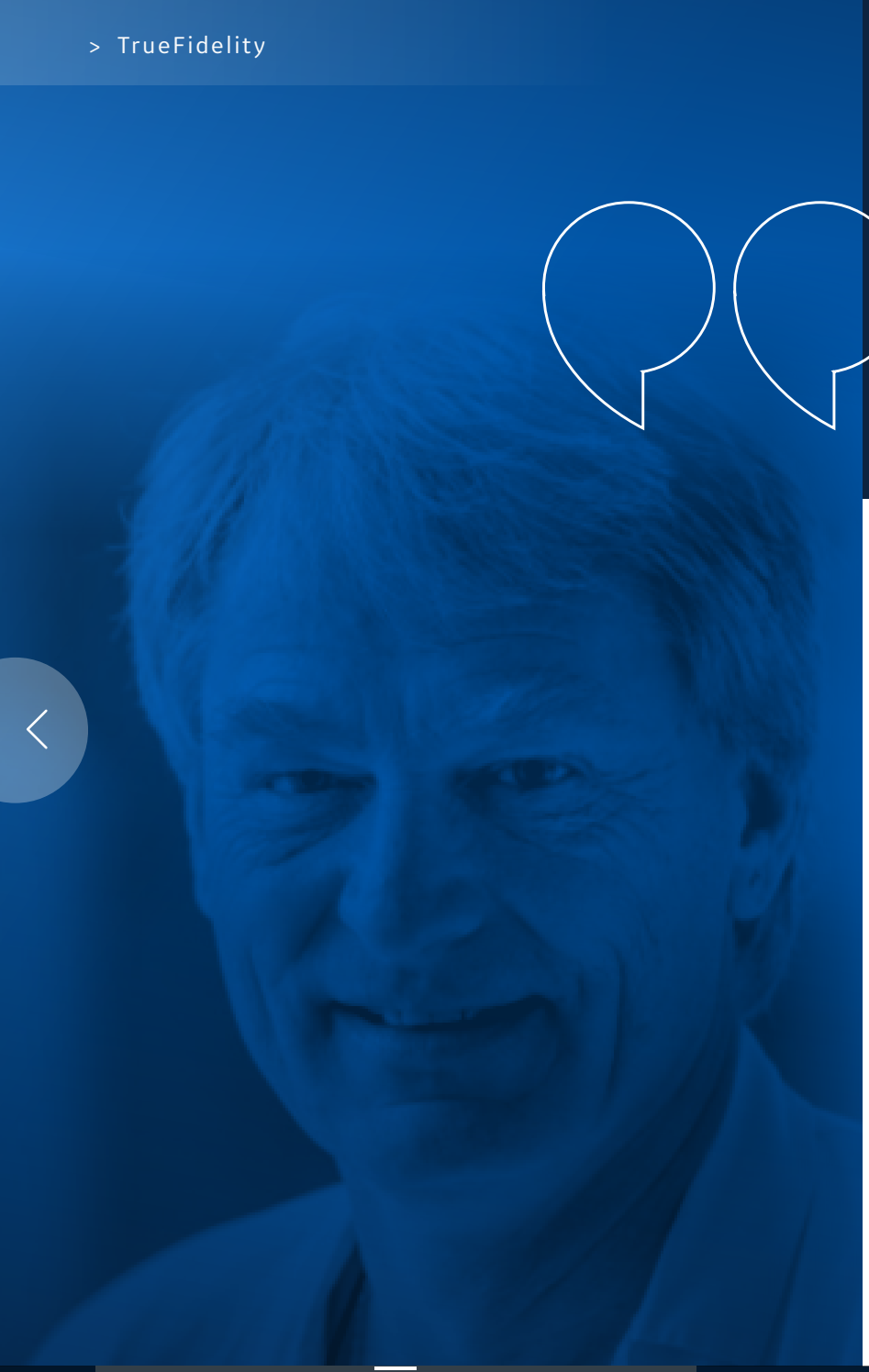
It would be difficult to go back to our "old" images.

Clinical benefits

- ✓ ***Improved image quality on pediatric exams which are usually very noisy***
- ✓ ***Fewer artifacts***
- ✓ ***Improved reading of the exam***

Portal CAP – 9 year old patient – CTDI 2 / DLP 108

Portal CAP – 3 year old patient – Acquisition at 80 kV – CTDI 1.99 / DLP 88



PD DR. CHRISTIAN KELLENBERGER

University Children´s Hospital Zurich, Switzerland

Tertiary Pediatric University Hospital, largest Pediatric Radiology Department in German speaking parts of Europe with about 1000 CT studies per year.

We acquired the Revolution CT scan with TrueFidelity deep learning image reconstruction in December 2019 and we immediately started with the image quality of DL reconstruction.

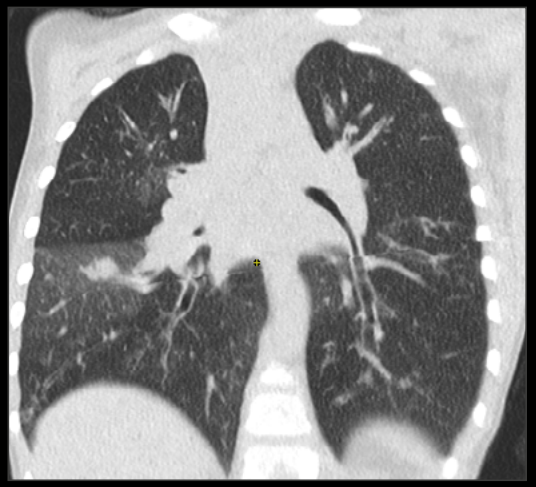
We are striving to lower the dose as much as possible (ALARA) with TrueFidelity image reconstruction and still retain a diagnostic image quality.

As TrueFidelity is available across all clinical applications and has the potential for lowering dosage, we are continuously investigating how far we can go.

Our primary focus is on ultra low dosage in pediatric chest imaging.

With axial volume scan we have the benefit of speed, fewer respiratory and cardiac pulsation artifacts. It is also the most dose-efficient scan mode. (no over-ranging).

In this case we had a finding of mosaic attenuation and bronchiectasis – even with a very low dose.



4Y ULD Volume scan – DLP 2.3 - CTDI 0.1

4Y ULD – 0.71 mSv - CTDI 1.01

Applied dose is very low. Even with some noise, the image quality for diagnosis is more than sufficient.

DR. ANDREW WOOD

Consultant Cardiac and Vascular Interventional Radiologist

Revolution CT since 2015 and Revolution Apex installed in December 2020 University Hospital of Wales, Cardiff, Wales, UK.

MRS. SIAN HEWSON

CT Clinical Lead Radiographer

Revolution CT since 2015 and Revolution Apex installed in December 2020 University Hospital of Wales, Cardiff, Wales, UK.

The University Hospital of Wales is the largest hospital in Wales situated in Cardiff and forms part of the Cardiff and Vale University Health Board. The hospital was opened in 1971 and situated on a site with room to grow. It is now a tertiary hospital with over 1000 bed capacity offering specialist services such as Cardiothoracics, Cardiology, Renal Transplant, Stroke and Trauma. It is also the site of the Children's Hospital of Wales providing both pediatric and adult care.

In September 2020 the University Hospital of Wales became the Major Trauma Centre for South Wales and is the third largest in the United Kingdom. Our CT Revolution Apex was installed at the beginning of December 2020 and the scanner opened for clinical use on December 16. The scanner is situated in the heart of the Accident and Emergency department providing a rapid response in major trauma and stroke imaging. Since "go live" on December 16 the scanner has performed over 3000 examinations as of the end of January 2021 and it is expected that over 18000 patients will be scanned by the end of 2021.

Revolution Apex offers a new iterative reconstruction, TrueFidelity, and adapting our protocols to implement the TrueFidelity Image reconstruction was simple.

The CT team at UHW comprises 29 radiographers with varying skill levels. The ease of use in adapting our protocols allowed training of the staff to progress without a hitch. In turn 24/7 CT cover was established after the 2nd day of training, providing essential cover for the Accident and Emergency Trauma Unit. (Image 1)

We have built the new AI TrueFidelity image reconstruction algorithm into the vast majority of our protocols resulting in an easy to follow workflow. Radiographers can scan without having to adjust protocols during routine scanning ensuring quick and fast work that is required in a busy Major Trauma CT Unit. There has been an increased use in lower kVp in many of our studies which is a result of the improved SNR within the images. (Images 2 a, b & c)

Image 1. 4 year old hit by car, scanned 2nd Day 100 kVP TrueFidelity Recon DLIR - H DLP115 CTDI 2.40

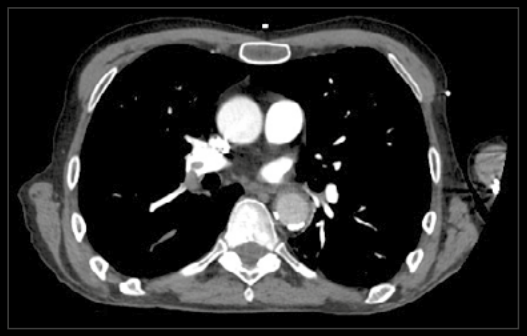


Image 2b. 73 year old CT Pulmonary Angio - +ve Pulmonary Emboli TrueFidelity DLIR - H - 80 kVp DLP 183 CTDI

Image 2a. 54 year old CT Pulmonary Angio Emphysema TrueFidelity DLIR - M + lungs - 100 kVp DLP254 CTDI 6.44

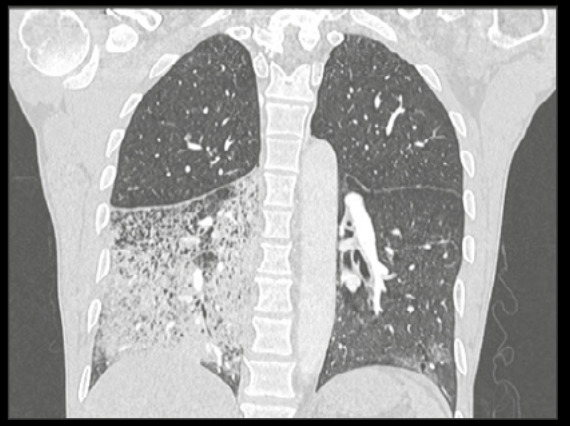


Image 2c. 55 year old CT Pulmonary Angio (Lungs) Bacterial Pneumonia TrueFidelity DLIR – M + lung - 100 kVp DLP313 CTDI 7.73

We are able to combine the use of TrueFidelity with Smart MAR (Metal Artifact Reduction Algorithm) which significantly benefits our imaging and improved visualisation in areas where previous beam hardening and streak artifacts from prostheses would have degradation in the diagnostic quality of the images. Combining Smart MAR with the TrueFidelity algorithm results in high-quality images with the possibility to visualise anatomical structures that in the past would have been obscured by the artifact from the prosthetic. (Images 3a & b)

Images 1-5 show high quality imaging achieved across a broad range of examinations including our younger population on our new Trauma CT.

Image 3a. Chest Abdomen Pelvis Smart MAR and TrueFidelity DLIR - H

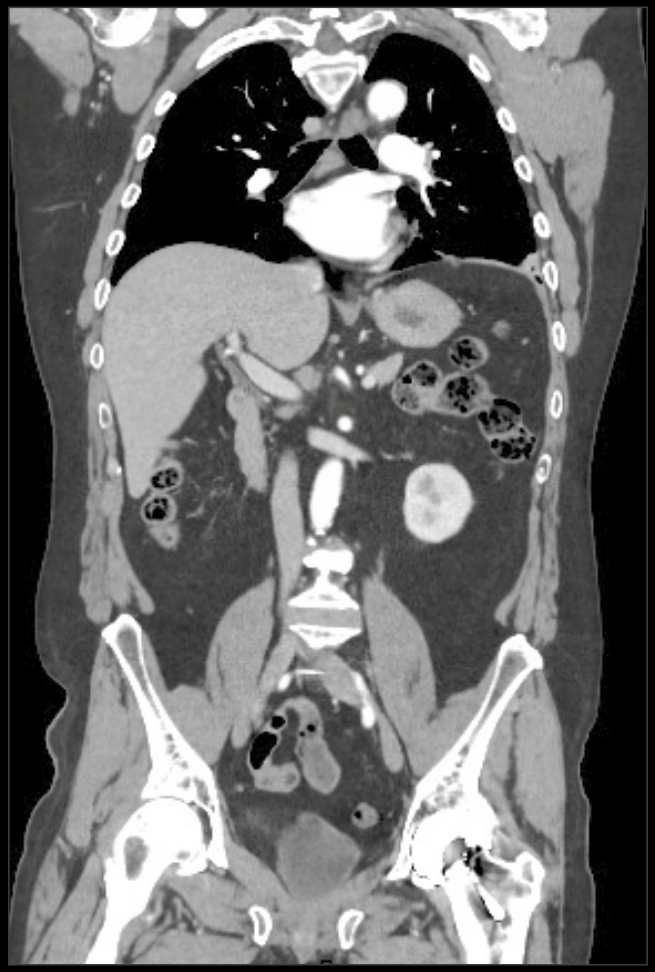


Image 3b. Chest Abdomen Pelvis Smart MAR and TrueFidelity DLIR - H

Having used the TrueFidelity on our new CT Revolution Apex:

- ✓ I find the TrueFidelity Images demonstrate noticeably reduced noise in vascular structures and adjacent solid organs as demonstrated in the peripheral angio images. (Images 1a & b)
- ✓ I find image viewing much more comfortable. The reduction in background noise enhances the focus on cardiac and vascular structures and pathology.

