SIEMENS

siemens.com/somatom-definition-flash

SOMATOM Definition Flash

International version. Not for distribution in the US.

“Redefining standards” VS. “Trapped in traditions”

Second best is not an option.

SOMATOM Definition Flash

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In times of growing patient numbers, increasingly complex therapy pathways, and limited clinical capabilities, the reasonable thing to do is rethink clinical routines and not perform CT “the way it was always done“. Concentrating on what works sometimes makes it hard to learn what might work even better.

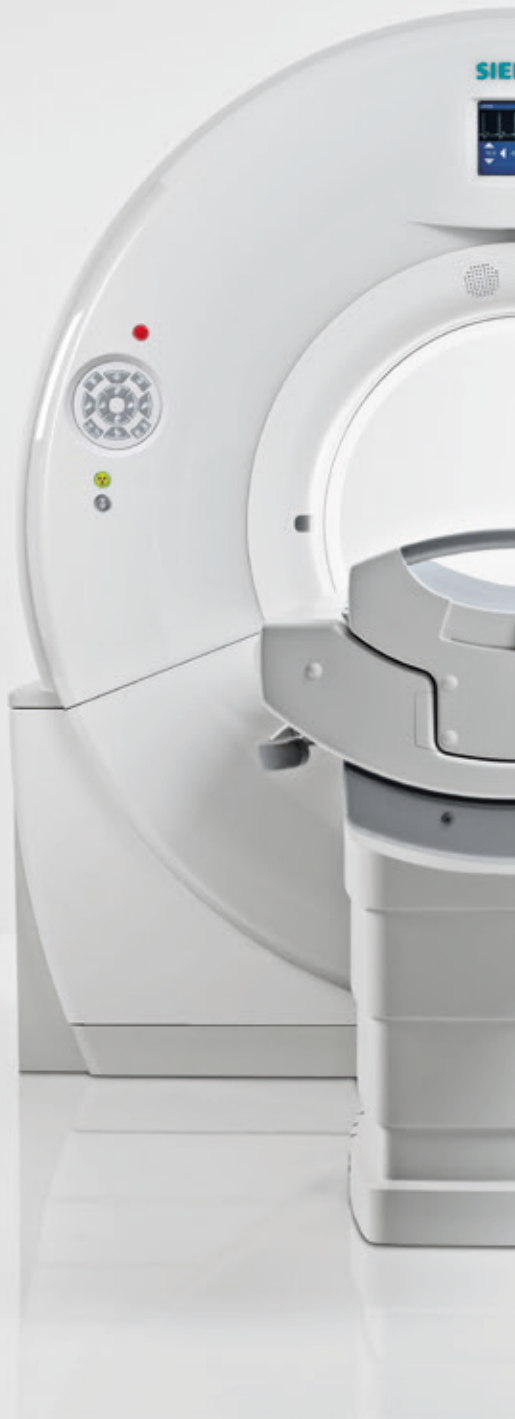
With the new SOMATOM Definition Flash, healthcare innovation leader Siemens contradicts a number of well established beliefs about how CT routines are run – and establishes new industry standards by completely redefining what you can do in your conventional CT practice.

Redefining standards in Cardiology, you will be able to scan without beta-blockers.

Redefining standards in Pediatrics, you will be able to scan without hazardous sedation.

Redefining standards in Oncology, you will be able to characterize lesions while maintaining dose neutrality with Dual Source Dual Energy.

“Conventional CT“ is not about following conventions, but about your patients‘ future. When better outcomes can be achieved, we must break conventions, redefine routines – and set new standards. Because when it comes to your patients‘ well-being, second best is not an option.



Benefits

Redefining standards in Cardiology

Advance your institution's process efficiency with state-of-the-art Dual Source technology, saving preparation time and resources by making heart-rate control unnecessary.

"Thanks to the SOMATOM Definition Flash and its temporal resolution of only 75 ms, we are now "freezing" cardiac motion during the acquisition time frame."

Kelly Han, MD
Children's Hospitals and Clinics of Minnesota
Minneapolis, USA

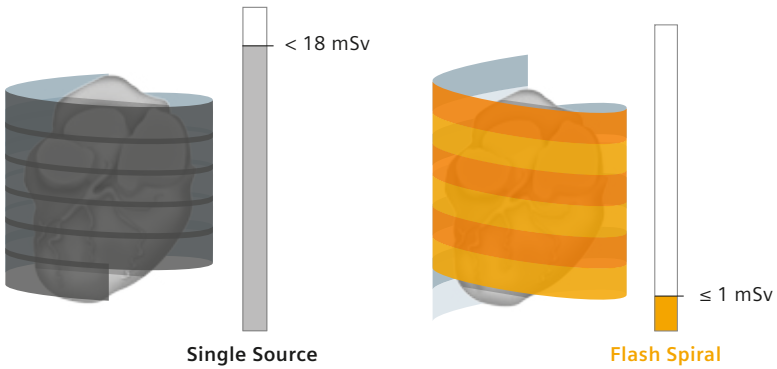
Saving time when time is short

When performing a cardiac scan, the main challenge is often posed by the time and effort it takes to prepare the patient with beta-blockers. This increases preparation time by up to an hour* and resources are tied up. With a temporal resolution of 75 ms, the new SOMATOM Definition Flash allows for heart scanning without any beta-blockers.

Scanning at all heart rates

In most of today's standard coronary CTA acquisitions, heart-rate variation means inappropriate data sampling, severe motion artifacts, and often unacceptably high radiation exposure. With a high-end cardiac CT scan taking only 250 ms – a quarter of a heartbeat – SOMATOM Definition Flash benefits all patients suffering from irregular heart rates or atrial fibrillations.

* assuming 8-10 cardiac patients/day, this equates to one non-MD FTE or appr. 65,000 US$/year http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3879696/ http://www.mhalink.org/AM/Template.cfm?Section=Home&ContentID=11241&Template=/CM/ContentDisplay.cfm



Lower noise for lower dose

Siemens innovations focus on reducing patient radiation exposure. The new SOMATOM Definition Flash hardware and software represent the next step in improving image quality without increasing dose. TrueSignal technology with the two fully integrated Stellar detectors minimizes electronic noise in the detector. The resulting higher signal-to-noise ratio (SNR) means that even low signal images are sharper and clearer.

Cardiac Dual Energy imaging

The new SOMATOM Definition Flash is unique in its ability to scan the entire heart and evaluate its morphology and coronaries with a full temporal resolution of 75 ms. A second reconstruction visualizes perfusion defects in the myocardium. Dual Energy CT is also able to highlight iodine content to visualize organ perfusion. Finally, dynamic myocardial stress perfusion imaging makes it possible to assess the hemodynamic relevance of a stenosis through blood flow quantification.

"With the SOMATOM Definition Flash, we can routinely scan patients with high and irregular heart rates without the need to prepare the patient, due to Dual Source technology's native temporal resolution of 75 ms which allows many options for motion-free image capture."

Brian B. Ghoshhajra, MD
MGH Boston
Boston, USA

Redefining standards in Pediatrics

Increase your institution's competitiveness and improve patient outcome by making Flash speed and Dual Source your standard – acquiring excellent diagnostic images at minimal dose, even with patients who cannot hold their breath.

"With the Flash, we can lower the dose without the need of sedation for patients under five because of the speed of the scan."

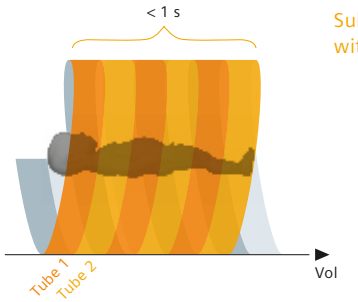
Marilyn J. Siegel, MD
Washington University School of Medicine and
St. Louis Children's Hospital
St. Louis, USA

Win-win for kids and institutions

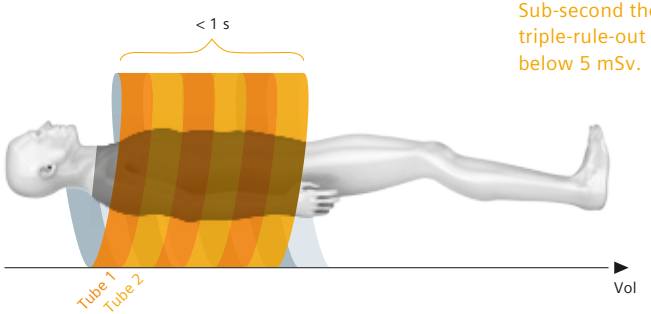
Around the world, for millions of children every year, CT-based diagnosing of illness and injury often enough helps save their lives. However, considering the inevitable radiation exposure, it is crucial to keep pushing for higher and higher standards in reducing exposure to as low as reasonably achievable, optimizing mA and/or kVp settings, and avoiding preventable re-scans. The more efficient you're able to perform pediatric CT, the better for your patients – and your institution.

Scan without sedation

Parents know best what professionals like to call the "non-cooperative": For a child, undergoing a CT scan can be quite scary. The younger the patient, the harder it is for them to hold still, increasing the risk of undiagnostic images. This is why today's standard procedure includes intense preparation, sedation, and after-care. Besides the fact that any sedation bears a certain risk and can in some cases cause serious side effects, sedation is time- and resource-intensive. SOMATOM Definition Flash allows you to routinely perform pediatric scans without hazardous sedation, freeing up the resources of anesthetic professionals.



Sub-second pediatric scan without sedation or anesthesia.



Sub-second thorax scan for triple-rule-out with a dose below 5 mSv.

Scan FAST

Flash speed makes pediatric imaging easier to use and more patient-friendly. The Flash Spiral scan mode combines a scan speed of 458 mm/s and a temporal resolution of 75 ms – reducing the average examination time to only 0.49 s. As children are sometimes uncooperative and cannot always lie straight on the table for side comparisons, SOMATOM Definition Flash provides FAST (Fully Assistant Scanner Technologies) features to improve patient outcome as well as your daily workflow. For example, FAST 3DAlign supports you by automatically optimizing the field of view and tilting the reconstructions based on anatomical landmarks.

Scan with CARE

CARE (Combined Applications to Reduce Exposure) features provide excellent image quality at the right dose level, making CT scanning safer for the most precious patients, our children. CARE Child makes an additional dose reduction possible at consistently high image quality. The CARE package includes dedicated pediatric scan modes (70 kV) and specific CARE Dose4D curves, taking the specific anatomy of each child and neonate patient into account. Combined with ADMIRE, the industry's most advanced model-based iterative reconstruction tool, and the revised Stellar Detector, the SOMATOM Definition Flash will help redefine safety standards in pediatric CT.

"With the SOMATOM Definition Flash and its Flash spiral scan mode, we do not need to sedate children routinely. Usually no aftercare is needed when even challenging patients like pediatric are being examined."

Aurelio Secinaro, MD
Ospedale Pediatrico Bambino Gesù
Rome, Italy

Redefining standards in Oncology

Enhance your institution's clinicial capabilities by standardizing dose-neutral Dual Source Dual Energy CT – introducing "two-in-one" CT scanning for all your patients and turning imaging information into imaging intelligence with *syngo*. *via* applications.

"From our perspective, any institution with a SOMATOM Definition Flash can start using Dual Source DE protocols for head and neck tumors from one day to the next."

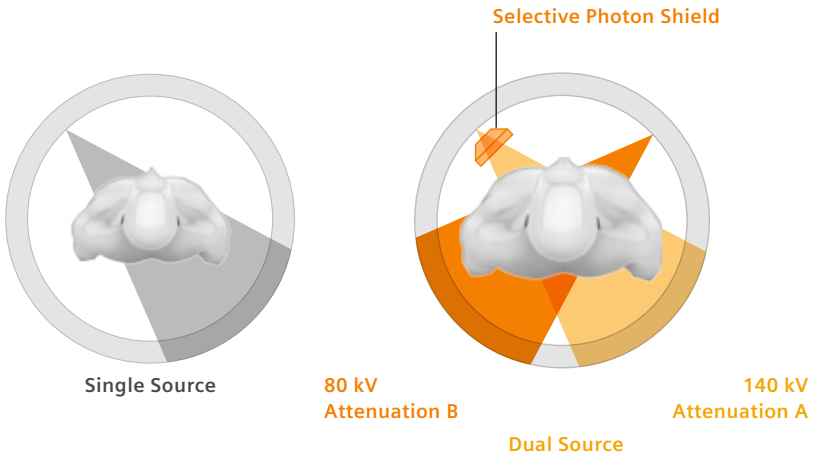
Hirofumi Kuno, MD
National Cancer Center, Hospital East
Chiba, Japan

Fewer scans, more information

When performing an oncology examination, you want to be able to characterize lesions in detail – not just recognize that there is a lesion, but precisely visualize and quantify tissue composition and morphology in order to provide precise diagnoses. Today's standard answer in many institutions: Multiple scans, obviously resulting in higher radiation exposure and potentially increasing risks for patients. Since SOMATOM Definition Flash enables routine Dual Source DE scanning, you will be able to get all the information you need in a single scan.