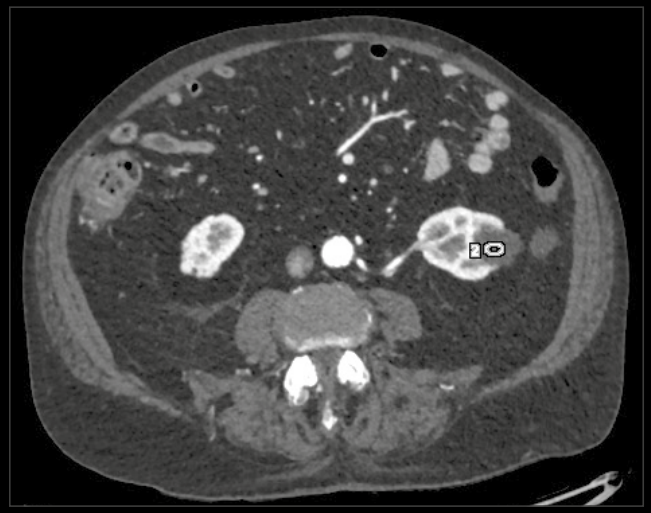


Image 1a. ASiR-V 50% Standard Deviation 21.5

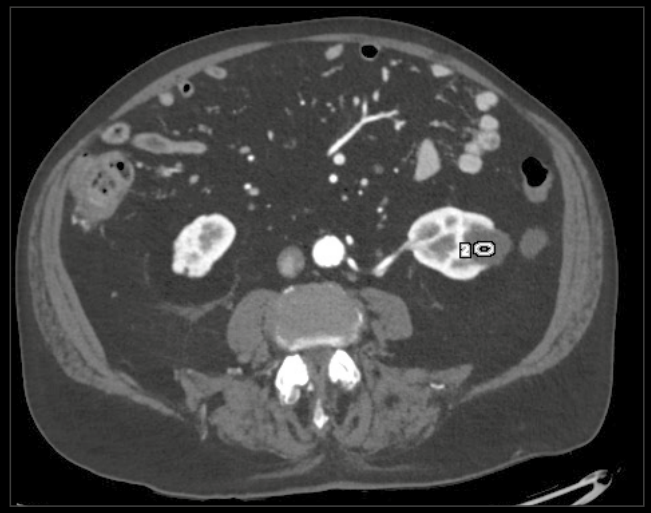


Image 1b. TrueFidelity – DLIR – High Standard Deviation 17.5 – demonstrating improved SNR

- ✓ I find the improved contrast homogeneity within vessels allows for more streamlined diagnosis of atheroma and vascular stenosis. (Image 2)
- ✓ Overall TrueFidelity allows a more stress-free image viewing experience.

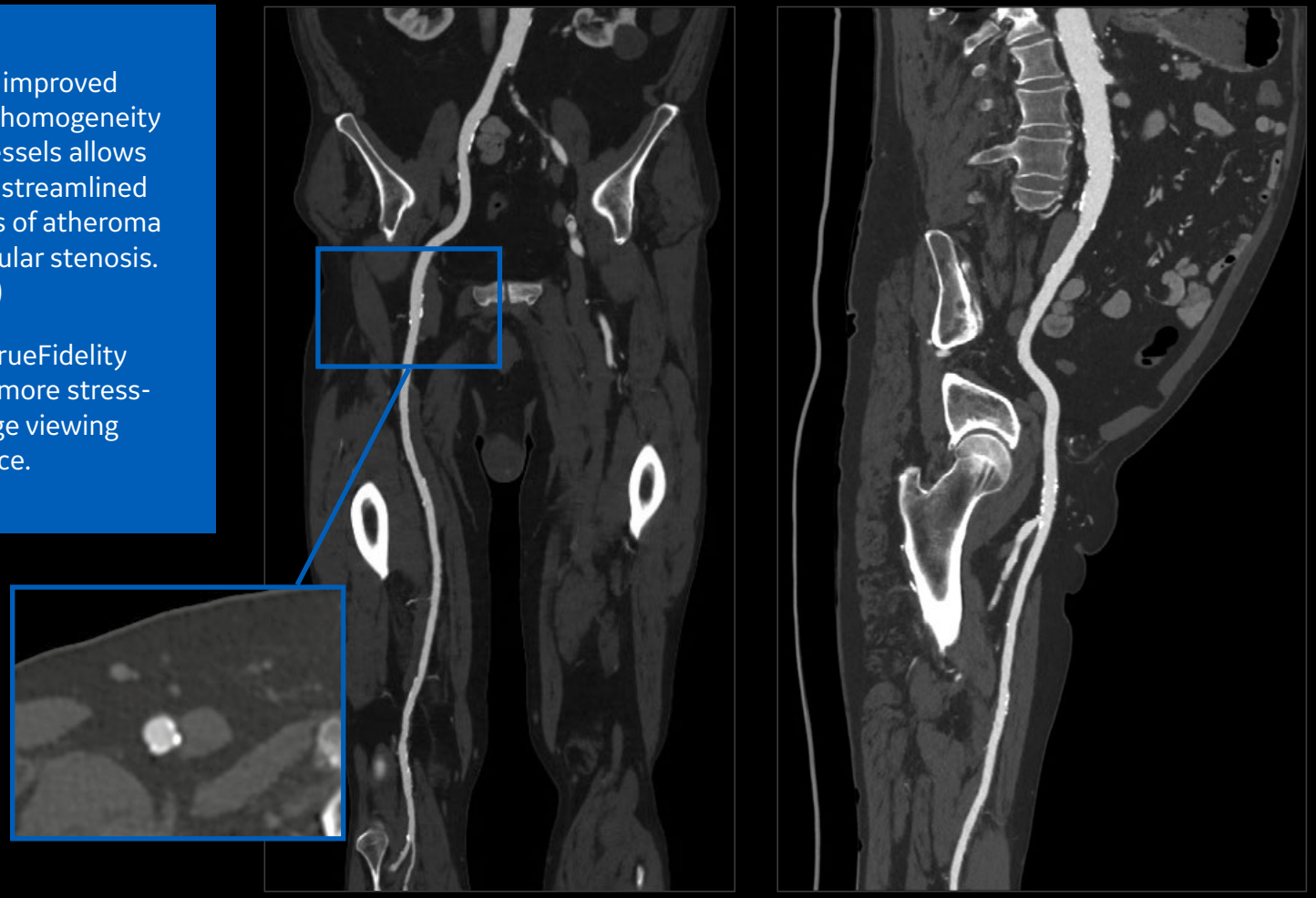
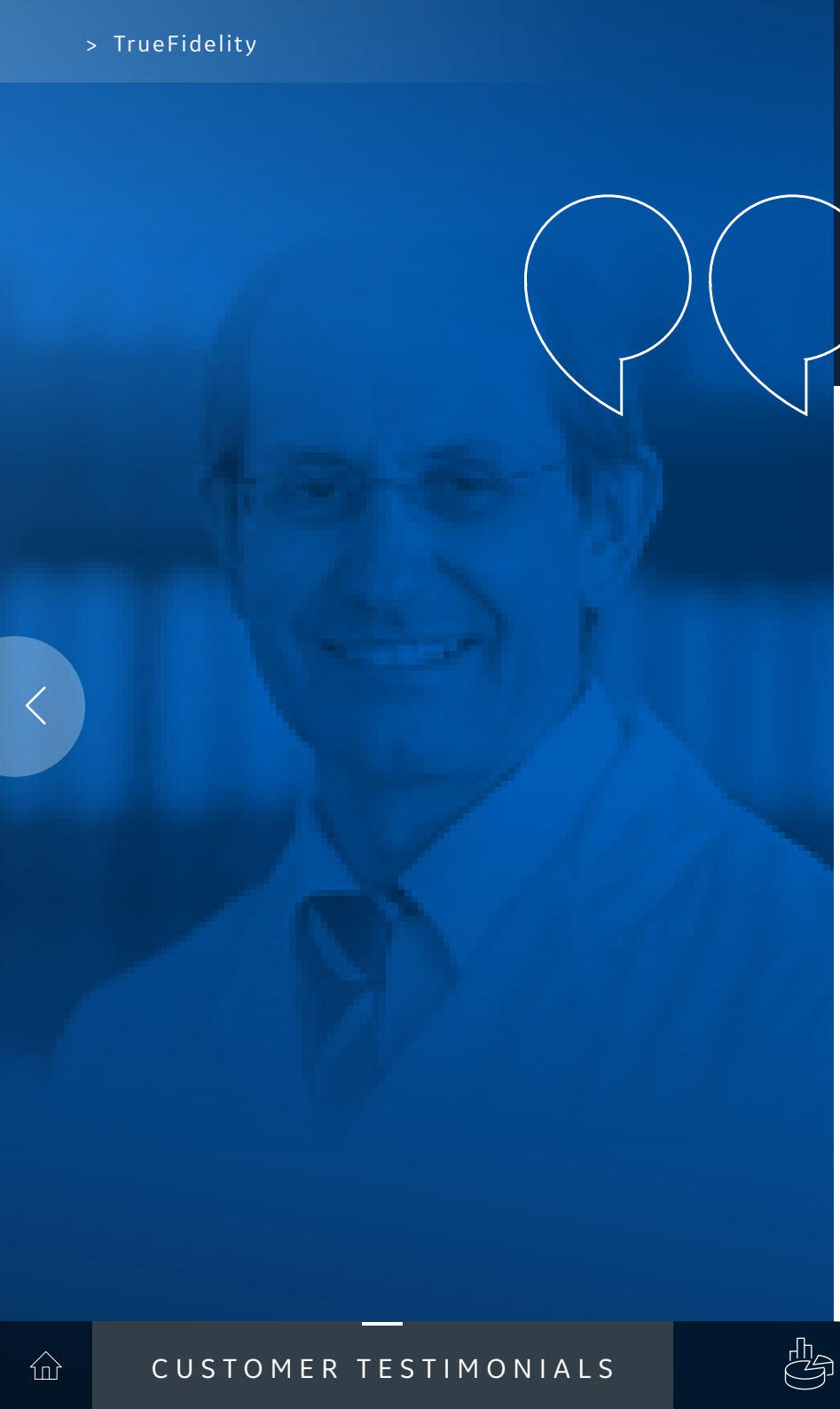


Image 2. TrueFidelity DLIR – H - improved contrast homogeneity 80 kVp Peripheral Angio – DLP 435 CTDI 3.24

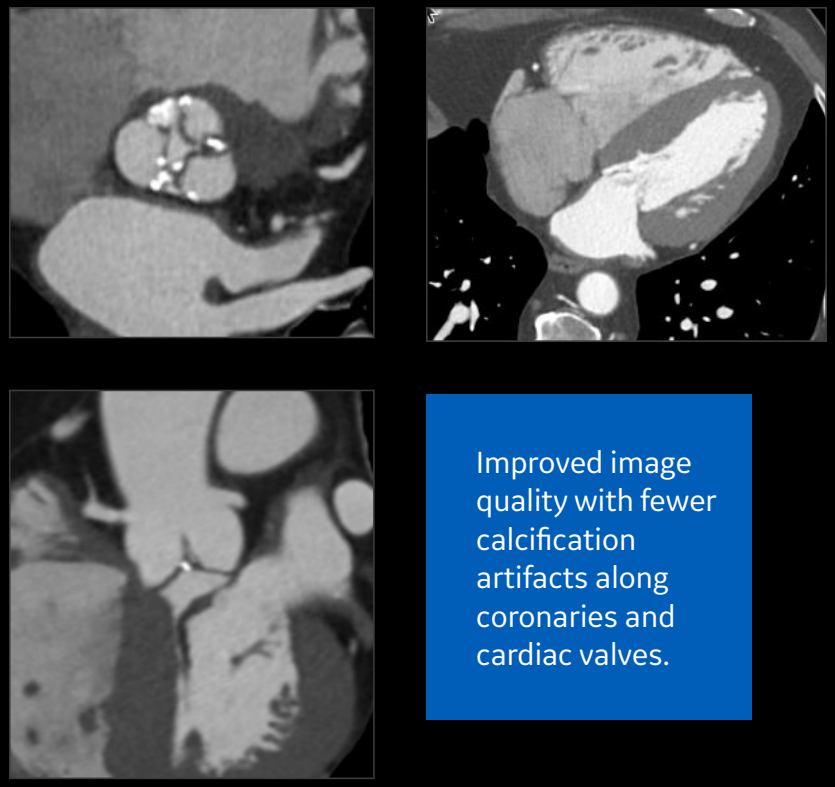


PROF. KLAUS HERGAN

University Hospital Salzburg, Austria

Department of Radiology of the 1200-bed University Hospital Salzburg

The sharpness of the images is a breakthrough development in image reconstruction algorithms. We see details that we have never seen before. Abdominal, Lung and Cardiac Imaging benefits most from this technology. I am mainly interested in cardiac and cardiovascular imaging. We found much better image quality, depiction of details, and image sharpness for cardiac valves, sclerotic and soft plaque in cardiac and extracardiac vessels, as well as fewer artifacts around stents and stent-grafts. DECT for pulmonary embolism easily convinced everybody in our Department. Combining this experience with TrueFidelity is a development in which no one will miss a detail in daily diagnostic work, especially in the diagnosis of pulmonary embolism. It seems to be that sensitivity and specificity will increase in diagnosing pulmonary embolism but also in oncological imaging. AI is and will be an important part in daily radiology routine. Radiologists will profit from technologies like TrueFidelity today and in the future making the radiologist's role indispensible to patient management.



Improved image quality with fewer calcification artifacts along coronaries and cardiac valves.

Thickened bicuspid aortic valve with aneurysm of the ascending aorta.

Better delineation of lung lesions with less background noise using TrueFidelity.

0.625 mm Iodine (Water) material decomposition

Pulmonary Artery acquisition with 25 cc contrast media greatly benefits from GSI Xtream with TrueFidelity for better image quality and dose reduction even when reading thin slices (as seen here).

Small lesion depiction benefits from DECT and TrueFidelity despite low dose protocol (CTDI 6,8).

3 mm coronal Iodine (Water) material decomposition

PD DR. ALAIN LUCIANI

University Hospital Mondor, APHP Créteil, France

Revolution Apex

The imaging department of University Hospital HU Henri Mondor is a tertiary care reference center for cardiovascular and oncological imaging, and more specifically regarding liver disease and liver tumour management. The imaging team is also deeply involved in both translational and basic research, with the INSERM U955 Team 18 located at HU Henri Mondor, with a goal to refine morphological, functional and prognostic classification of liver tumors. The HU Henri Mondor imaging department has been working and developing the use of spectral imaging (GSI) in CT especially for the diagnosis of primary liver cancer.

Tremendous advances have been made over the past decade regarding CT imaging of liver cancer. The introduction of GSI at Henri Mondor back in 2011 on a HD750 Platform and more recently in 2016 on the Revolution CT platform led to a renewed experience in the characterization of cancer; the combination of both low keV imaging together with iodine maps improved both tumor depiction and functional analysis [(1)].

PD DR. ALAIN LUCIANI

University Hospital Mondor, APHP Créteil, France

Revolution Apex

In addition, GSI limits the need for unenhanced acquisitions in oncology [2]. But the images then reconstructed were issued from iterative-based reconstruction algorithms. Although these techniques indeed improve image quality especially for liver imaging, and reduce X-ray doses used [3], the noise texture within the images is significantly different than that observed on FBP derived images [4]. And this is where TrueFidelity DLIR reconstructions kick-in! By combining the now demonstrated potential of GSI regarding the noise texture of FBP derived images, it seems as if combined optimized contrast, spatial resolution and functional assessment were present all at once! And most importantly, this perception is shared by the entire team, which even further faciliates the integration of GSI in routine clinical practice.

1. Mulé S, Pigneur F, Quelever R, et al. Can dual-energy CT replace perfusion CT for the functional evaluation of advanced hepatocellular carcinoma? Eur Radiol. 2018;28(5):1977–1985. doi: 10.1007/s00330-017-5151-y.
2. Lacroix M, Mulé S, Herin E, et al. Virtual unenhanced imaging of the liver derived from 160-mm rapid-switching dual-energy CT (rsDECT): Comparison of the accuracy of attenuation values and solid liver lesion conspicuity with native unenhanced images. European Journal of Radiology. 2020;133:109387. doi: 10.1016/j.ejrad.2020.109387.
3. Hérin E, Gardavaud F, Chiaradia M, et al. Use of Model-Based Iterative Reconstruction (MBIR) in reduced-dose CT for routine follow-up of patients with malignant lymphoma: dose savings, image quality and phantom study. Eur Radiol. 2015;25(8):2362–2370. doi: 10.1007/s00330-015-3656-9.
4. Pasquier H, Gardavaud F, Chiaradia M, et al. Iterative reconstructions in multiphasic CT imaging of the liver: qualitative and task-based analyses of image quality. Clin Radiol. 2018;73(9):834.e9-834.e16. doi: 10.1016/j.crad.2018.05.006.

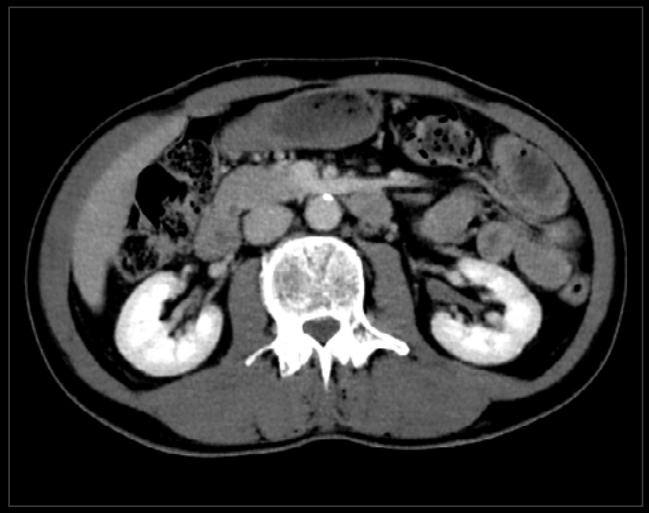
GSI acquisition parameters – so-called GSI presets – are very closely adapted to patients body habitus together with the clinical indications of CT. This leads, however, to a theoretical increase in X-ray dose [1], balanced by the lack of unenhanced phase images. Now DLIR TrueFidelity reconstructions allow the selection of even further optimized GSI presets, combining optimized mAS management, leading to values as low as 5 mGy CTDIw. Again, integrating GSI systematically in all patients referred for oncological assessment at our institution is a great achievement.

These images illustrate the current imaging protocols used at our institution. These developments were based on strategies: optimized GSI imaging for liver assessment, allowing the extraction of functional parameters, together with a reduced X-ray dose.

Portal phase

120 kVp

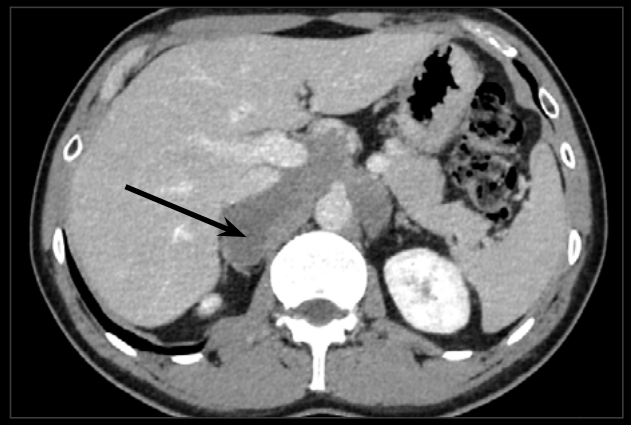
40 keV



Prostate adenocarcinoma

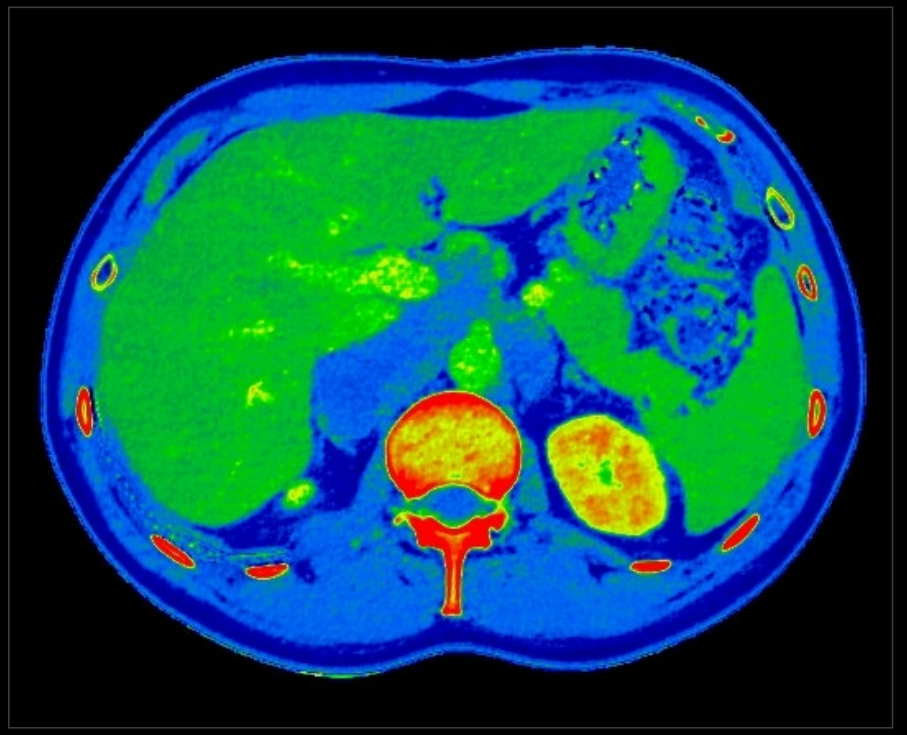
Chest-Abdo-Pelvis follow-up GSI 0,6 cc/kg Contrast Media DLP 492 mGy.cm.

Good image quality at low dose thanks to TrueFidelity. Better contrast resolution thanks to GSI.



50 keV

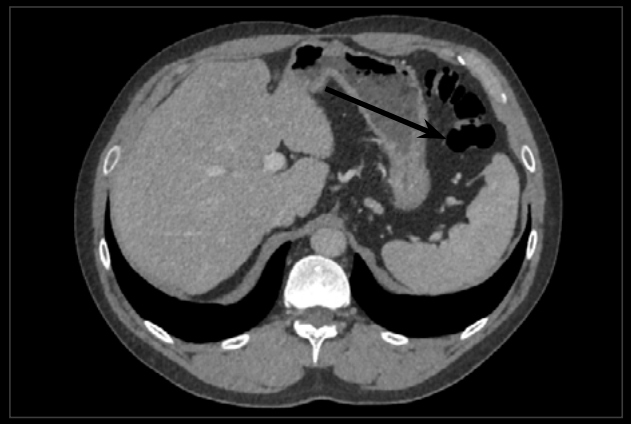
Iodine map



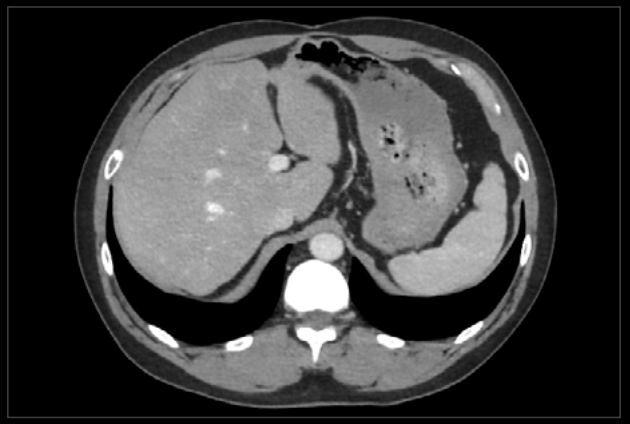
Iodine (Water) material decomposition

Abdominal lymphangioma: Iodine map demonstrating the absence of iodine in this mass. Excellent image quality of the iodine map with TrueFidelity.

Comparison of acquisitions chest-abdomen-pelvis between SECT Revolution CT and GSI on Revolution Apex.



1st exam done with Revolution CT reconstruction ASiR-V at 120 kVp DLP 520

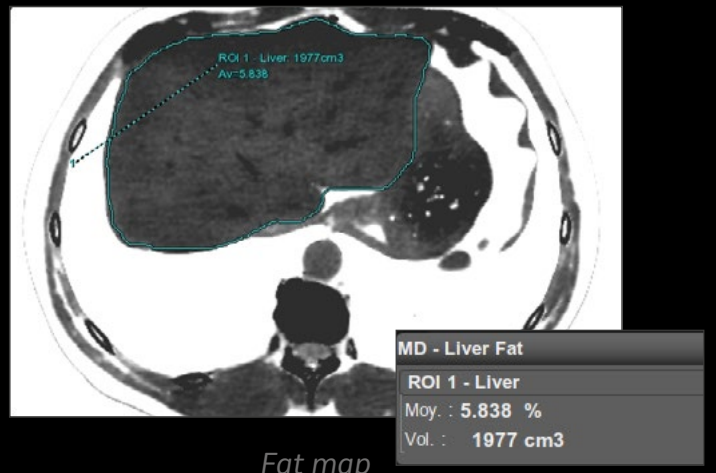


50 keV

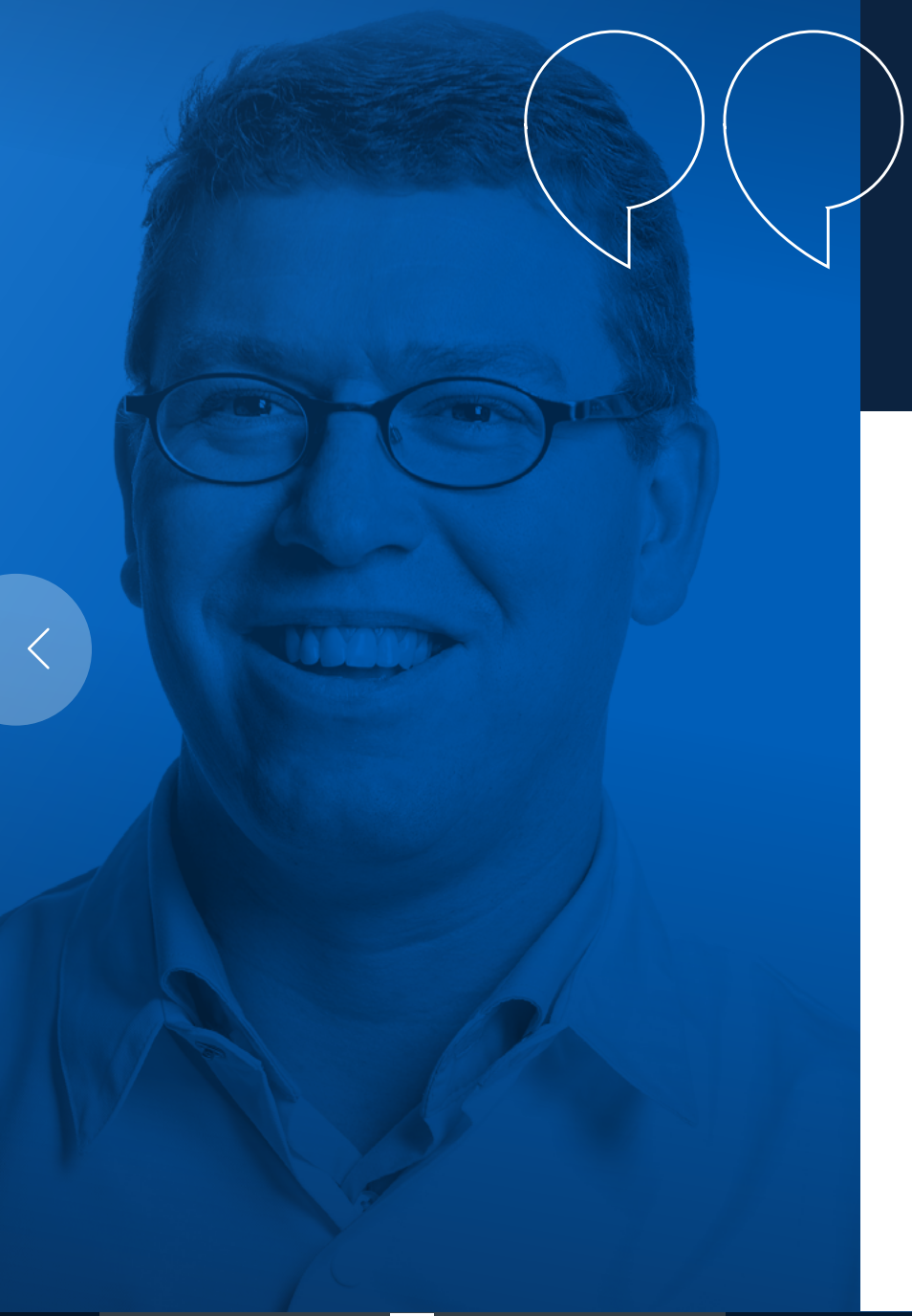
Iodine (Water) map

Follow–up with Revolution Apex in GSI, DLP 600.