Less risk, more confidence

Dual Source is the only modality that enables Dual Energy scanning at doses comparable to a conventional 120 kV scan. Creating virtual non-contrast images based on the Dual Energy information will help you and your institution save time and resources – without adding dose. Using the revised Selective Photon Shield in additon to the Stellar detectors lets you achieve higher diagnostic confidence and redefine your own standards when it comes to sound treatment decisions.



Bringing Dual Energy to clinical routine

Dual Source Dual Energy offers a variety of clinical applications – from research to clinical routine. For example, Monoenergetic imaging creates results similar to those acquired with a synchrotron X-ray beam of single photon energy. Dual Energy Optimum Contrast, another Dual Source Dual Energy application, achieves images with very low noise at high contrasts supporting the visualization of occult or conspicuous soft tissue lesions. Supporting you in your clinical routine, these reproducible results are delivered automatically at the scanner with FAST DE Results. Waiting time and user interaction can be eliminated due to auto transfer to the PACS.

Bariatric imaging with full diagnostic image quality

Everywhere the trend towards obesity is on the rise. This comes with severe challenges in clinical routine: Undiagnostic image quality and re-scans. Sometimes, it is even not possible to scan bariatric patients. SOMATOM Definition Flash has two high-power generators and two STRATON® X-ray tubes of 100 kW each. This combination enables enough power reserves for robust image quality – even at the fast scan speeds in Flash mode (pitch of 3.4). Furthermore, the 78 cm gantry bore and table strength to hold 300 kg provide for a more comfortable patient experience.

“Because of the dose neutrality of the Dual Energy scans, they have been implemented as clinical routine protocols in our daily workflow.”

Associate Professor Savvas Nicolaou, MD
VGH University of British Columbia
Vancouver, Canada

Quantitative diagnostic imaging and functional assessment in cardiovascular care

Enhance your clinical capabilities and improve patient outcome by combining the possibilities of coronary CT Angiography and the full spectrum of functional imaging.

syngo.via* for sustainable care

As the number of chronic disease patients rises, the demand for high-quality efficient care is increasing. *syngo*®.via can help foster sustainable care by equipping physicians with workflows and applications for evaluating images from multiple modalities. *syngo*.via's client-server-based nature supports a smooth, teamwork-like sharing of tasks, just as is required in 3D labs and larger radiology departments. Images can be shared among up to 10 users at once, providing a sound basis for joint evaluation and decision-making if needed.

Coronary artery disease

is one of the major causes of mortality and morbidity worldwide, contributing significantly to health-related spendings. With a coronary CT angiography, a coronary stenosis can be diagnosed easily within clinical routine. Automatic Case Preparation on our state-of-the-art *syngo*.via Cardiovascular Engine pre-processes your images and displays them in the appropriate layout. This enables you to evaluate the case as soon as it is opened and still gives you the flexibility to choose from a variety of evaluation tools.

The CT Cardiovascular Engine

is a powerful combination of software applications and scanner features that helps answer the key diagnostic questions rapidly on one modality. Combining the possibilities of coronary CT Angiography and the full spectrum of functional imaging, you will be able to take the assessment of coronary heart disease to a new level with *syngo*.via *syngo*.CT Cardiac Function – Enhancement[1] and *syngo*.CT Myocardial Perfusion[1] via Client @AWP allows direct access to the CT Cardiovascular Engine and all other advanced clinical applications by installing a client directly at the CT Acquisition Workplace.

syngo.CT Myocardial Perfusion offers a quick and secure evaluation of myocardial blood flow, myocardial blood volume and providing actual quantitative assessment for determining the hemodynamic relevance of intermediate stenosis of the coronaries. This gives the treating physician decision support in identifying those patients with coronary lesions who will benefit from an interventional procedure.

Relevance and benefits

Ruling out high-grade coronary stenosis is possible in under one minute. But what about the functional relevance of an intermediate lesion? Will the patient actually benefit from an intervention?

With *syngo*.CT Cardiac Function** – Enhancement, you can choose from the full spectrum of myocardial perfusion: From first-pass enhancement in both rest and stress conditions to late enhancement for the evaluation of scarred tissue.

syngo.CT Myocardial Perfusion[1] takes you to a new level in measuring the myocardial blood flow and volume, allowing you to use actual quantitative assessment for the hemodynamic relevance of intermediate stenoses of the coronaries.

SOMATOM Definition Flash with the CT Cardiovascular Engine enables you to choose the right diagnostic approach for every patient – and, in effect, to redefine standards in your clinical routine.

**syngo.via can be used as a standalone device or together with a variety of syngo.via-based software options, which are medical devices in their own rights. These products are pending regulatory clearance in some countries and may therefore not yet be commercially available in all countries. Usage of syngo.via in operating rooms or for an emergency case requires customer to provide respective emergency measures in case of non-availability of system or network.*

***optional*

Clinical Images

collimation:
128 x 0.6 mm

Flash scan mode

scan time:
0.2 s

scan length:
87 mm

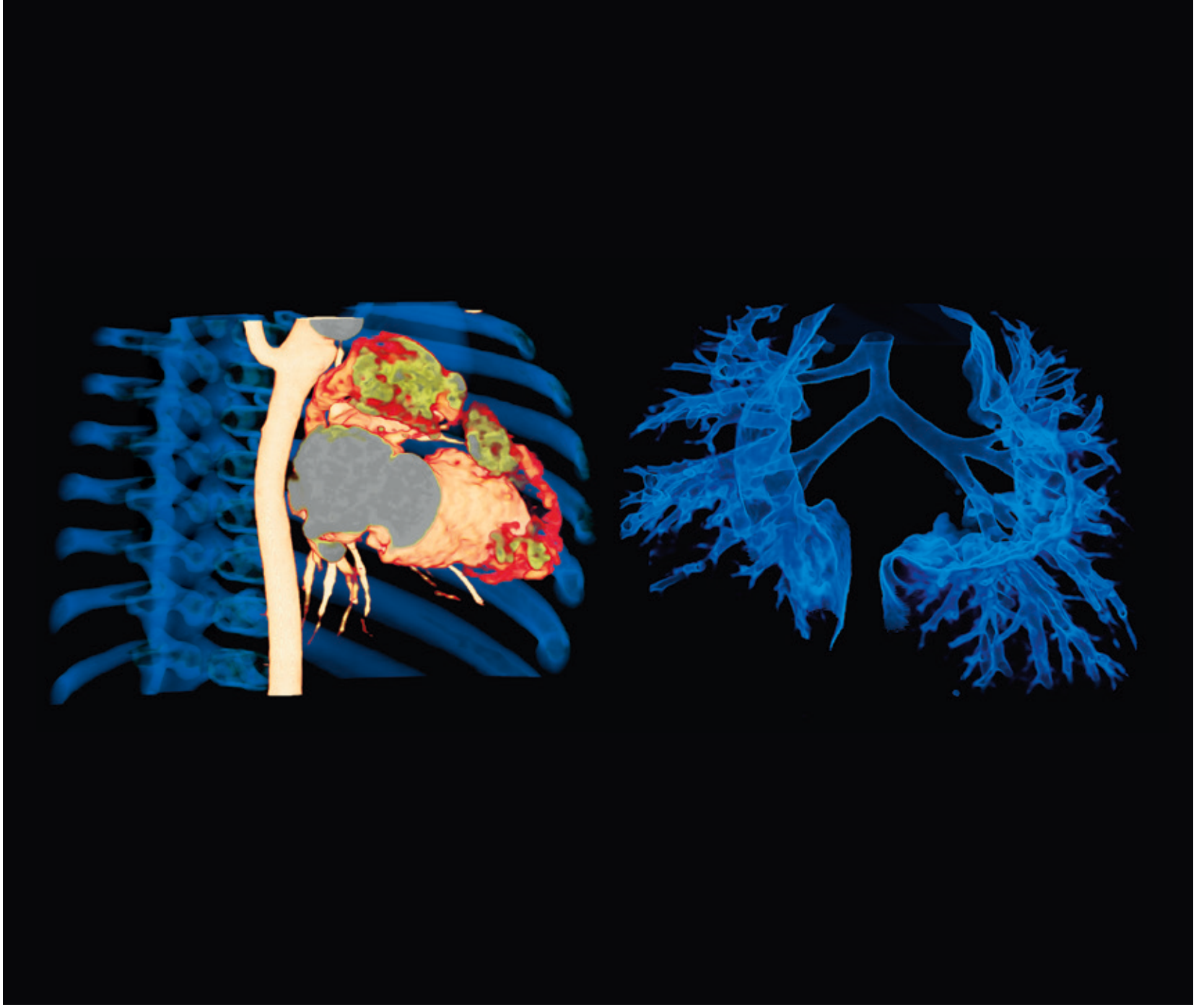
rotation time:
0.28 s

tube settings:
80 kV, 82 mAs

CTDIvol:
1.32 mGy

DLP:
21 mGy cm

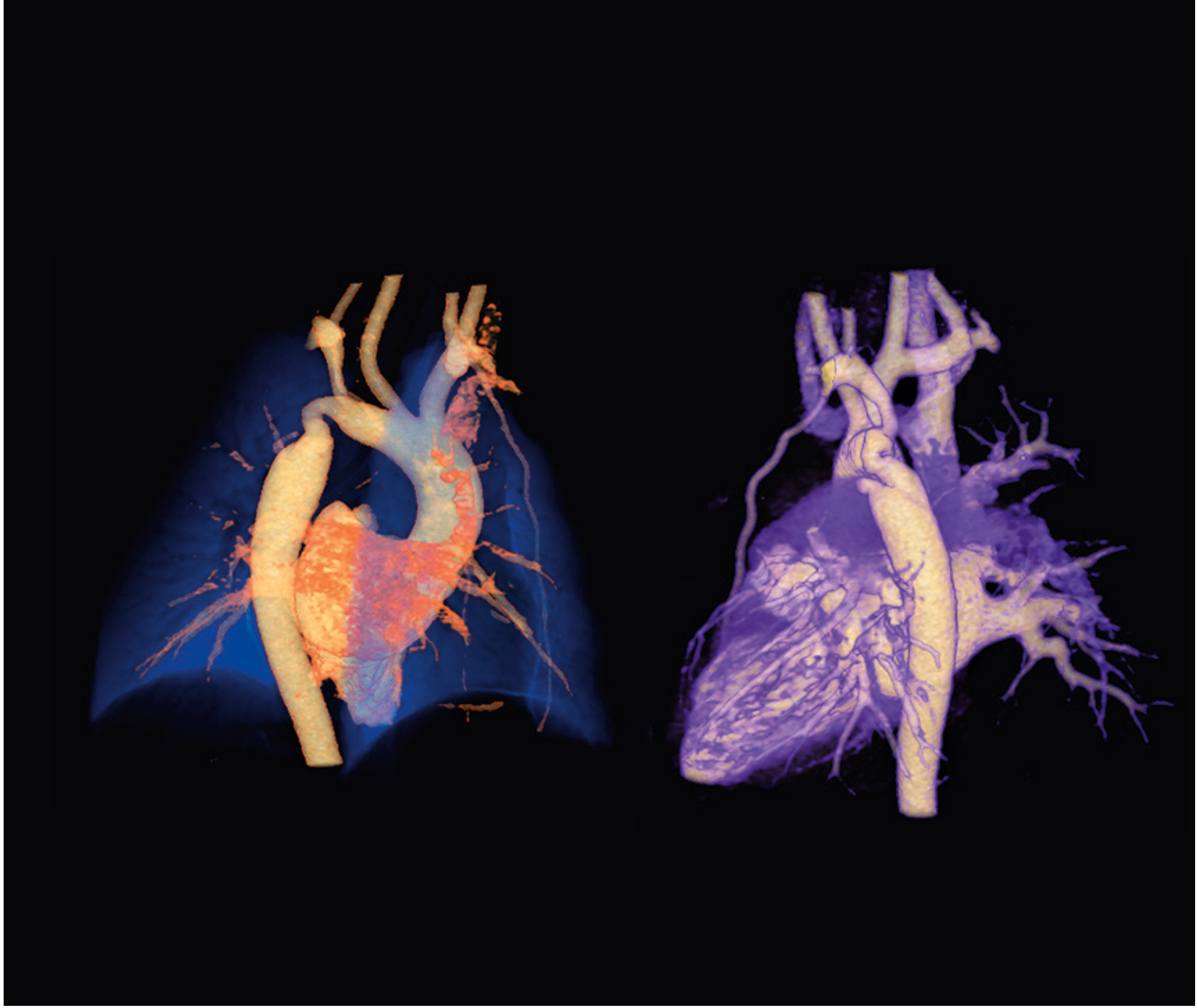
eff. dose:
1.88 mSv



Case:
Left aortic arch with aberrant right subclavian artery & pig bronchus.