Better image quality and functionnal information for an equivalent dose thanks to TrueFidelity.



Fat map



DR. KOENRAAD NIEBOER MD FESER

Radiologist, Emergency Department, University Hospital UZB, Brussels, Belgium

Revolution CT user since 2014, upgraded to Revolution Apex with TrueFidelity GSI in 2020.

Looking at TrueFidelity images for the first time, I thought to myself that finally, overall image texture was much better. For several years we have worked with iterative reconstruction where it was most important to lower the dose but that meant comprising image texture if the dose was lowered too much and with a noise power spectrum which could at times become non-interpretable. Now TrueFidelity, with the same low dose, gives a better image quality and an image texture similar to the FBP which we were trained on.

We see a real boost on image texture in all applications but even more so in body imaging, thoracic scans and vascular examinations. TrueFidelity is always ON and it has a bigger impact on exams when the Noise Index is higher or with a bigger standard deviation.

There is the possibility to lower the dose with TrueFidelity but I also appreciate the potential of TrueFidelity in improving image quality at the same dose level and improving diagnostic accuracy.

I really like also to use TrueFidelity on GSI. It can generate extra information including monochromatic energies and material decomposition images to improve diagnostic accuracy in our emergency ward.

In the emergency department, we often have patients who can't raise their arms above their head. Thoracic imaging and abdominal imaging with previous reconstruction algorithm had significant beam hardening under these conditions so you had to go to a higher kVp setting to avoid this. Thanks to TrueFidelity, we can now get rid of a large part of these artifacts. For us, it's a real benefit to have better imaging with these difficult conditions with arms lowered.

Scout

ASiR-V 70

TrueFidelity DL-H

Dose Report

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy-cm)	Phantom cm
SCOUT					
1	Scout	S0-I600	0.06	3.39	Body 32
1	Scout	S0-I600	0.11	6.77	Body 32
NIERSTENEN					
2	Helical	I13.75-I565	4.27	261.68	Body 32
			Total Exam DLP:	271.84	

September 2017
Revolution CT
ASiR-V

0,71 mm

0,63 mm

Dose Report

Series	Type	Scan Range (mm)	CTDIvol (mGy)	DLP (mGy*cm)	Phantom cm
SCOUT					
1	Scout	S0-I600	0.10	6.15	Body 32
1	Scout	S0-I600	0.10	6.15	Body 32
QC! NIERSTENEN					
2	Helical	I55-I605	2.63	171.41	Body 32
			Total Exam DLP:	183.71	

September 2020
Revolution Apex
TrueFidelity GSI (DLIR high)

September 19

Arms down

TrueFidelity

kV-assist 2.0

Non contrast TrueFidelity 120 kVp

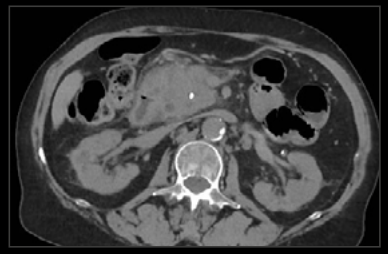
Art TrueFidelity 100 kVp

Ven TrueFidelity 120 kVp

October 27

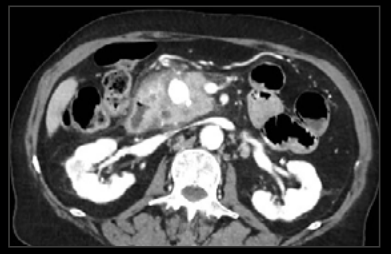
Arms up

TrueFidelity GSI DLIR high



TrueFidelity GSI VUE

Art TrueFidelity GSI 60 keV



Ven TrueFidelity GSI 68 keV

TrueFidelity GSI offers the potential to generate extra information at the same dose level to improve diagnostic accuracy.

DR. CONSTANCE HORDONNEAU
DR. BENOIT MAGNIN

Radiologists, University Hospital Estaing
Clermont-Ferrand, France

Abdominal imaging

We were impressed with the quality of TrueFidelity images, which were very consistent, with a significant reduction in image noise while retaining fine details.

In overweight or very thin patients, there is a clear difference in the quality of the images with a loss of noise and a much less granular appearance of the images while maintaining the sharpness of the contours or the visibility of small lesions. There is a real advantage for these patients, but also for cirrhotic patients with very heterogeneous hepatic enhancements related to the pathology. Currentlly, the diagnostic confidence in the visualization of hypodense hepatic lesions in the portal phase is improved.

We carry out a lot of follow-up of patients treated for digestive or pancreatic neoplasia. One of the challenges is the level of confidence in the detection or visualization of hypovascular hepatic lesions; this confidence is improved by the quality of the images in TrueFidelity.

We also ensure the follow-up of cirrhotic patients, where detection of HCC within a sometimes heterogeneous enhancement of the liver; a reduction in noise allows increased confidence in the nodular nature or not of a contrast enhancement.

DR. CONSTANCE HORDONNEAU
DR. BENOIT MAGNIN

Radiologists, University Hospital Estaing
Clermont-Ferrand, France

Abdominal imaging

We already use GSI a lot in our department as well as being able to adjust the KeV to allow the best diagnosis but also to reduce the amount of contrast product in patients with renal failure. The addition of TrueFidelity on the GSI made it possible to regain image quality and even reduce mAS and kV on acquisition and therefore reduce dosimetry and manage to work at isodose compared to a standard acquisition without GSI.

Clinical benefits

- ✓ ***Better picture quality***
- ✓ ***Reduction of dosimetry***
- ✓ ***Increased diagnostic confidence especially in lean or obese patients***

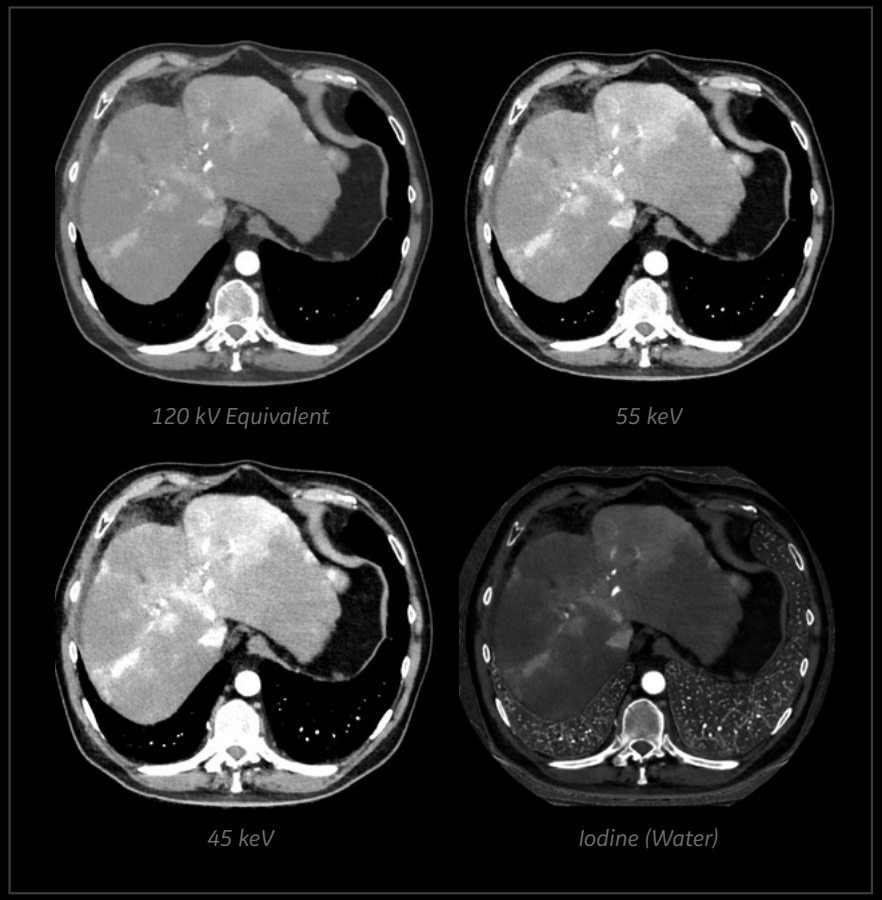
Portal GSI CAP Monochromatic
55 keV –70 mL contrast media
(1,3 mL/kg)

ASiR 30 and TrueFidelity reconstruction in axial slice (same zoom, same contrast) with coronal slice in minIP on a dilated bile duct

The use of GSI in patients with impaired function by reducing the dose of contrast product provides for satisfactory enhancement by reconstructing at low energies. TrueFidelity reconstruction helps reduce noise and ultimately obtain an image of the same quality as when using a normal dose of contrast agent.

Nevertheless, the contours remain clear, fine structures such as the colonic walls and the skin are clearly visible.

The TrueFidelity reconstruction helps reduce noise on the liver, the subcutaneous fat, while providing clear contours (liver, large muscles of the abdomen, round ligament of the liver). The bile duct (circled in red) shown slightly dilated upstream of a lesion, clearly visible on the coronal slice in minIP (red arrow) is easier to detect with TrueFidelity.



TrueFidelity GSI – Monochromatic and Material Decomposition

The detection of arterial contrast enhancement is clearly facilitated by reconstruction at low energies or the use of images of decomposition of matter with contrasting densities that are more clearly marked than in single energy. TrueFidelity reconstruction once again reduces noise.

DR. HUGUES BRAT

Radiologist, Medical Director at 3R, Sion, Switzerland

Revolution™ EVO user

After the first clinical case presentations during the RSNA 2019 convention, I was convinced TrueFidelity would be the game-changing application for CT scanners. At Groupe 3R, we ordered seven Revolution EVO CT scanners equipped with TrueFidelity and installed the world-premiere in May 2020 despite Covid-19 hurdles.

Our medical physics expert performed phantom testing and TrueFidelity enabled us to further reduce dosage by 33% compared to our optimized CT protocols reconstructed with IR algorithms, while preserving FBP-like image texture and low contrast detectability.*

Game-changing
Today we have moved to 80 kV abdomen imaging for non-overweight patients with a BMI < 23. After phantom simulation we expect excellent image quality examinations at a mean CTDIvol value of 2.5-3 mGy for low liver contrast task detection and characterization (Swiss DRL: 11 mGy). A few samples of clinical routine patient exposure:

Clinical indication	CTDIvol (mGy) (Swiss DRL)	DLP (mGy.cm) (Swiss DRL)
Lung cancer screening	0.29 (7)	10.59 (250)
Pulmonary embolism	1.89 (7)	61.23 (250)
Urinary tract stone	1.62 (6)	70.20 (280)
Liver lesion detection BMI < 23	3.1 (11)	135 (540)
Liver lesion detection BMI > 23	6.78 (11)	275 (540)

Source: Dr. Brat clinical use and measurements.

** The views and opinions expressed are those of the speaker and do not necessarily reflect the official policy or position of GE Healthcare or General Electric.*

In the samples shown here, you can fully appreciate the diagnostic image quality with the sharpness of organ outlines, the smoothness of the liver parenchyma without blurring, the high spatial resolution for low contrast lesion detection - and all this at 0.6 mm thickness!

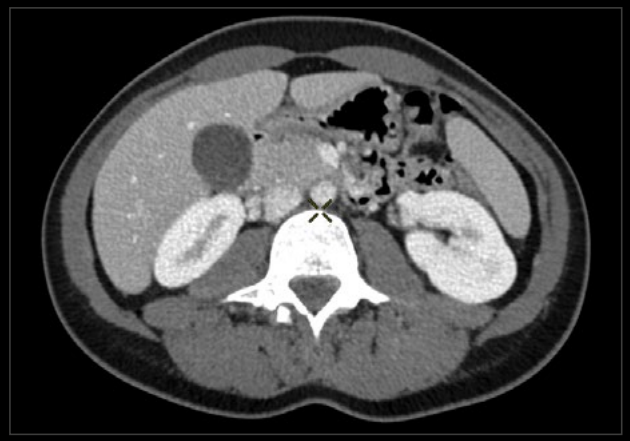
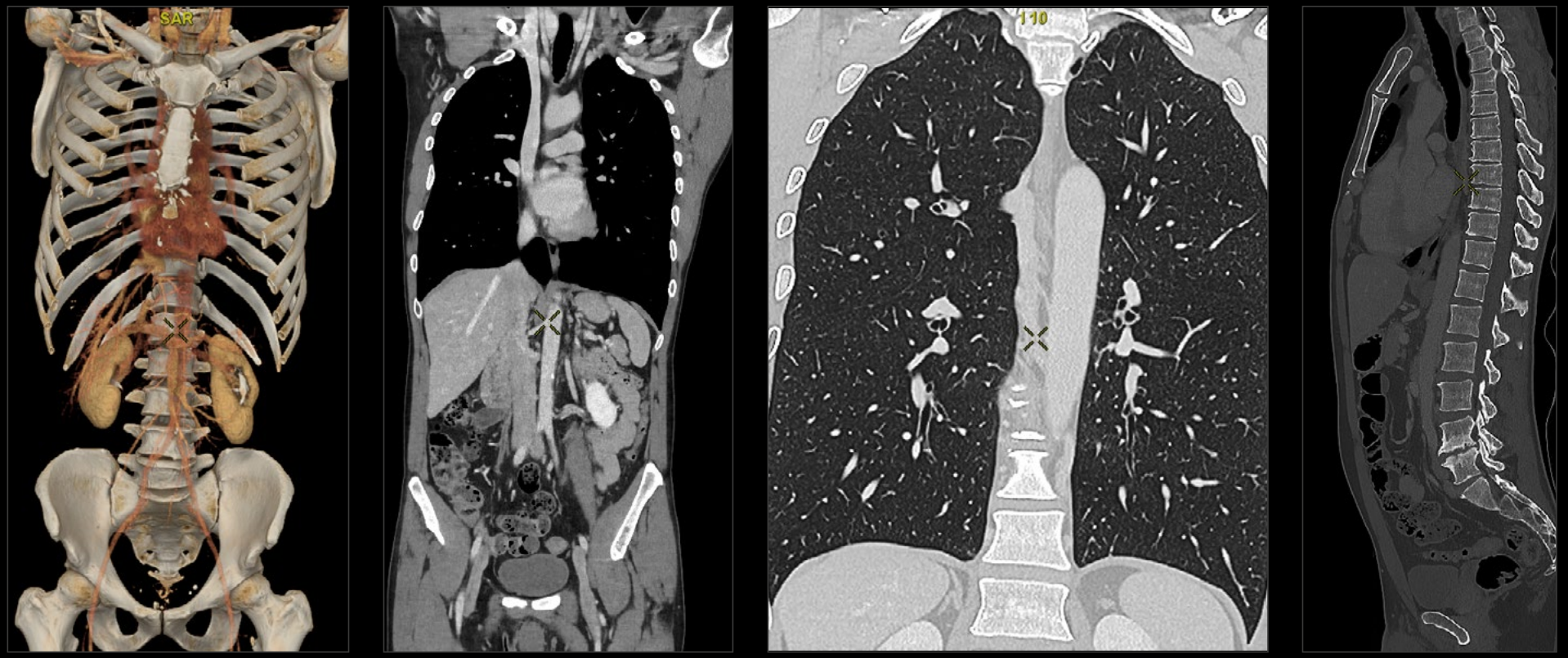


Image 1: axial (a) and coronal (b) reconstructions of an abdomen CT examination in a 28 year old patient with a BMI of 20. 80 kV, mA modulation (50-200), 0.6 s rotation time and pitch 0.984. TrueFidelity (DLIR) High reconstruction. CTDIvol: 3.1 mGy/DLP 135 mGy.cm.

Image 2: ***One-stop-shop at 80 kV:***
(a) *3D-VR,* ***(b)*** *coronal chest and abdomen,* ***(C)*** *coronal chest and* ***(d)*** *sagittal lumbar spine reconstruction in a 35 year old patient with a BMI of 22. 80 kV, ma modulation (50-200), 0.6 s rotation time and pitch 0.984. TrueFidelity (DLIR) High reconstruction. CTDIvol: 2.81 mGy/DLP 205 mGy.cm.*



INITIAL EXPERIENCE[1]

Image Quality Assessment of Abdominal CT Using **New deep learning image reconstruction**

Infographic is a summary of example results from literature and its content does not constitute a representation or guarantee from GE Healthcare.

INITIAL EXPERIENCE[1]: IMAGE QUALITY ASSESSMENT OF ABDOMINAL CT USING NEW DEEP LEARNING IMAGE RECONSTRUCTION

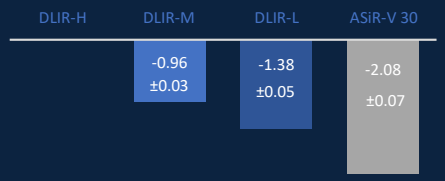
Limited use of iterative reconstruction in low-contrast conditions

Although CT iterative reconstructions can provide noise reduction while preserving adequate image quality in high-contrast conditions such as angiography, these nonlinear algorithms can degrade the texture of the reconstructed images, becoming inappropriate for low-contrast tasks.[1]

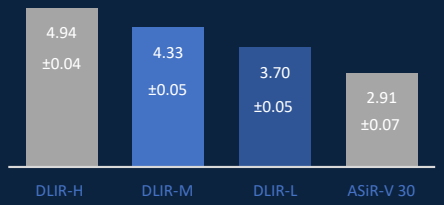
Image noise and CNR*

Noise reduced by up to **47%** leading to a **94%** CNR increase in the liver with DLIR-H *vs* ASiR-V 30%

Noise texture***



Overall image quality**



Lesion diagnostic confidence**

"Compared with ASiR-V 30%, DLIR improved CT evaluation of the abdomen in the portal venous phase. DLIR strength should be chosen to balance the degree of desired denoising for a clinical task relative to mild blurring, which increases with progressively higher DLIR strengths." [1]

INITIAL EXPERIENCE[1]: IMAGE QUALITY ASS… W DEEP LEARNING IMAGE RECONSTRUCTION

40 patients, mean BMI: 27, mean size-specific dose index: 28.3 mGy.

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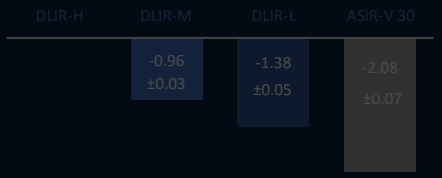

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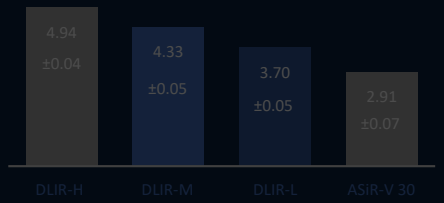

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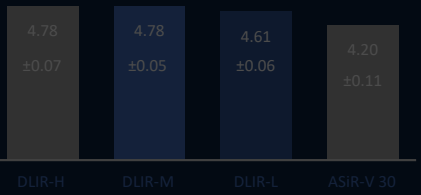

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INITIAL EXPERIENCE[1]: IMAGE QUALITY ASSESSMENT OF A … NG IMAGE RECONSTRUCTION

Retrospective study evaluating overall image quality, lesion conspicuity and diagnostic confidence, artifacts, image noise, image texture and resolution in contrast-enhanced oncologic CT of the abdomen reconstructed with ASiR-V 30%, deep learning image reconstruction (DLIR) low, medium and high.

Limited use of iterative reconstruction in low-contrast conditions

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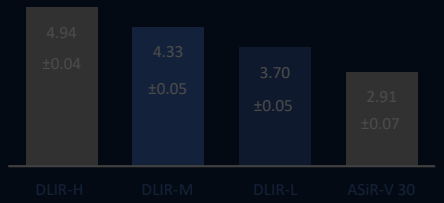

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INITIAL EXPERIENCE[1]: IMAGE QUALITY ASSESS
IMAGE RECONSTRUCTION

1. Jensen CT, Liu X, Tamm EP, et al. (2020) Image Quality Assessment of Abdominal CT by use of new deep learning image reconstruction: Initial Experience. American Journal of Roentgenology 215:50–57. https://doi.org/10.2214/AJR.19.22332

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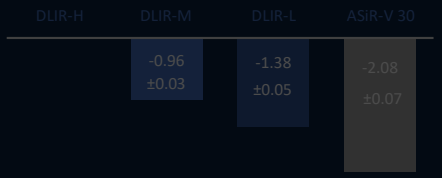
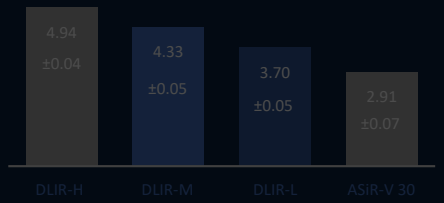
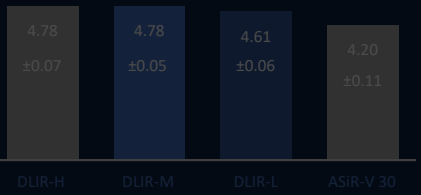


Overall image quality**



Lesion diagnostic confidence**



"Compared with ASiR-V 30%, DLIR improved CT evaluation of the abdomen in the portal venous phase. DLIR strength should be chosen to balance the degree of desired denoising for a clinical task relative to mild blurring, which increases with progressively higher DLIR strengths." [1]

INITIAL EXPERIE
IMAGE RECONSTRU

** Measured as the pixel standard deviation within 1-cm³ ROIs in the liver, the aorta, the spleen, and within the paraspinal musculature.*

*** Evaluated by two independent observers on a 5-point Likert scale: 5, excellent; 4, above average; 3, average; 2, below average; and 1, poor.*

**** Evaluated using a 5-point comparative scale as follows: 0, best reconstruction; –1, slightly inferior (no influence on diagnosis); –2, mildly inferior (possible influence on diagnosis); –3, moderately inferior (probable influence on diagnosis); and -4, markedly inferior (impairing diagnosis).*

Infographic is a summary of example results from literature and its content does not constitute a representation or guarantee from GE Healthcare.

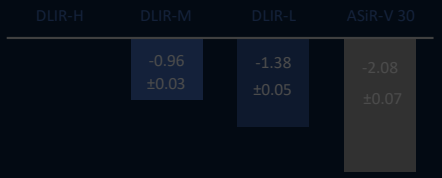
Limited use of iterative reconstruction in low-contrast conditions

Although CT iterative reconstructions can provide noise reduction while preserving adequate image quality in high-contrast conditions such as angiography, these nonlinear algorithms can degrade the texture of the reconstructed images, becoming inappropriate for low-contrast tasks.[1]

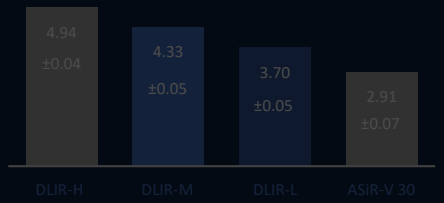
Image noise and CNR*

Noise reduced by up to **47%** leading to a **94%** CNR increase in the liver with DLIR-H *vs* ASiR-V 30%

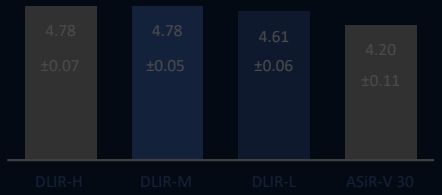
Noise texture***



Overall image quality**



Lesion diagnostic confidence**



"Compared with ASiR-V 30%, DLIR improved CT evaluation of the abdomen in the portal venous phase. DLIR strength should be chosen to balance the degree of desired denoising for a clinical task relative to mild blurring, which increases with progressively higher DLIR strengths." [1]

IMPACT ON NOISE, IMAGE QUALITY AND DIAGNOSTIC ACCURACY[1]

Validation of **deep learning image reconstruction** for coronary computed tomography angiography

IMPACT ON NOISE, IMAGE QUALITY AND DIAGNOSTIC ACCURACY[1]: VALIDATION OF DEEP LEARNING IMAGE RECONSTRUCTION FOR CORONARY COMPUTED TOMOGRAPHY ANGIOGRAPHY

Limited use of high levels of iterative reconstruction

Paralleling the growing clinical use of coronary CT angiography (CCTA), the increased cumulative burden of radiation exposure has triggered the development of various techniques such as iterative reconstructions. However, high levels of iterative reconstructions have been repeatedly reported as not adapted to routine CT examinations due to a plastic-like, blotchy image appearance.[1]

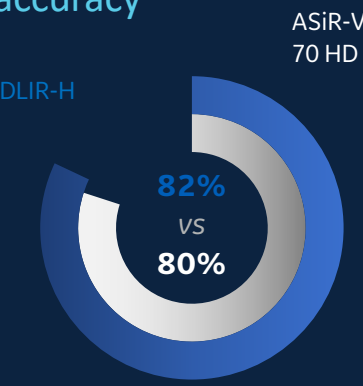
Reduced image noise*

up to **43%**
with DLIR-H
vs ASiR-V
70% HD

Improved image quality**

at similar noise levels, image quality increased by
up to **62%**

Similar diagnostic accuracy***



Compared to ASiR-V, DLIR yields a substantial reduction in image noise while increasing image quality, especially in high-resolution mode. “DLIR significantly reduces noise in CCTA compared to ASiR-V, yielding superior image quality at equal diagnostic accuracy.”[1]

IMPACT ON NOISE, IMAGE QUALITY AND ... TION OF DEEP LEARNING IMAGE RECONSTRUCTION FOR CORONARY ... RAPHY

43 patients, 1.12 mSv average,
mean BMI 27

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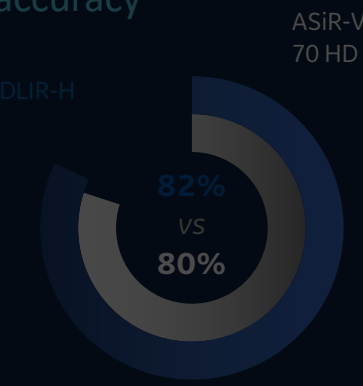

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IMPACT ON NOISE, IMAGE QUALITY AND DIAGNOSTIC … LEARNING IMAGE RECONSTRUCTION FOR CORONARY COMPUTED T…

Retrospective study evaluating image quality and diagnostic accuracy of deep learning image reconstruction (DLIR) *vs* ASiR-V in patients with suspected or known CAD who underwent CCTA followed by invasive coronary angiography.