Benefit:
The Flash spiral mode with 458 mm/s allows examinations without breath-hold or sedation in non-cooperative patients such as children.

Courtesy of University of Virginia / Virginia, USA



Courtesy of Shandong Medical Imaging Research Institute / Shandong, P.R. China

collimation:
128 x 0.6 mm

Flash scan mode

scan time:
0.32 s

scan length:
144 mm

rotation time:
0.28 s

tube settings:
70 kV, 130 mAs

CTDIvol:
0.37 mGy

DLP:
8 mGy cm

eff. dose:
0.35 mSv

Case:
Aortic coarctation and patent ductus arteriosus.

Benefit:
CARE Child facilitates 70kV scans, CARE Dose4D reduces the mAs accordingly – making sure that for our most delicate patients (children), the radiation dose is as minimal as possible.

collimation:
128 x 0.6 mm

Flash scan mode

scan time:
0.68 s

scan length:
308 mm

rotation time:
0.28 s

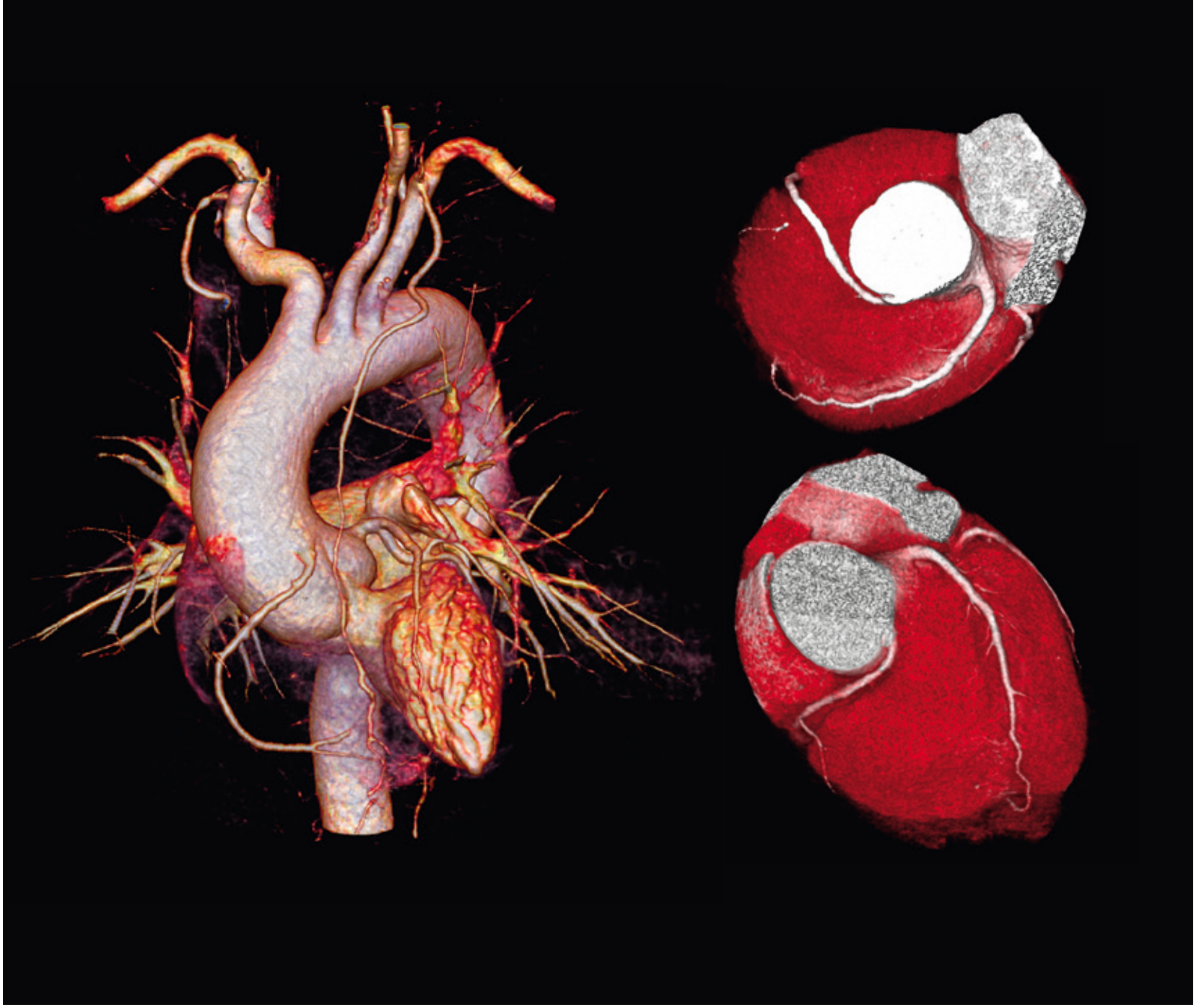
tube settings:
120 kV, 426 mAs

CTDIvol:
6.95 mGy

DLP:
252 mGy cm

eff. dose:
3.5 mSv

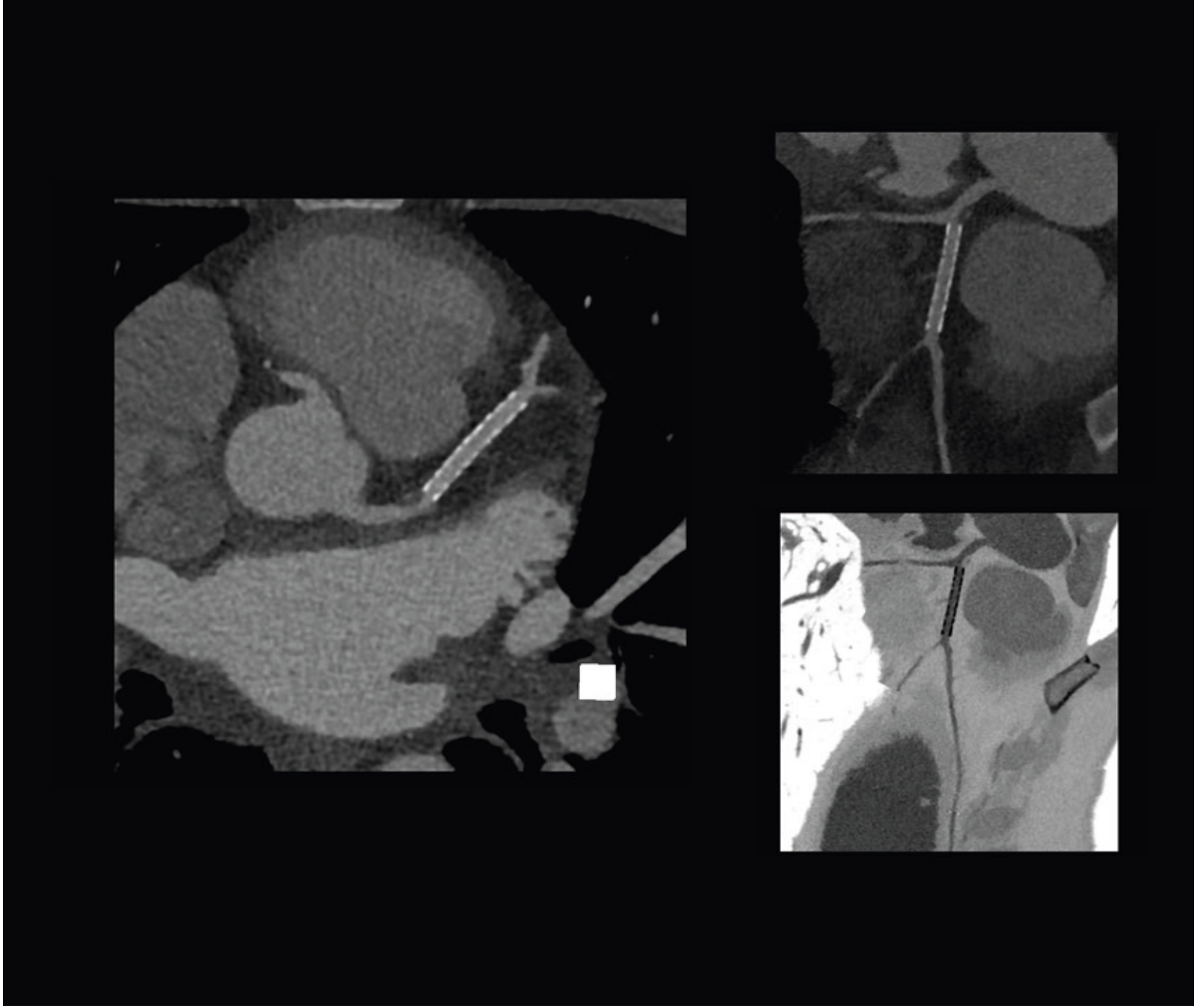
heart rate:
100 bpm



Case:
Assessment of cardiac abnormality at origin of RCA with high heart rate.

Benefit:
High temporal resolution of DS CT with 75 ms allows freezing motion in cardiac CT, resulting in a clear visualization of coronaries.

Courtesy of Cardiac Imaging, Grupo Fleury / São Paulo, Brazil



Courtesy of Rambam Healthcare Campus, Medical Imaging Department / Haifa, Israel

collimation:
128 x 0.6 mm

ECG-triggered sequential scan mode

scan time:
6 s

scan length:
137 mm

rotation time:
0.28 s

tube settings:
120 kV, 338 mAs

CTDIvol:
34 mGy

DLP:
470 mGy cm

eff. dose:
6.58 mSv

heart rate:
48-96 bpm

Case:
Patent LAD stent.