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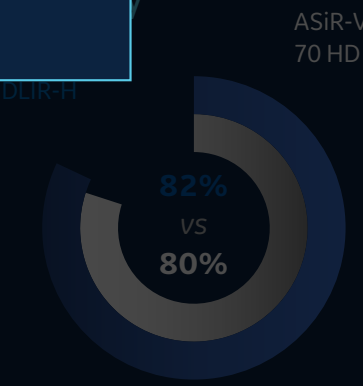

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IMPACT ON NOISE, IMAGE QUALITY AND
IMAGE RECONSTRUCTION FOR CORONARY

1. Benz DC, Benetos G, Rampidis G, et al. (2020) Validation of deep learning image reconstruction for coronary computed tomography angiography: Impact on noise, image quality and diagnostic accuracy. Journal of Cardiovascular Computed Tomography 14:444–451. https://doi.org/10.1016/j.jcct.2020.01.002

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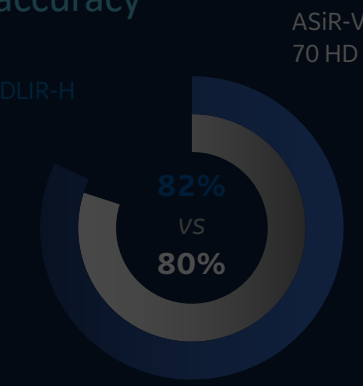

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IMPACT ON NOISE, IMAGE QUALITY AND DIAGNOS
IMAGE RECONSTRUCTION FOR CORONARY COMPUTE

** Measured as the pixel standard deviation within a 20 mm diameter region of interest in the aortic root.*

*** Evaluated on a 5-point Likert scale by three independent observers.*

**** Three independent readers evaluated the luminal narrowing as a percentage of the vessel diameter to assess relevant coronary artery disease (i.e., ≥ 50% luminal narrowing) in comparison to the reference standard of invasive coronary angiography.*

Infographic is a summary of example results from literature and its content does not constitute a representation or guarantee from GE Healthcare.

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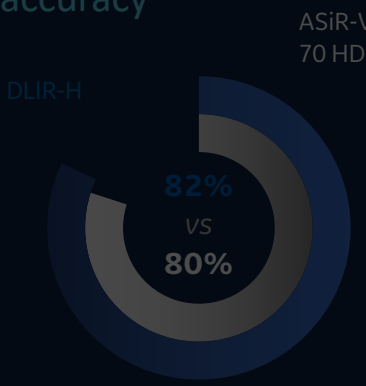

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A PHANTOM STUDY[1]

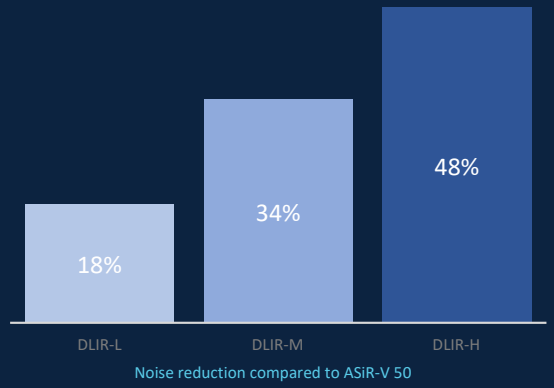
Image quality and dose reduction opportunity of **deep learning image reconstruction algorithm for CT**

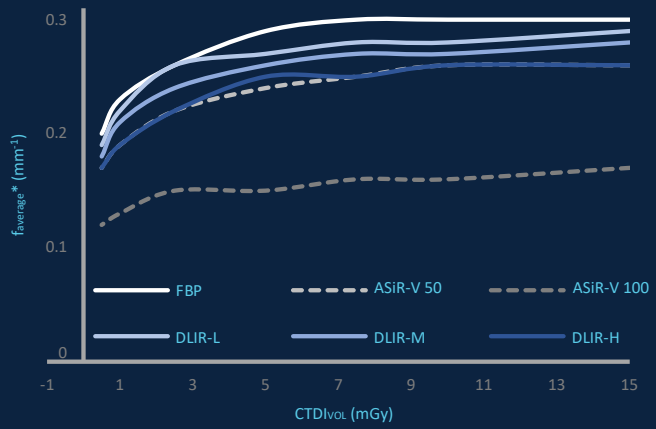
A PHANTOM STUDY[1]: IMAGE QUALITY AND DOSE REDUCTION OPPORTUNITY OF DEEP LEARNING IMAGE RECONSTRUCTION ALGORITHM FOR CT

Unfamiliar texture of CT iterative reconstruction

Using iterative reconstruction (IR) algorithms reduces the noise magnitude but alters the texture of the image. The image quality obtained with these algorithms can hinder interpretation, which limits the use of the highest iterative levels and therefore the dose reduction potential in clinical practice.[1]

Further noise reduction while maintaining texture





Low-contrast Spatial resolution

29% *vs* ASiR-V 50

*Increase of the f_{50}** at low-contrast*

61% *vs* ASiR-V 100

A PHANTOM STUDY[1]: IMAGE QUALITY AND DOSE REDU
OF DEEP LEARNING IMAGE RECONSTRUCTION ALGORITH

Phantom study assessing (0.5 to 15 mGy) noise characteristics, spatial resolution and lesion detectability of TrueFidelity deep learning image reconstruction (DLIR) at different noise levels in comparison to FBP and ASiR-V 50 and 100.

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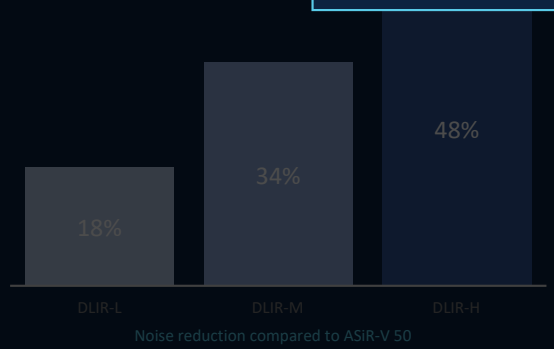

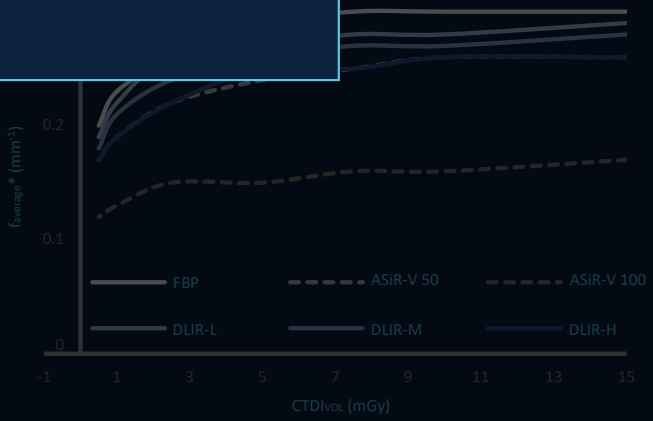

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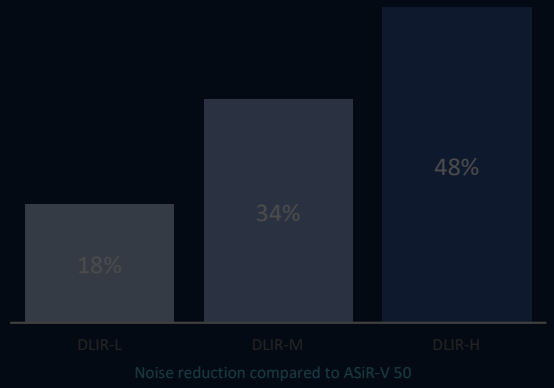

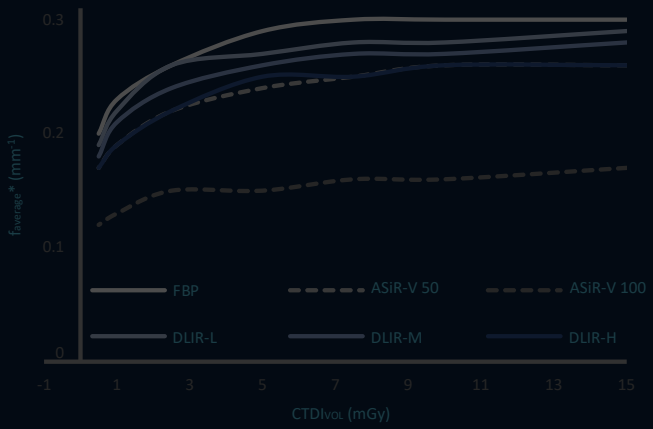

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A PHANTOM STUDY[1]: IMAGE QUALITY AND DOSE OF DEEP LEARNING IMAGE RECONSTRUCTION AL

** Average spatial frequency of the Noise Power Spectrum.*

*** Spatial frequency at which the Task-Based Modulation Transfer Function reduces to 50%.*

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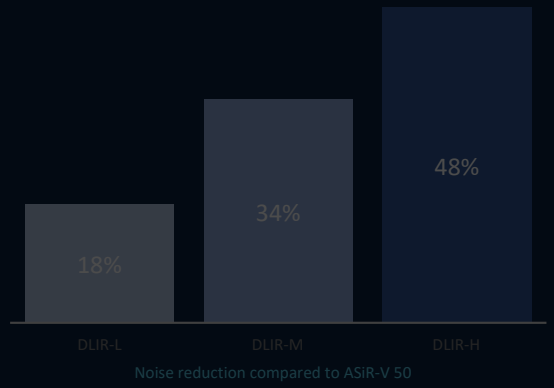

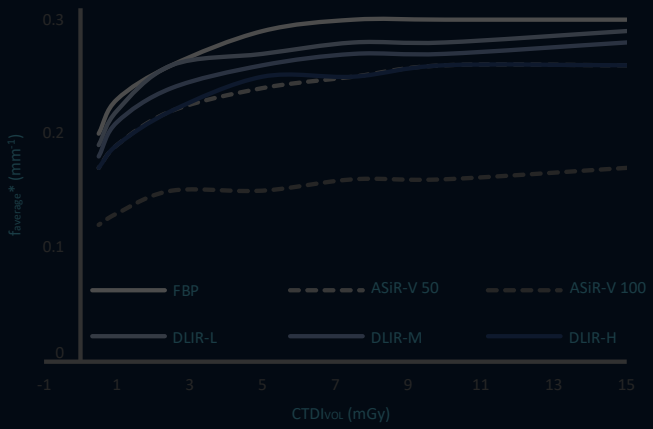

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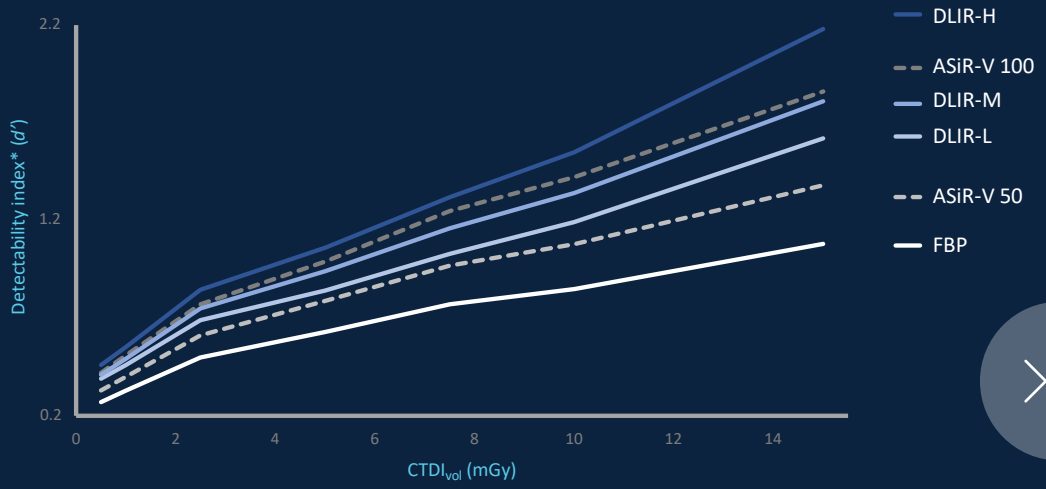
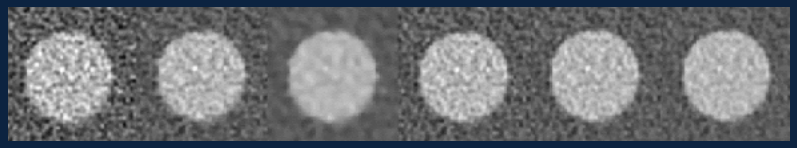
Detectability of subtle lesion



Refined subjective image quality**



"The new TrueFidelity deep learning image reconstruction algorithm reduced noise magnitude and improved spatial resolution and detectability without changing noise texture relative to FBP. Images obtained with DLIR seem to indicate more potential for the dose optimization process than those obtained with IR."[1]