Benefit:
The Stellar detectors significantly reduce slice blurring, resulting in a more precise visualization of calcified lesions and in-stent restenosis evaluation.

collimation:
32 x 1.2 mm

ECG-triggered perfusion scan mode

scan time:
31 s

scan length:
70 mm

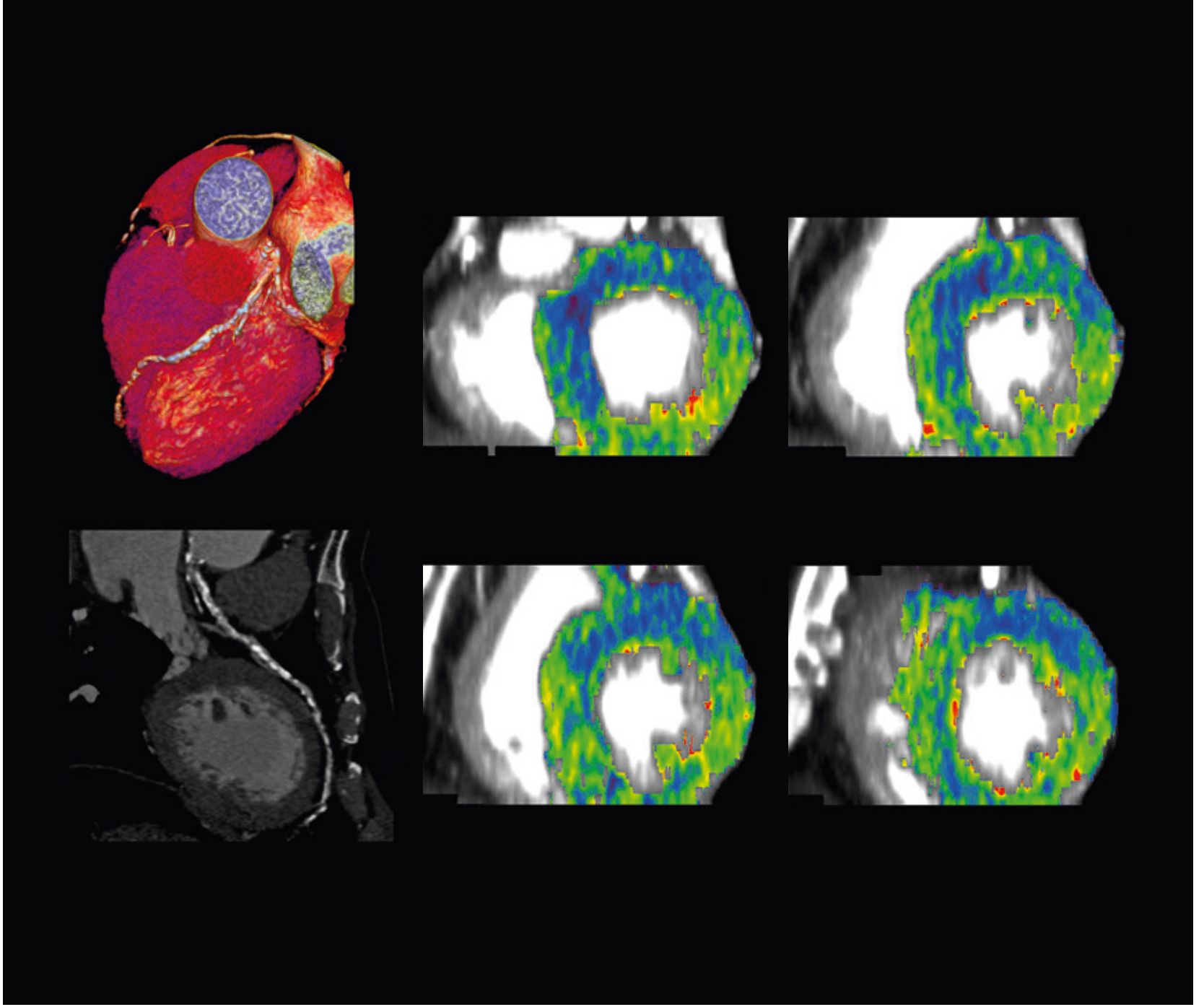
rotation time:
0.28 s

tube settings:
100 kV, 125 mAs

CTDIvol:
78.2 mGy

DLP:
562 mGy cm

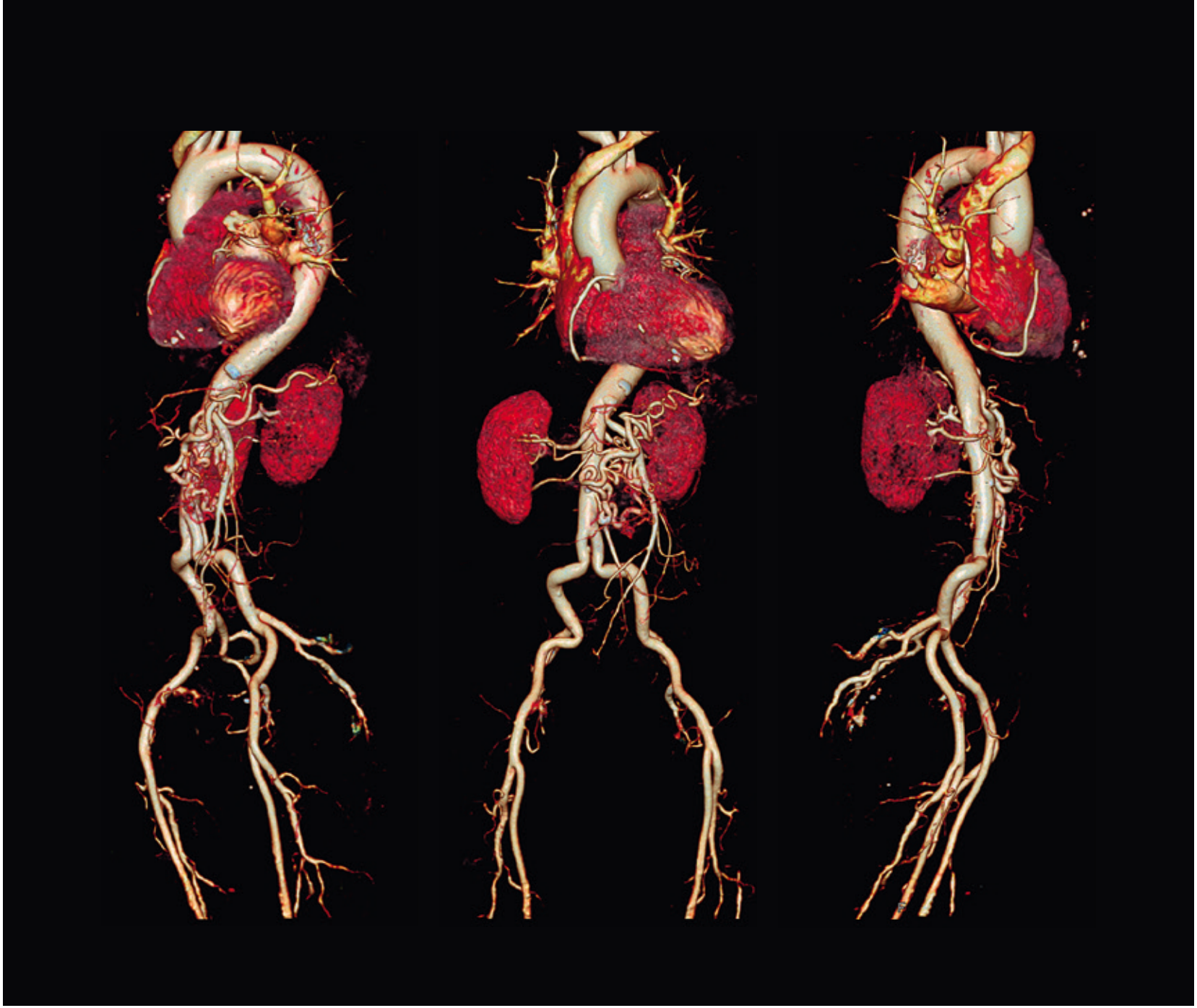
eff. dose:
7.9 mSv



Case:
Adenosine-stress myocardial perfusion.

Benefit:
The heart perfusion mode dynamically covers the complete heart with sufficient temporal resolution even for high heart rates induced by Adenosine.

Courtesy of Europa Clinics / Brussels, Belgium



collimation:
128 x 0.6 mm

Flash scan mode

scan time:
1.3 s

scan length:
563 mm

rotation time:
0.28 s

tube settings:
100 kV, 150 mAs

CTDIvol:
3.6 mGy

DLP:
224 mGy cm

eff. dose:
3.3 mSv

Case:
TAVI planning.

Benefit:
Flash Spiral obtains all relevant structures, including coronary arteries, for pre-procedural Transcatheter Aortic Valve Implantation planning in a single scan in less than 2 s.

Courtesy of Friedrich-Alexander-Universität Erlangen-Nürnberg, Institute of Medical Physics / Erlangen, Germany

collimation:
40 x 0.6 mm

DE / Bone marrow

scan time:
10 s

scan length:
168 mm

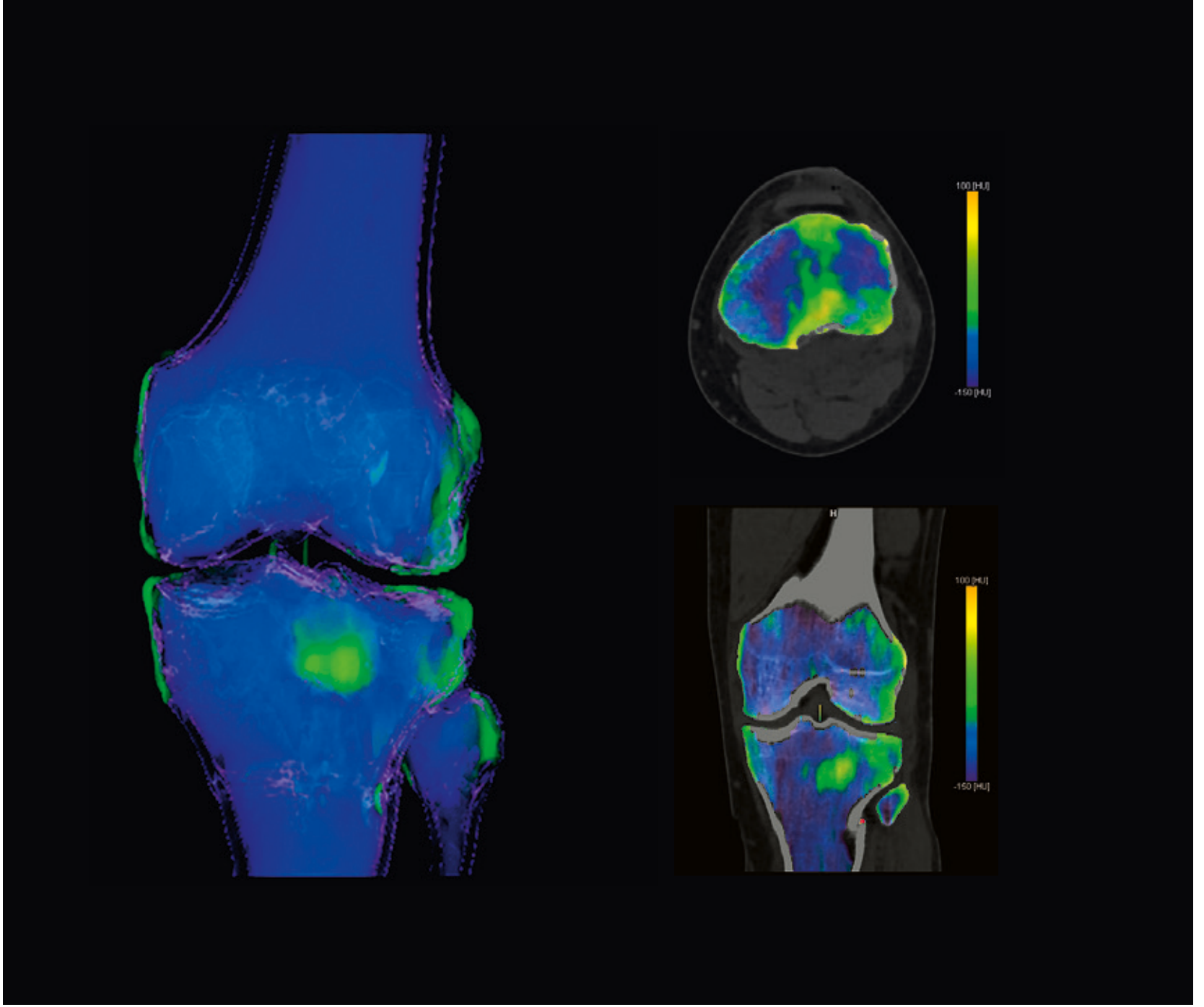
rotation time:
0.5 s

tube settings:
80 kV/ SN 140 kV

CTDIvol:
7.59 mGy

DLP:
41 mGy cm

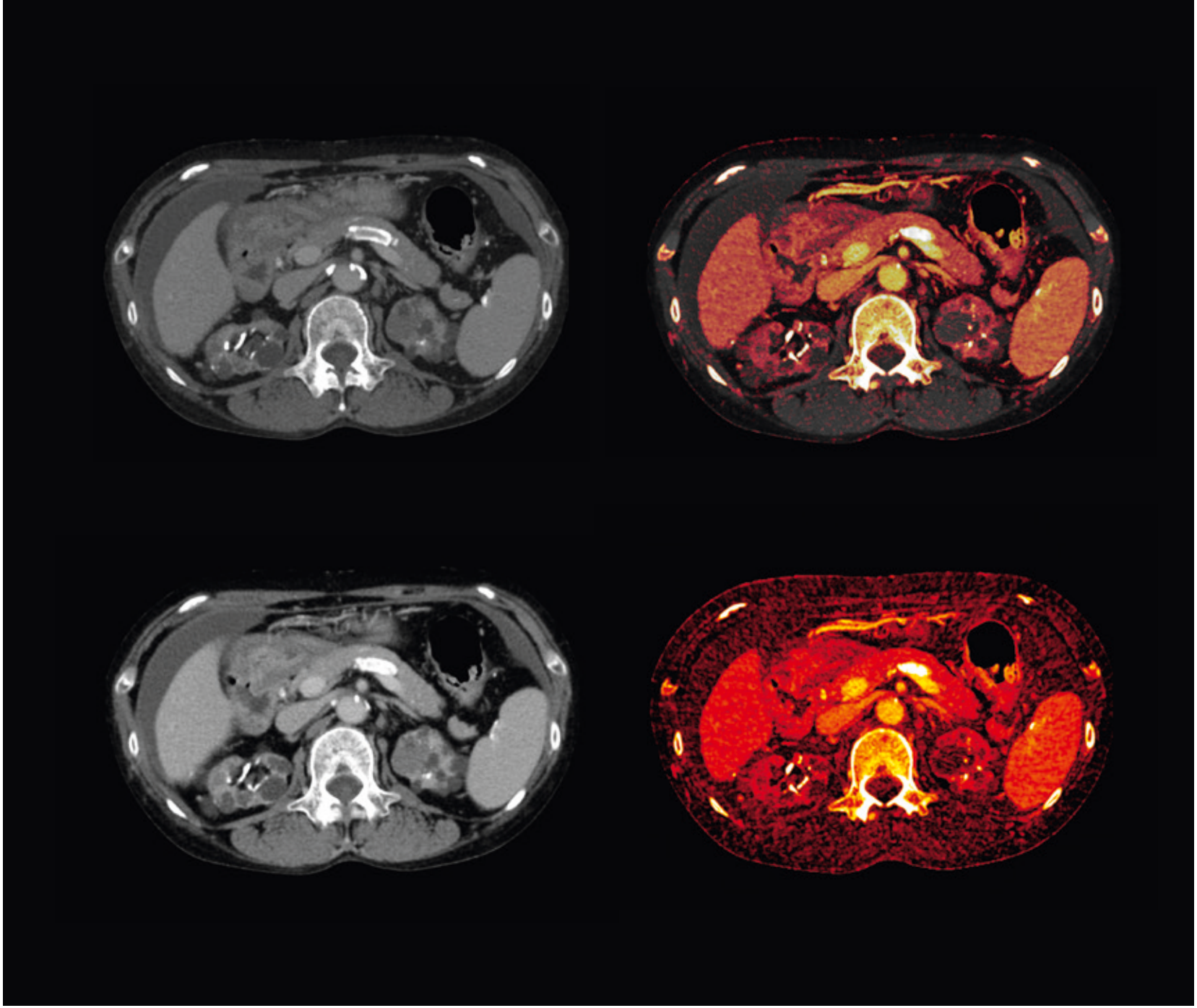
eff. dose:
0.11 mSv



Case:
Posterior cruciate ligament avulsion in the knee including an extensive bone marrow edema.

Benefit:
Dual Source Dual Energy examinations in combination with *syngo*.via DE Bone Marrow allow for the precise characterization of lesions.

Courtesy of Goethe University/ Frankfurt, Germany



Courtesy of Tokai University Hospital/ Yokohama, Japan

collimation:
32 x 0.6 mm

DE / VNC

scan time:
19 s

scan length:
435 mm

rotation time:
0.28 s

tube settings:
100/Sn140 kV, 140/119 mAs

CTDIvol:
11.6 mGy

DLP:
523 mGy cm

eff. dose:
7.85 mSv

Case:
Complicated renal cysts.

Benefit:
Dual Source Dual Energy scanning uses both tubes at the same time with different kV settings – allowing for virtual non-contrast images, thus eliminating additional non-contrast scans.

collimation:
128 x 0.6 mm

Spiral scan mode

scan time:
16 s

scan length:
1.102 mm

rotation time:
0.28 s

tube settings:
80 kV, 190 mAs

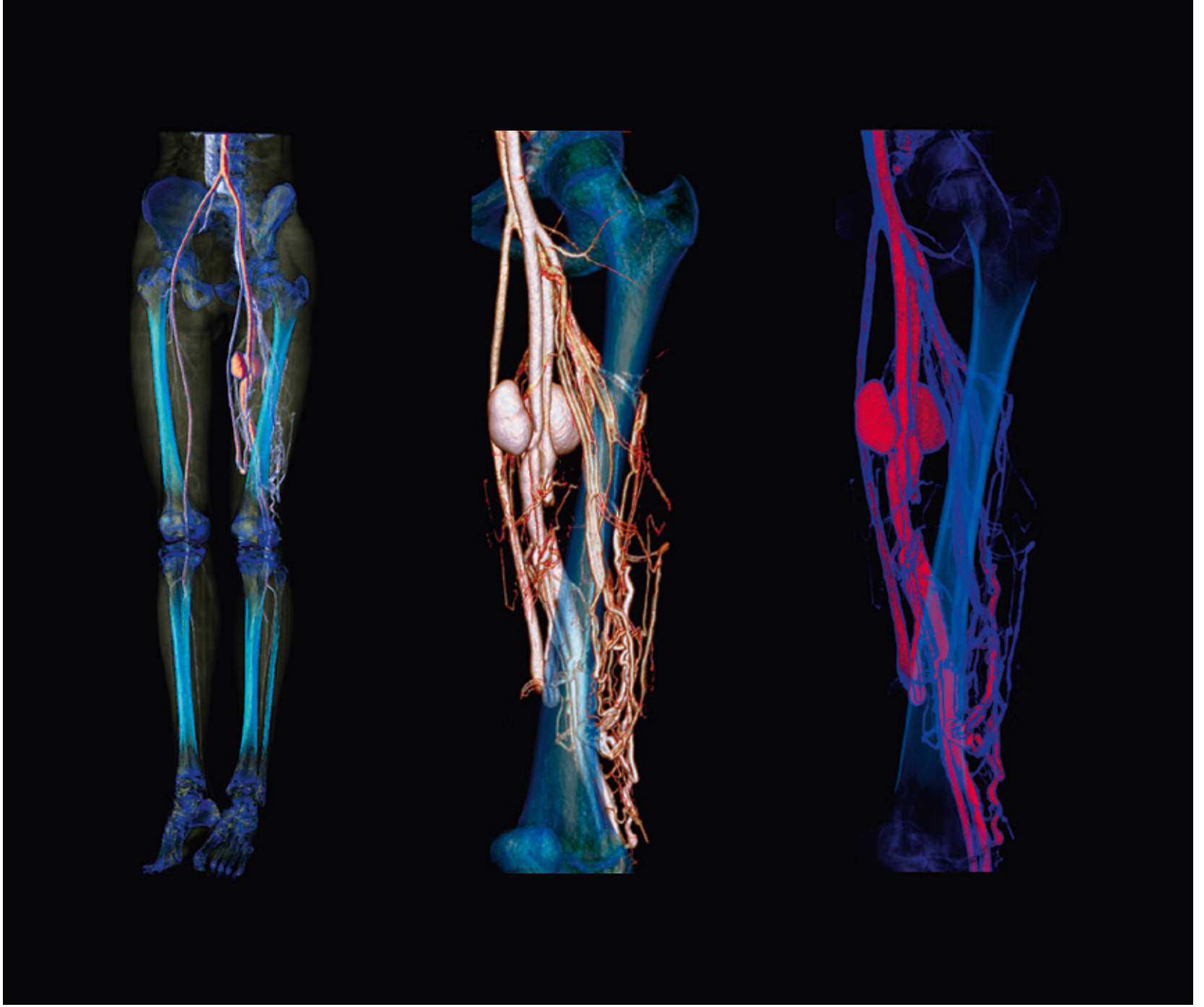
CTDIvol:
3.7 mGy

DLP:
419 mGy cm

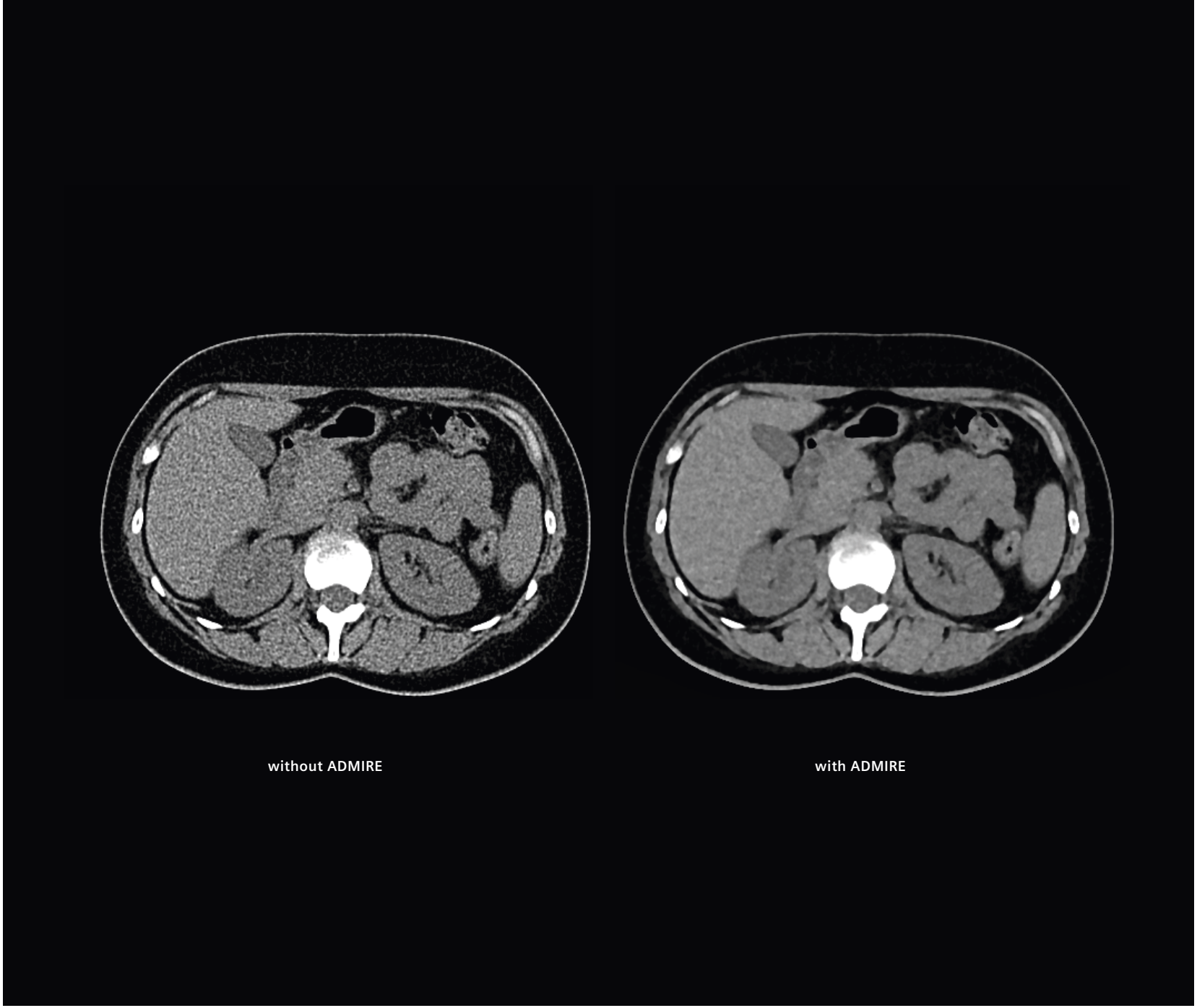
eff. dose:
1.8 mSv

Case:
Femoral artery pseudo-aneurysms with arteriovenous fistula.