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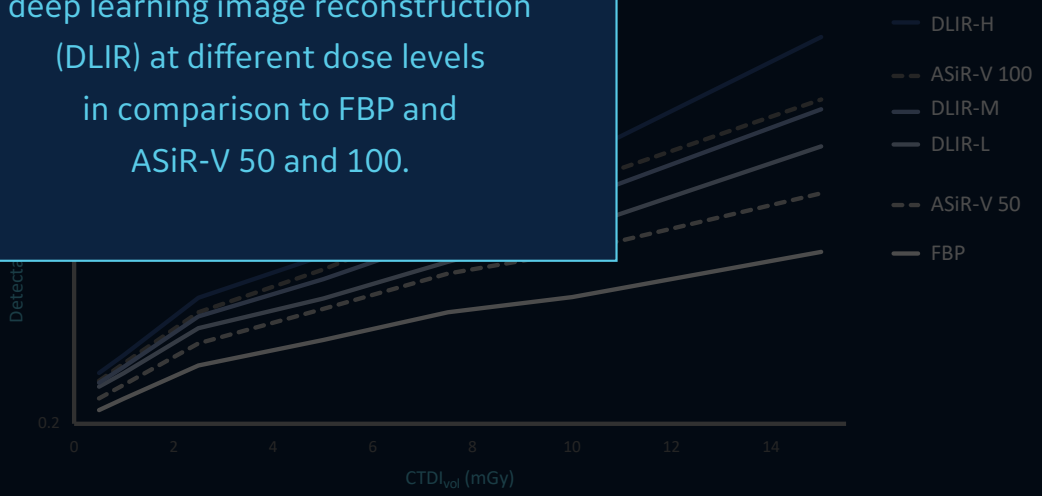

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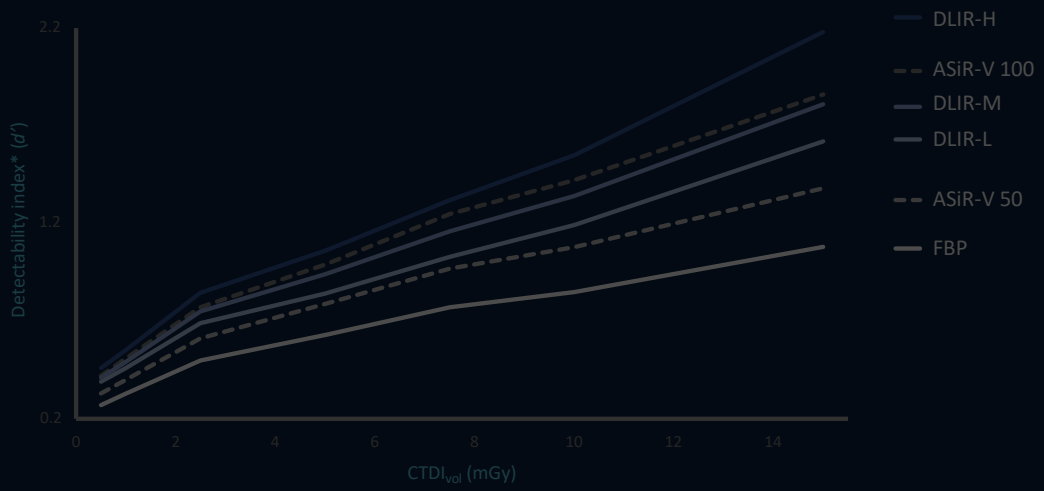

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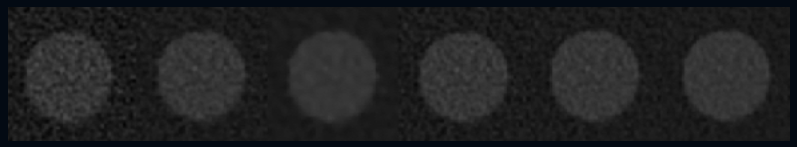

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A PHANTOM STUDY[1]: IMAGE QUALITY AND DOSE REDUC
OF DEEP LEARNING IMAGE RECONSTRUCTION ALGORITH

** Computed for a 10 mm lesion with 10 HU contrast.*

*** Images of 3×3 cm² regions of interest centered on the acrylic of the American College of Radiology phantom acquired with a CTDIvol of 7.5 mGy.*

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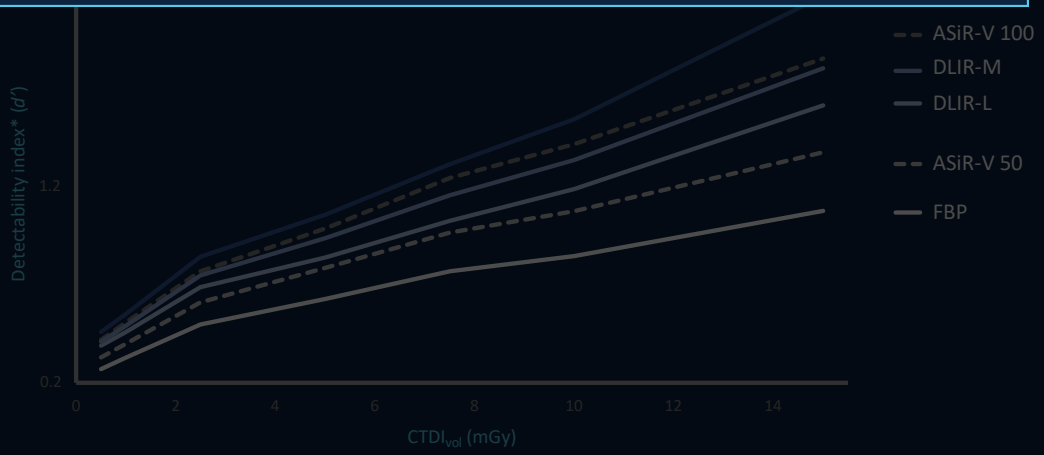

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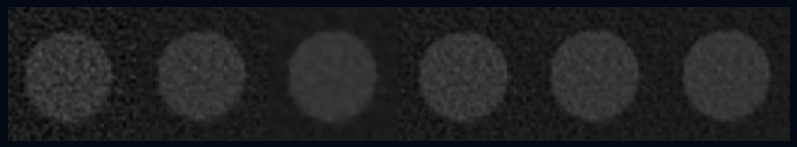

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A PHANTOM STUDY[1]

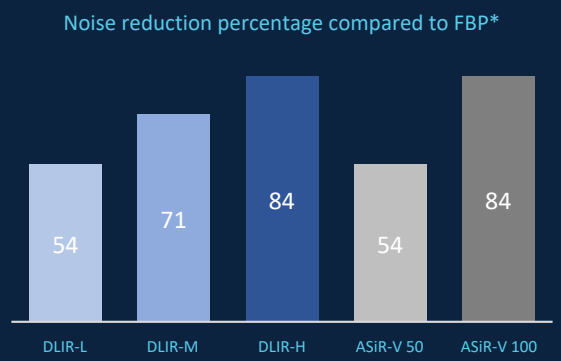
Task-based characterization of a deep learning image reconstruction and comparison **with filtered back-projection and a partial model-based iterative reconstruction in abdominal CT**

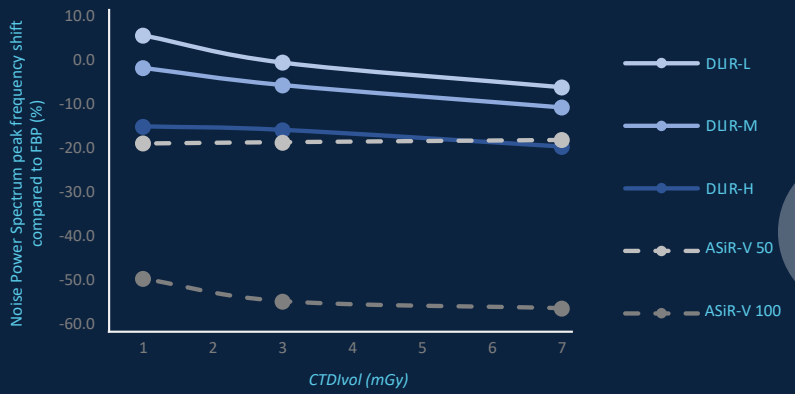
A PHANTOM STUDY[1]: TASK-BASED CHARACTERIZATION OF A DEEP LEARNING IMAGE RECONSTRUCTION AND COMPARISON WITH FILTERED BACK-PROJECTION AND A PARTIAL MODEL-BASED ITERATIVE RECONSTRUCTION IN ABDOMINAL CT

Iterative reconstruction limitations in abdominal CT

Iterative reconstructions not only reduce noise magnitude but also change noise texture, especially when used at high levels. This results in images with an artificial "plastic" appearance, which may affect diagnostic confidence particularly in abdominal CT where most of diagnostic tasks relies on low-contrast detectability.[1]

Further noise reduction while maintaining texture





Superior low-contrast spatial resolution**

A PHANTOM STUDY[1]: TASK-BASED CHARACTE… AND COMPARISON WITH FILTERED BACK-PROJ… RECONSTRUCTION IN ABDOMINAL CT

…NSTRUCTION …TIVE

Phantom study assessing (1, 3 and 7 mGy) noise characteristics, spatial resolution and lesion detectability of deep learning image reconstruction low, medium and high (DLIR-L, DLIR-M and DLIR-H) at different dose levels in comparison to FBP, ASiR-V 50 and 100.[1]

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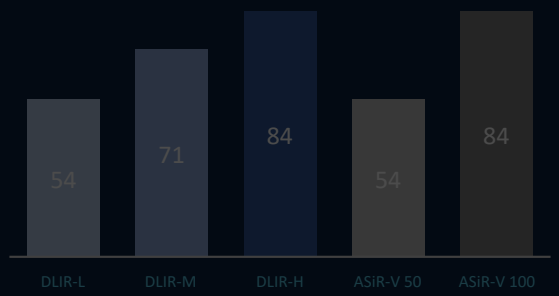
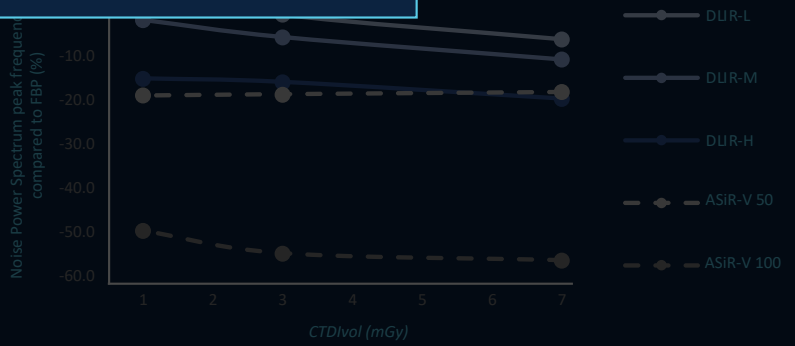
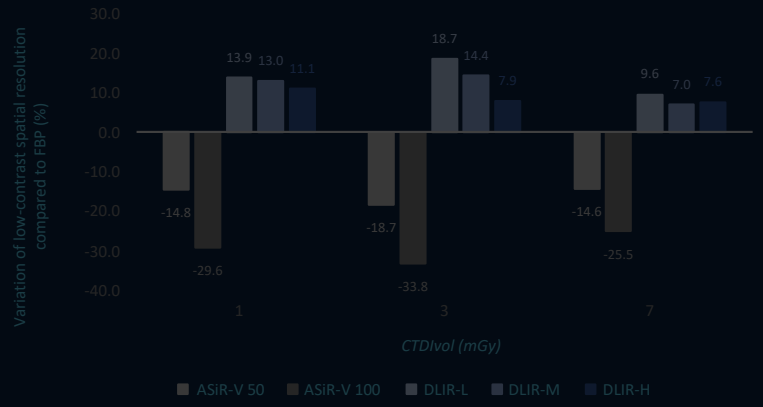
Further r…

Noise red…





Superior low-contrast spatial resolution**



A PHANTOM STUDY[1]: TASK-B… N
AND COMPARISON WITH FILTE…
RECONSTRUCTION IN ABDOMI…

1. Racine D, Becce F, Viry A, et al. (2020) Task-based characterization of a deep learning image reconstruction and comparison with filtered back-projection and a partial model-based iterative reconstruction in abdominal CT: A phantom study. Physica Medica 76:28–37. https://doi.org/10.1016/j.ejmp.2020.06.004

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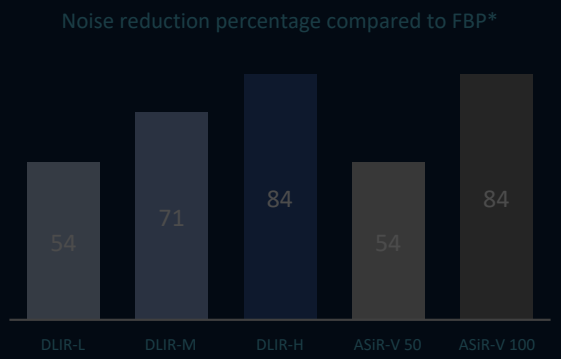
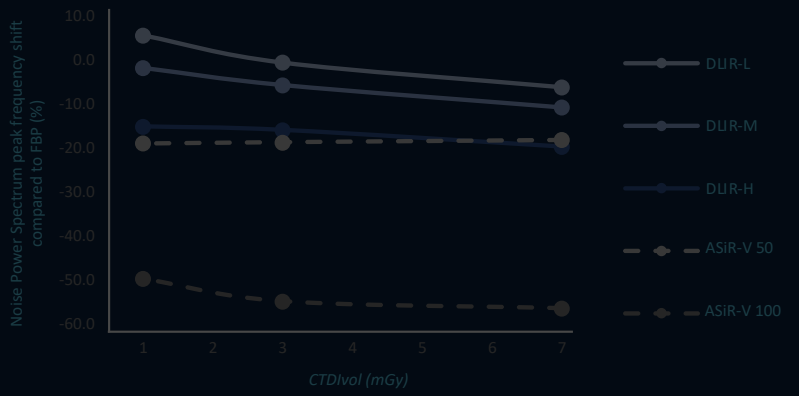
Further noise reduction while maintaining texture