Benefit:
CARE kV automatically adapts the kV for the dedicated patient and examination type allowing for low-dose runoff studies.



Courtesy of Xijing Hospital/ Xian, P.R. China



without ADMIRE

with ADMIRE

collimation:
128 x 0.6mm

scan time:
6.48 s

scan length:
309.4 mm

rotation time:
0.5 s

tube settings:
100 kV, 79 mAs

CTDIvol:
3.26 mGy

DLP:
106.1 mGy cm

eff. dose:
1.59 mSv

Case:
Arterial Abdomen

Benefit:
ADMIRE* allows for excellent image quality and sharp delineation of soft tissue borders.

*In clinical practice, the use of ADMIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task.

Courtesy of Universitätsklinikum Heidelberg / Heidelberg, Germany

collimation:
32 x 1.2 mm

Adaptive 4D spiral mode

scan time:
36 s

scan length:
100 mm

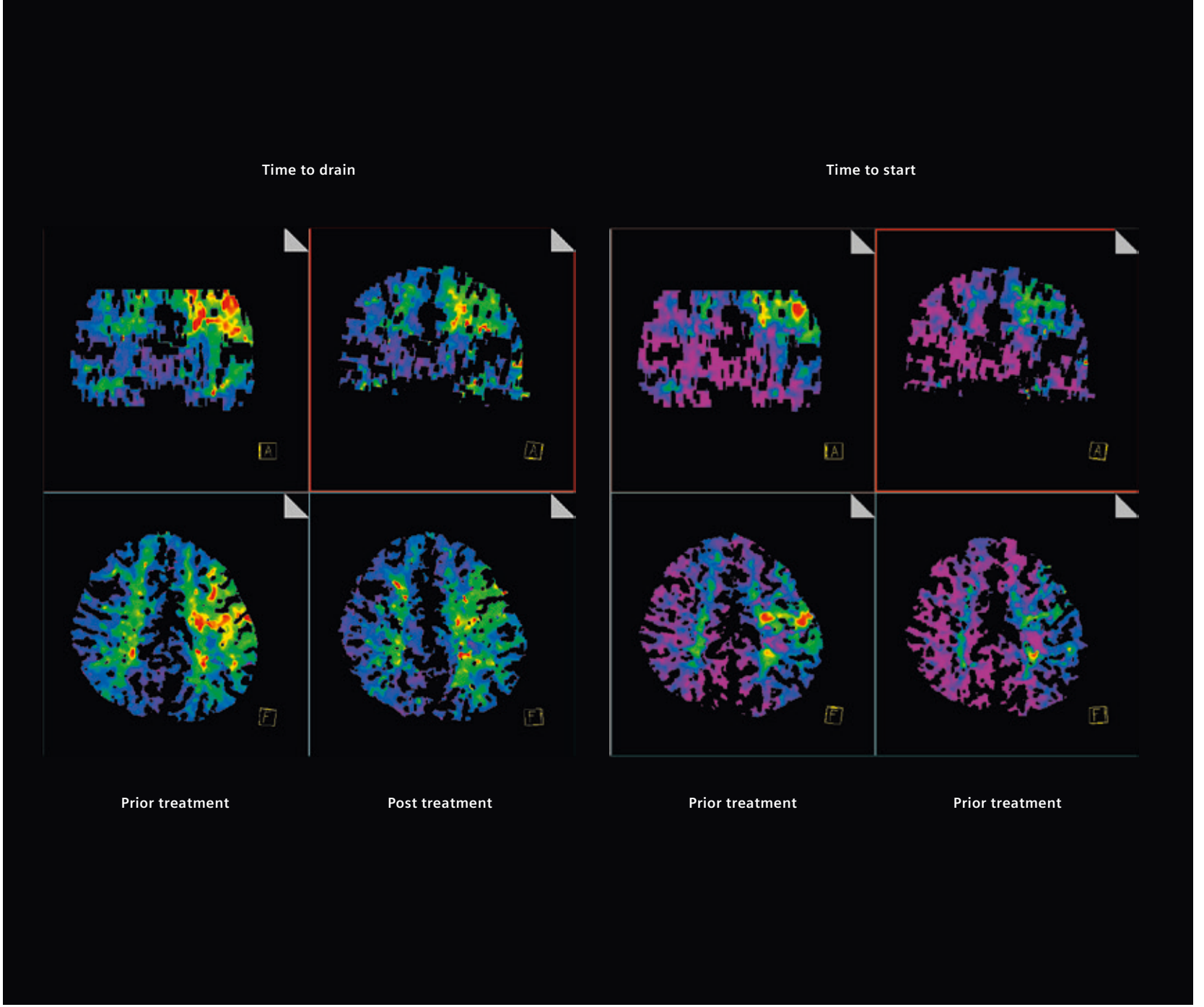
rotation time:
0.28 s

tube settings:
70 kV, 100 mAs

CTDIvol:
56.4 mGy

DLP:
665 mGy cm

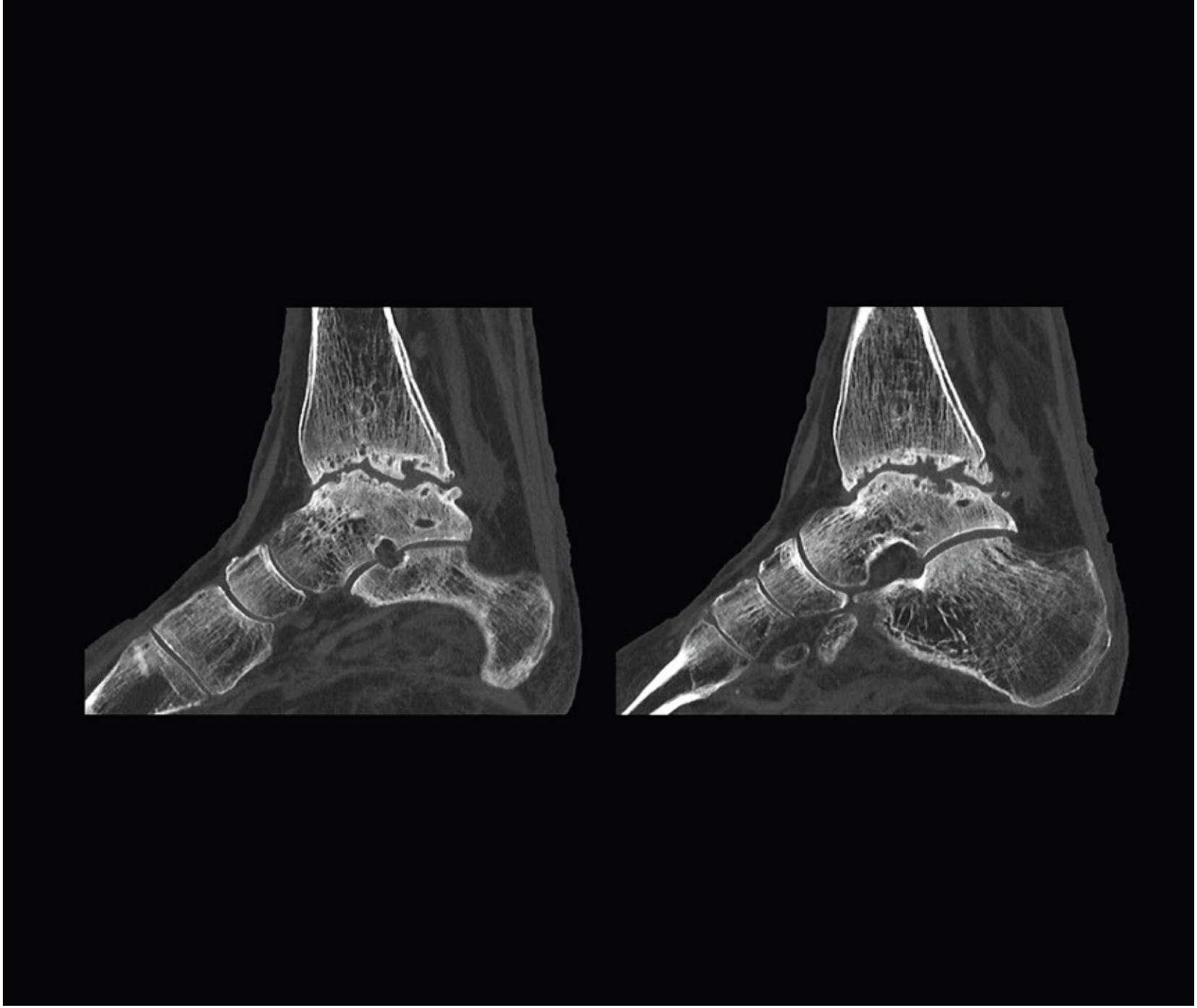
eff. dose:
1.4 mSv



Case:
Childhood Moyamoya disease before and after surgical revascularization.

Benefit:
Adaptive 4D Spiral delivers quantitative perfusion information of whole organs and the whole brain. In addition, the use of low kV settings reduces dose dramatically.

Courtesy of Huaxi University Hospital / Chengdu, Sichuan, P.R. China



collimation:
16 x 0.6 mm

UHR scan mode

scan time:
38 s

scan length:
119 mm

rotation time:
1 s

tube settings:
120 kV, 110 mAs

CTDIvol:
10.7 mGy

DLP:
134 mGy cm

eff. dose:
0.11 mSv

Case:
Extensive arthrosis of the talocalcanean and subtalar joint.

Benefit:
By using UHR scan modes, even the smallest lesions can be clearly visualized.

Courtesy of Erasmus MC - University Medical Center Rotterdam / Rotterdam, the Netherlands

collimation:
16 x 0.6 mm

UHR scan mode

scan time:
11 s

scan length:
46 mm

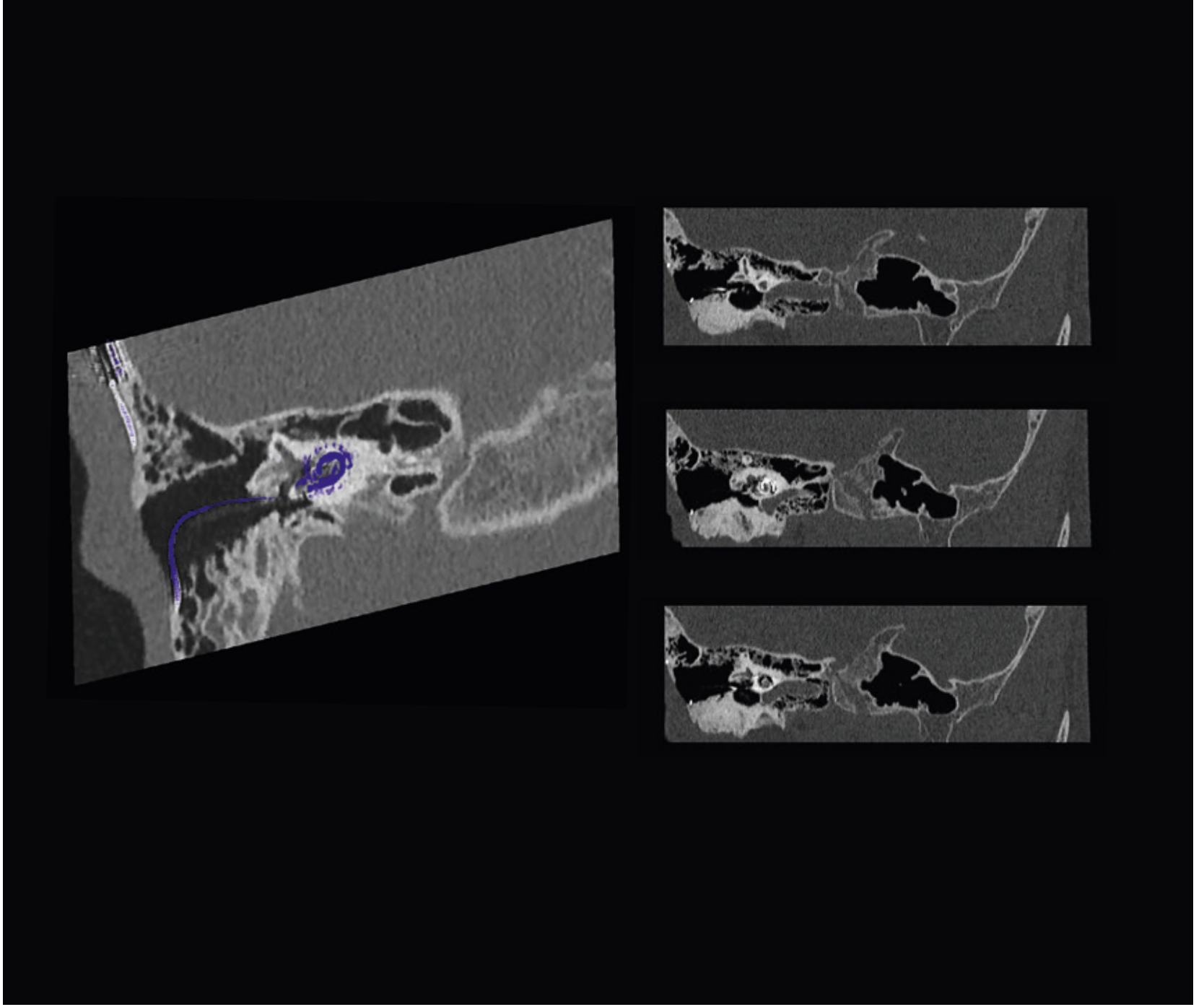
rotation time:
1 s

tube settings:
100 kV, 136 mAs

CTDIvol:
18.6 mGy

DLP:
97 mGy cm

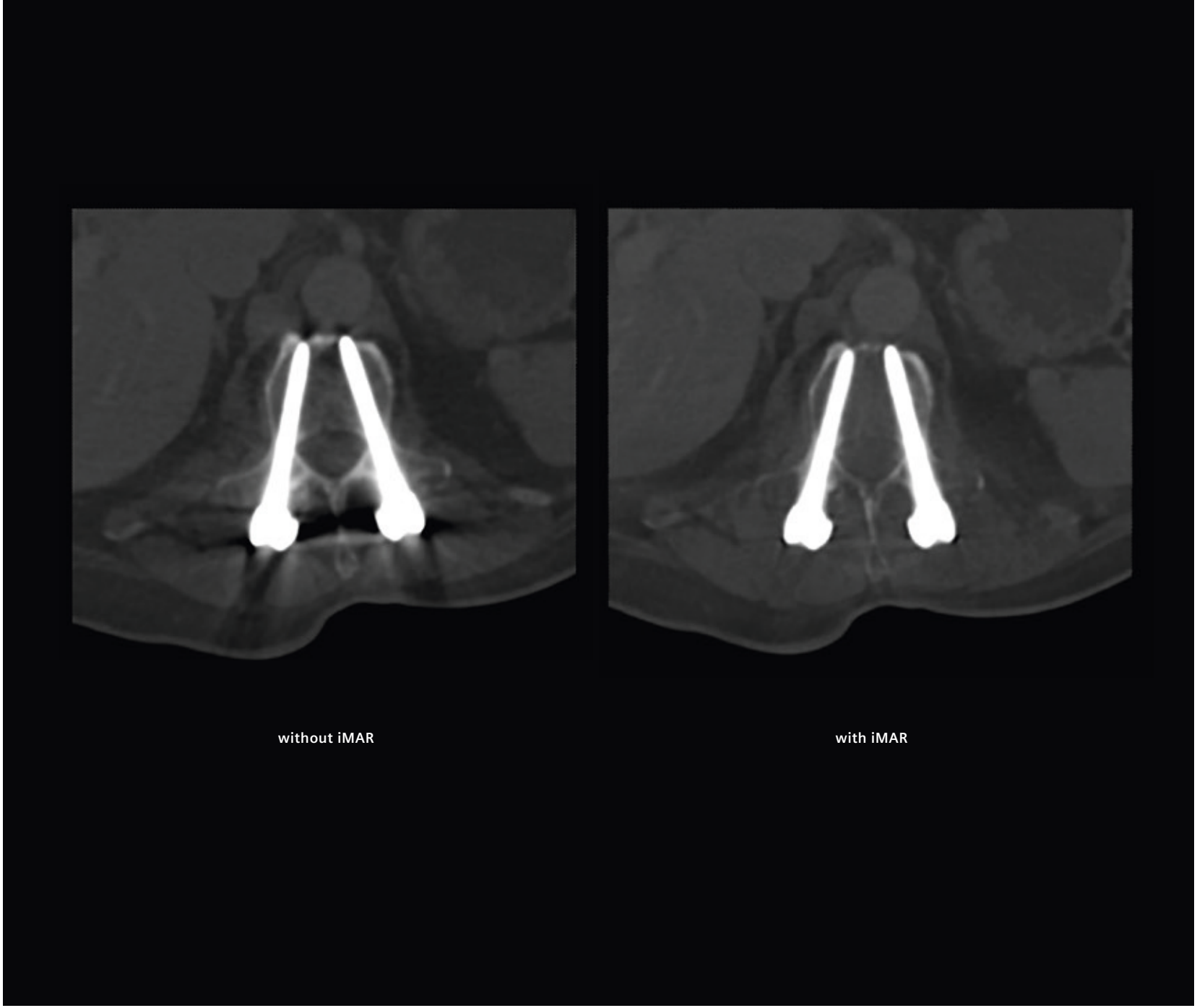
eff. dose:
0.31 mSv



Case:
Cochlear implant in adequate location.

Benefit:
The Stellar detectors and Edge technology deliver z-UHR-like high-resolution inner ear images, providing excellent image quality even in smallest regions.

Courtesy of Princess Margaret Hospital / Subiaco, Australia



without iMAR

with iMAR

collimation:
128 x 0.6 mm

Spiral examination with Stellar

scan time:
8.95 s

scan length:
424 mm

rotation time:
0.5 s

tube settings:
100 kV, 132 mAs

CTDIvol:
5.46 mGy

DLP:
239.6 mGy cm

eff. dose:
3.59 mSv

Case:
Grading of inserted pedicle screws for stabilization

Benefit:
iMAR removes or mitigates artifacts, e.g. in spine implants.

Courtesy of Universitätsklinikum Heidelberg / Heidelberg, Germany

Core Technologies

Dual Source Flash Spiral for a scan speed of 458 mm/s

With Flash Spiral, dose values under 1 mSv – especially important for the most dose-sensitive patients – are so frequent they can be considered routine.

Overcoming single source CT limits

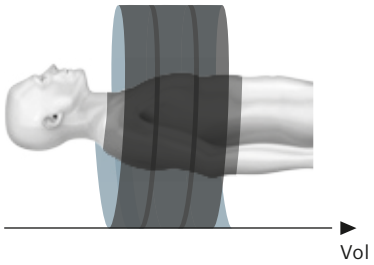
Even the most advanced single source CTs are limited in their scan speed: There is always a maximum table feed that cannot be exceeded in the acquisition of contiguous data. A spiral pitch below 1.7 ensures gapless coverage along the z-axis. When the pitch is increased, sampling gaps occur that hamper the image reconstruction. SOMATOM Definition Flash breaks this barrier by combining Dual Source technology with innovative hardware components.

Unique technology

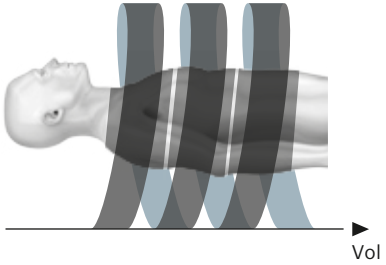
A gantry with a rotation speed of 0.28 s, a patient table that can handle immense table feeds of up to 458 mm/s, and ultra-fast data transmission technology enables Flash Spiral scanning. The second measurement system of Dual Source CT, however, fills the data gaps a quarter rotation later. In this way, the pitch can be increased up to 3.4 in a scan field of view that is covered by both detectors.

Enhancing everything: ADMIRE

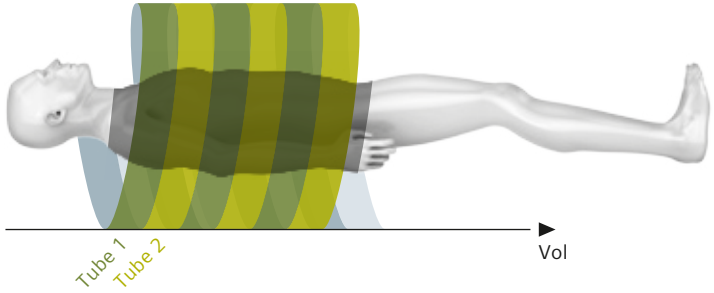
With ADMIRE – Siemens newest Advanced Modeled Iterative Reconstruction – you can smoothly integrate exceptionally low dose and excellent image quality into your daily routine. When using ADMIRE, clinical images provide higher resolution at organ borders and improved delineation of edges, e.g. to better localize lesions. Thick slices are now reconstructed at a more natural image impression, even from ultra-low-dose scans. Iteratively reconstructed low-dose datasets can now easily be stored in PACS or on film – ADMIRE gives clinicians access to enhanced image quality with a natural image impression and all clinical applications, while utilizing the full dose reduction potential offered by iterative reconstruction.



Single source CT scanners are limited to slow pitch, slow scan speed and overlapping scans



Gaps in the acquired volume occur at higher table feeds in single source CT



Dual Source CT combines the data from two sources at a table pitch of up to 3.4 without sequential or spiral scanning overlap

Low contrast and radiation dose

The Flash Spiral makes it possible to acquire an ECG-gated-synchronized dataset of the whole chest in less than 1 second – even without patients having to hold their breath. It enables dose values consistently below 5 mSv for an application that is in the range of 25 mSv with conventional CT. An additional benefit is a contrast agent dose as low as 40 mL.[1] This is a real benefit for patients with impaired renal function, as it can reduce the risk of contrast-induced nephropathy with subsequent dialysis in critically ill patients.

Routine sub-mSv heart scans

SOMATOM Definition Flash offers two times 38.4 mm detector z-coverage. At a pitch of 3.4, the table feed is 458 mm/s with a true temporal resolution of 75 ms for each individual image. This is sufficient to cover a heart in about 0.25 s, a quarter of a heart beat. Publications demonstrate that reliable coronary CTA is routinely feasible at radiation dose values below 1 mSv, even in patients up to 90 kg.[2, 3] Flash users worldwide confirm effective radiation doses in the range of 0.88 to 0.9 mSv, even without the use of iterative reconstruction methods such as SAFIRE.

[1] Wuest W et al. Dual Source multi-detector CT-angiography before Transcatheter Aortic Valve Implantation (TAVI) using a high-pitch spiral acquisition mode. Eur Radiol. 2012 Jan;22(1):51-8.

[2] Achenbach S, Marwan M, Ropers D, Schepis T, Pflederer T, Anders K, Kuettner A, Daniel WG, Uder M, Lell MM. Coronary computed tomography angiography with a consistent dose below 1 mSv using prospectively electrocardiogram-triggered high-pitch spiral acquisition. Eur Heart J. 2010;31(3):340-6.

[3] Leschka S, Stolzmann P, Desbiolles L, Baumueller S, Goetti R, Schertler T, Scheffel H, Plass A, Falk V, Feuchtner G, Marincek B, Alkadhi H. Diagnostic accuracy of high-pitch Dual Source CT for the assessment of coronary stenoses: first experience. Eur Radiol. 2009;19(12):2896-903.

[4] Sommer WH, Schenzle JC, Becker CR, Nikolaou K, Graser A, Michalski G, Neumaier K, Reiser MF, Johnson TR. Saving dose in triple-rule-out computed tomography examination using a high-pitch dual spiral technique. Invest Radiol. 2010 Feb;45(2):64-71.

Dual Source with Stellar detectors for highest spatial resolution

The revolutionary Stellar detectors and Edge technology ensure outstanding image quality and low dose.