Superior low-contrast spatial resolution**

A PHANTOM STUDY[1]: TASK-BASED CHARACTERIZA
AND COMPARISON WITH FILTERED BACK-PROJECTI
RECONSTRUCTION IN ABDOMINAL CT

** Noise magnitude quantified using the noise power spectrum measured at 7 mGy.*

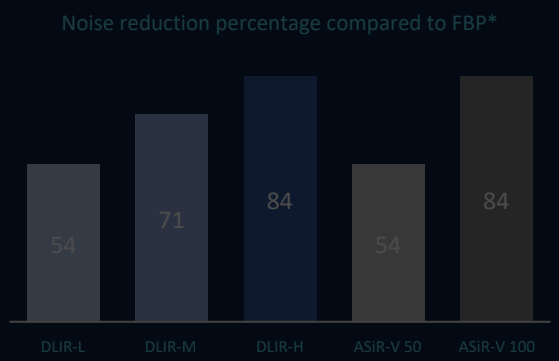
*** Low-contrast spatial resolution quantified using the frequency at which the target transfer function reached 50% of its maximum value.*

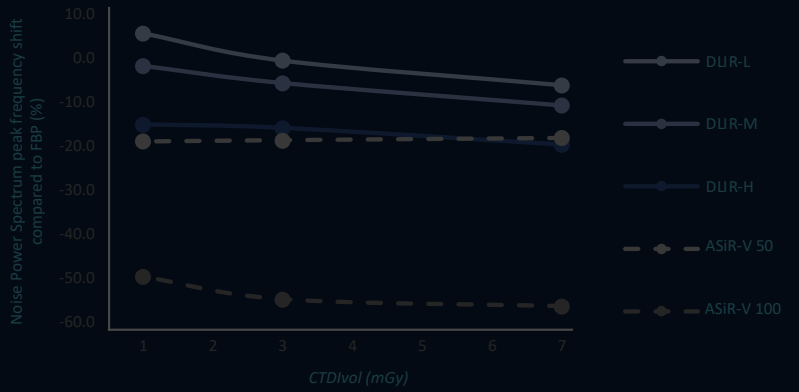
Infographic is a summary of example results from literature and its content does not constitute a representation or guarantee from GE Healthcare.

Iterative reconstruction limitations in abdominal CT

Iterative reconstructions not only reduce noise magnitude but also change noise texture, especially when used at high levels. This results in images with an artificial "plastic" appearance, which may affect diagnostic confidence particularly in abdominal CT where most of diagnostic tasks relies on low-contrast detectability.[1]

Further noise reduction while maintaining texture





Superior low-contrast spatial resolution**

A PHANTOM STUDY[1]: TASK-BASED CHARACTERIZATION OF A DEEP LEARNING IMAGE RECONSTRUCTION AND COMPARISON WITH FILTERED BACK-PROJECTION AND A PARTIAL MODEL-BASED ITERATIVE RECONSTRUCTION IN ABDOMINAL CT

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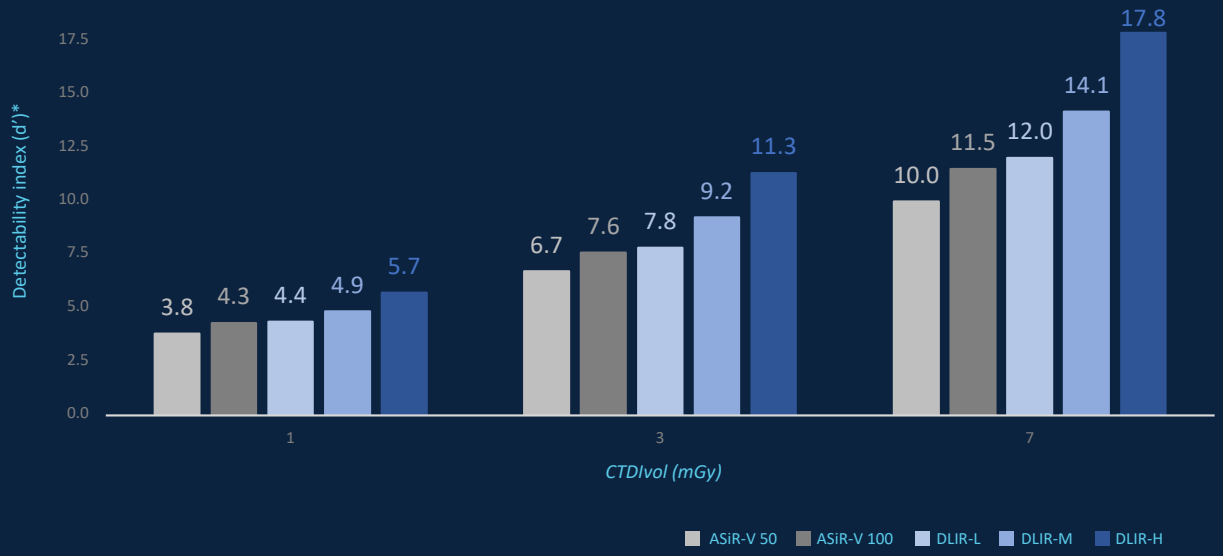
Superior low-contrast detectability



"Unlike ASiR-V, DLIR substantially reduces noise while maintaining noise texture and slightly enhancing spatial resolution overall. DLIR outperforms ASiR-V by enabling higher detectability of both low- and high-contrast simulated abdominal lesions across all investigated dose levels."[1]

A PHANTOM STUDY[1]: TASK-BASED CHARACTE… …NSTRUCTION AND COMPARISON WITH FILTERED BACK-PROJ… …TIVE RECONSTRUCTION IN ABDOMINAL CT

Phantom study assessing (1, 3 and 7 mGy) noise characteristics, spatial resolution and lesion detectability of deep learning image reconstruction low, medium and high (DLIR-L, DLIR-M and DLIR-H) at different dose levels in comparison to FBP, ASiR-V 50 and 100.[1]

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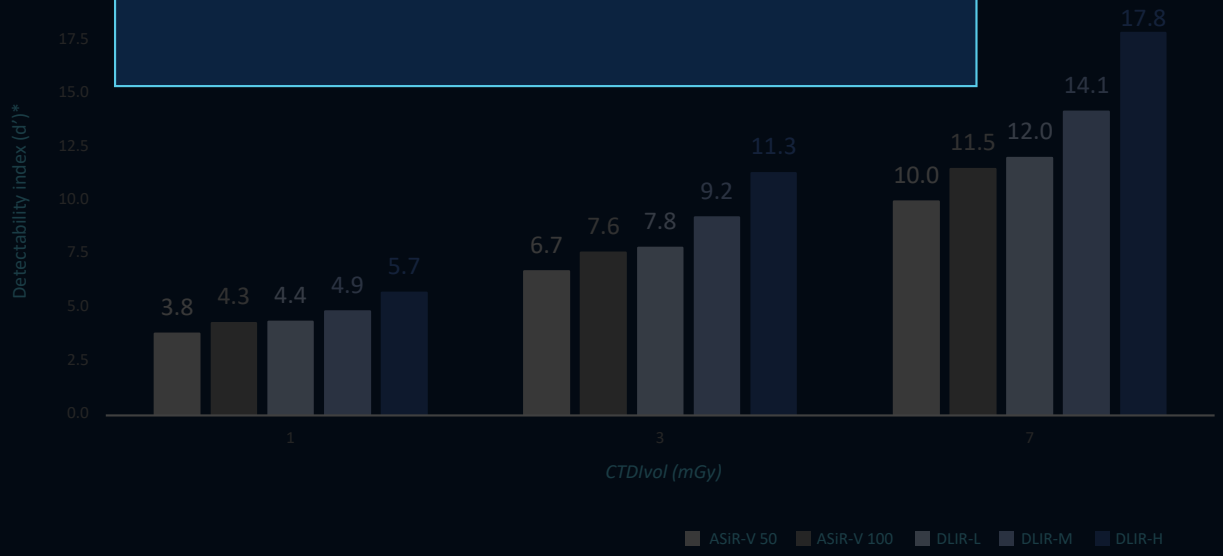
Supe…



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A PHANTOM STUDY[1]: TASK-BASED C… N AND COMPARISON WITH FILTERED BA… RECONSTRUCTION IN ABDOMINAL CT

1. Racine D, Becce F, Viry A, et al. (2020) Task-based characterization of a deep learning image reconstruction and comparison with filtered back-projection and a partial model-based iterative reconstruction in abdominal CT: A phantom study. Physica Medica 76:28–37. https://doi.org/10.1016/j.ejmp.2020.06.004

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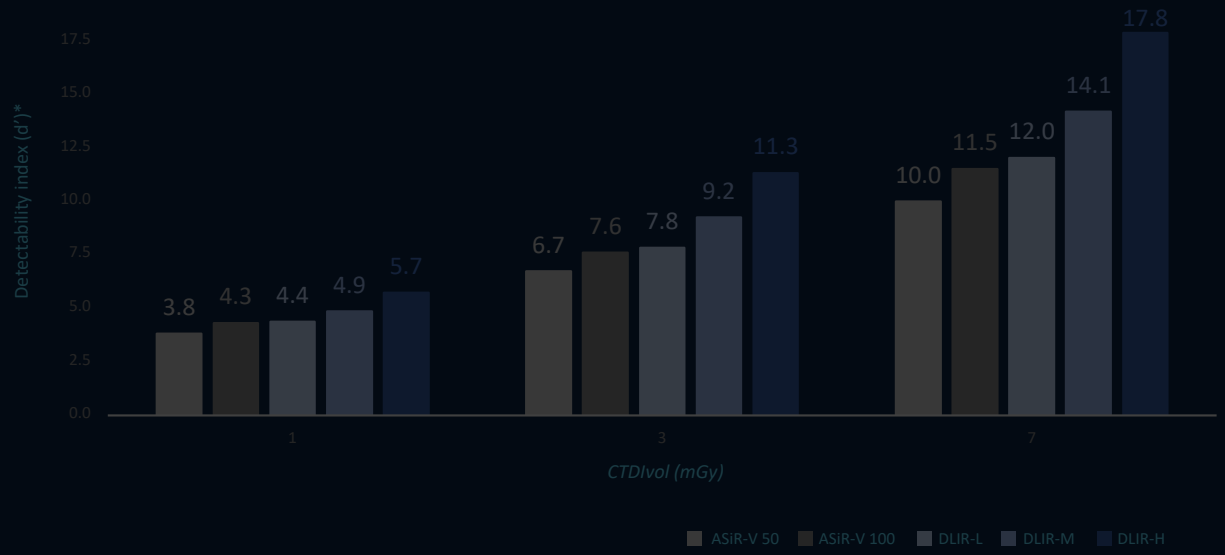
Superior low-contrast detectability



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A PHANTOM STUDY[1]: TASK-BASED CHARACTERIZA AND COMPARISON WITH FILTERED BACK-PROJECTI RECONSTRUCTION IN ABDOMINAL CT

** Detectability index computed for a simulated 5 mm diameter lesion with a contrast of 50 HU representative of suspected appendicitis or colonic diverticulitis.*

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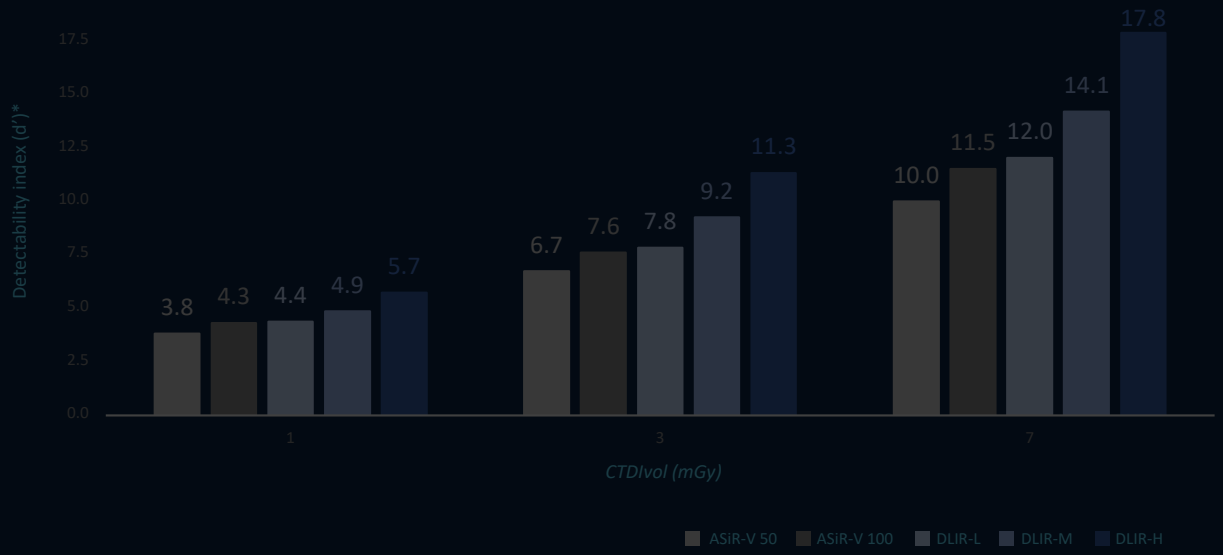

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