Challenges with conventional CT

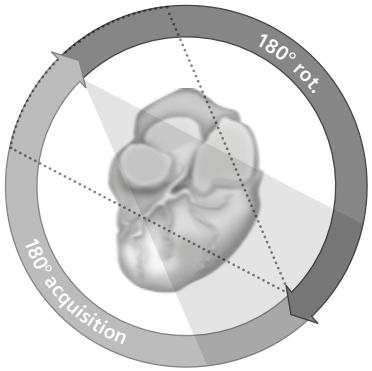
Despite all advances in single source CT, limitations such as motion artifacts in very obese patients, limited spatial resolution, and long breath-hold times remain. Stents smaller than 3 mm diameter or severely calcified arteries constitute diagnostic dilemmas, mainly due to partial volume artifacts as a consequence of insufficient longitudinal resolution. For patients with higher heart rates, careful selection of separate reconstruction intervals is mandatory. Thus, the administration of beta-blockers is still required to artificially slow down the heart rate.

Dual Source acquisition

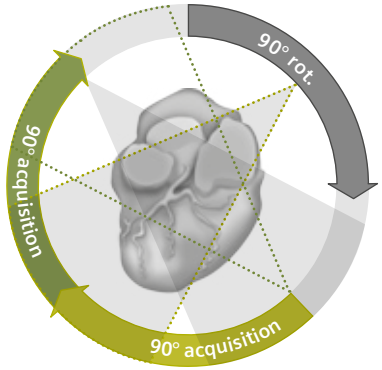
SOMATOM Definition Flash is equipped with Dual Source technology that acquires contiguous data from two Stellar detectors. The idea is simple: Two X-ray sources and two detectors work together at the same time. Siemens has miniaturized the electronic components on the detectors, and integrated them directly into the photodiode. The Stellar detectors generate ultra-thin slices with very high spatial resolution for an extremely high level of image detail. SOMATOM Definition Flash therefore makes possible coronary CTA in very obese patients in whom invasive angiogram often is the only alternative.

Faster than a beating heart

Robust imaging of the heart anatomy, including the coronary arteries, still poses a challenge in patients with high and irregular heart rates. SOMATOM Definition Flash's 0.28 s rotation speed, two X-ray tubes, and two detectors create a heart-rate-independent temporal resolution of 75 ms of the entire heart. This extends the benefits of coronary CTA to a patient suffering from AF, traditionally considered unsuitable for coronary CTA.[1] Thus, SOMATOM Definition Flash provides electrophysiologists with anatomical details to optimize their ablation procedures.



Single Source CT
with 180° acquisition and
limited true temporal resolution



Dual Source CT
with 90° acquisition for the industry's
highest true temporal resolution

Single Source CT
180° acquisition, not fast enough to freeze high and irregular heart rates

Dual Source CT
2 x 90° Dual Source acquisition, fast enough to freeze cardiac motions (even for patients with atrial fibrillation)

Edge technology

The full electronic integration of Siemens Stellar detectors drastically reduces electronic noise and cross-talk, while increasing SNR. With less cross-talk, slice blurring between neighboring detector rows can be avoided, and slice profiles become much more precise. This enables the generation of 0.5 mm slices delivering a spatial cross-plane resolution of 0.3 mm. SOMATOM Definition Flash's unmatched temporal resolution of 75 ms plus Edge technology helps users see even the finest details, for example, in the analysis of calcified plaque and in-stent restenosis.[2]

Better low-signal results

At high signal levels, the noise produced by the Stellar detector with TrueSignal technology is more or less the same as that produced by conventional CT technology. However, when the signal is lowered – either by high attenuations from obese or broad shouldered patients, or by reducing the applied mA – the impact of the Stellar detectors increases. With lower electronic noise, the signal is less impaired, so the same noise level can be achieved with significantly lower signals.

iMAR - iterative Metal Artifacts Reduction

Improves diagnostic confidence by reducing metal artifacts – even in challenging cases like dental fillings, spine implants, and pacemakers.

iMAR is based on the Adaptive Sinogram Mixing. It combines a strong metal artifact removal method in areas with severe artifacts and a soft correction in areas with less severe artifacts.

The result is an outstanding image quality with metal artifacts removed while valuable information remains.

[1] Sidhu MS et al. Advanced adaptive axial-sequential prospectively electrocardiogram-triggered dual-source coronary computed tomographic angiography in a patient with atrial fibrillation. J Comput Assist Tomogr. 2011 Nov-Dec;35(6):747-8.

[2] Alkadhi, et al. CT of coronary artery stents using a detector with integrated electronics: evidence from in-vitro experiments. Investigative Radiology, 2012

Dual Energy with Selective Photon Shield for better spectral separation

Growing public awareness of radiation underlines the importance of the commitment of Siemens to making Dual Energy as dose-efficient as any single energy scan.

Benefit of the second source

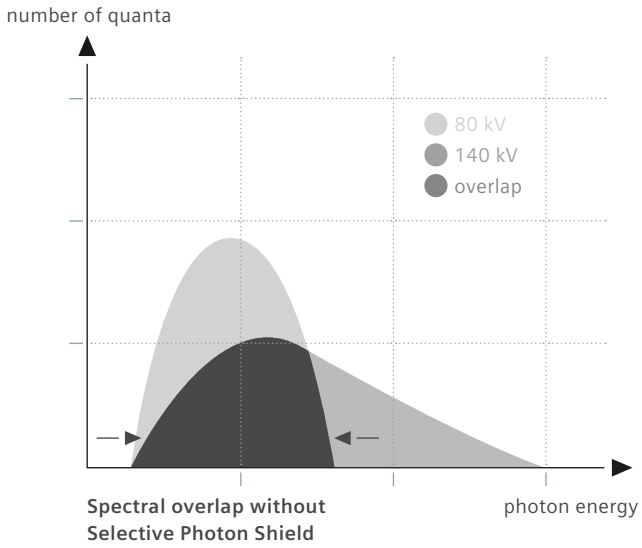
With Dual Source CT, two detectors operate at different tube potentials during synchronous acquisition. The separate adjustment of tube current for low- and high-kV scans leads to excellent image quality also in the low-kV scan range. In addition, it avoids spectral contamination or waste of applied dose occurring during kV-switching time intervals. The Dual Source approach made possible the introduction of the Selective Photon Shield for even further spectral separation. At the same time, the Stellar detector extends the dynamic range with HiDynamics for higher image detail level, especially in low signal and low-kV scans.

Dose neutrality

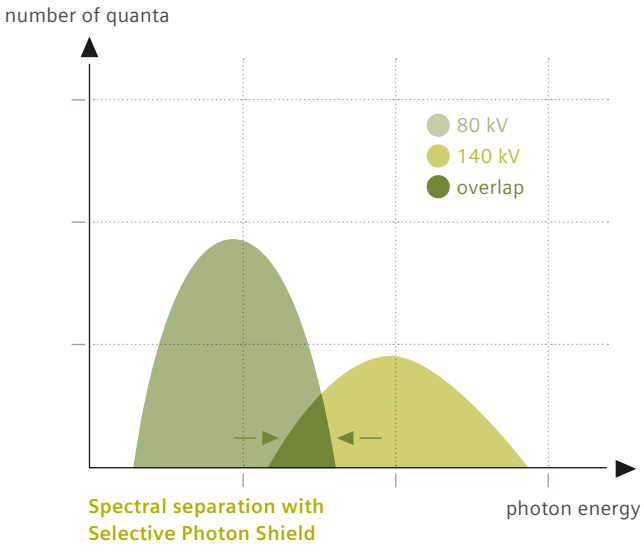
The development of the Selective Photon Shield is an important factor in achieving dose neutrality in Dual Energy scanning. Blocking low-energy photons from the high-energy X-ray spectrum results in much better separation of the 80 kV and 140 kV images. By preventing unnecessary exposure, the Selective Photon Shield assures "dose neutrality"[1, 2, 3] for single-dose Dual Energy, making it as dose-efficient as conventional 120 kV scans.

More diagnostic information

Dual Source Dual Energy technology provides additional information beyond morphology with the same dose as a single energy scan. Siemens unique solution is compatible with other dose-reduction features such as CARE kV, Adaptive Dose Shield, and X-CARE. In addition, ADMIRE* can be applied to increase the level of diagnostic information while reducing dose.



Spectral overlap without Selective Photon Shield



Spectral separation with Selective Photon Shield

The Selective Photon Shield increases energy separation and reduces dose by blocking low-energy photons from the high-energy X-ray tube's spectrum. This results in optimal information quality and dose neutrality.

The focused photon spectrum

The Selective Photon Shield in the SOMATOM Definition Flash increases dose efficiency by filtering unnecessary photons out of the high-energy X-ray tube. The remaining photon spectrum is, therefore, better focused and more clearly separated from the photons emitted by the low-energy tube. Better separation of the 80/140 kV images is ideal for the head and extremities, especially CT angiographies, because bone-iodine differentiation is increased by up to 80%.

More clinical applications

Siemens' vast number of DE functionalities covers numerous clinical fields and applications – from scientific research to the expansion of diagnostic possibilities in daily clinical practice. Furthermore, the Selective Photon Shield's spectral separation makes it possible to use 100/140 kV imaging with 30% better bone-iodine contrast. Its higher power reserves for cardio, abdomen, and pelvis examinations, or for larger patients in general, make Dual Energy a viable clinical application for more patients.

Enhanced clinical value

Non-contrast CT scans are commonly used, and often they are followed by a contrast-enhanced CT. Dual Source DE virtual non-contrast can reduce radiation exposure by almost 50%.[2] Requiring only one scan saves time and costs – with additional dose reduction potential, especially in pediatric CT. FAST DE Results eliminates waiting time and user interaction by direct transfer of DE results from scanner to PACS (like Liver VNC, Monoenergetic).

[1] Schenzle JC. et al, Radiol. 2010 Jun; 45(6): 347–53.

[2] Graser A. et al, Invest Radiol. 2010 Jul; 45(7): 399–405.

[3] Thomas C. et al, Invest Radiol. 2010 Jul; 45(7): 393–8.

[4] Lee CW et al. Eur Radiol. 2011 Jan;21(1):54-62.

*In clinical practice, the use of ADMIRE may reduce CT patient dose depending on the clinical task, patient size, anatomical location, and clinical practice. A consultation with a radiologist and a physicist should be made to determine the appropriate dose to obtain diagnostic image quality for the particular clinical task

Customer Services

A range of innovative service solutions provide the answers to best support our customers in raising quality and productivity in healthcare.

Maintainable healthcare

Providing economically viable healthcare means efficiently and productively delivering the highest quality care possible. This is why Siemens works closely with its customers, offering experience and innovative solutions to increase uptime, improve performance, and optimize workflow for maintainable healthcare. This means raised quality, better productivity, and greater cost-effectiveness.

Increased availability with System Services

Peak performances and higher uptime are achieved by proactively ensuring system availability with innovative service solutions. Siemens Remote Services, for example, establishes a highly efficient, secure and certified remote connection between CT systems and Siemens service organization for remote monitoring and remote fixing in order to maximize availability and performance.

Proactive maintenance

With the Siemens Guardian Program™ including TubeGuard, potential tube downtime can be predicted ahead of time. This allows healthcare institutions to schedule maintenance without impairing regular patient hours for higher system efficiency.

Improved operation with User Services

Personalized education and training are the key to more expertise, greater efficiency, and higher productivity of the system operators. In addition, dedicated consultancy services facilitate further improvement of system usage. Optimize CARE CT for example is a comprehensive program to help customers reduce radiation in CT scanning. The program provides expert insights, methods, and tools that assist customers in developing a customized roadmap towards improving their CT dose.

Optimized utilization with Management Services

Increased workflow optimization and better productivity through process optimization and consulting help improve efficiency, system utilization, and return on investment. Utilization Management Consulting combines quantitative data from the Utilization Management report with technical experience and radiological workflow management. Customers can then learn about their strengths and improvement potential across all professional groups.

SOMATOM Definition Flash

“Redefining standards” VS. “Trapped in traditions”
Second best is not an option.

Detector	2 x Stellar detector
Number of slices	2 x 128
Rotation time	0.28 s*
Temporal resolution	75 ms*, heart-rate independent
Generator power	200 kW (2 x 100 kW)
kV steps	70, 80, 100, 120, 140 kV
Isotropic resolution	0.33 mm
Cross-plane resolution	0.30 mm
Max. scan speed	458 mm/s* with Flash Spiral
Table load	up to 307 kg / 676 lbs*
Gantry opening	78 cm

* Optional

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