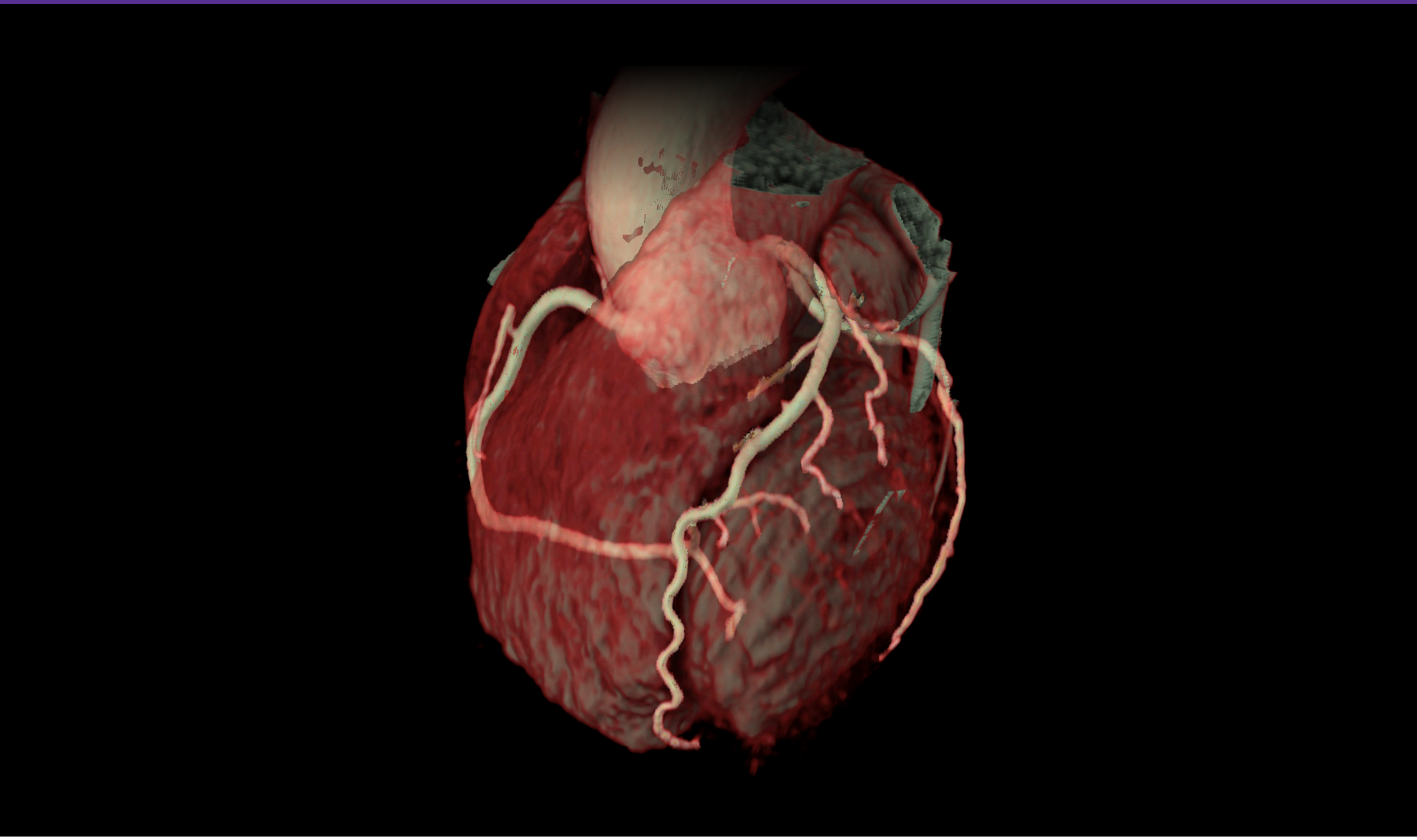
GE HealthCare



Introducing a new way to image the heart

ECG-less Cardiac redefines cardiac CT with fast workflows and increased access

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Content

The evolution of cardiac CT

Cardiac computed tomography (CT) has evolved significantly over the past few decades. Cardiac CT—especially coronary CT angiography (CCTA)—offers significant clinical value in both diagnosis and management of cardiovascular disease. Electrocardiogram (ECG) gated cardiac CT began to be widely used in the late 1990s to early 2000s, as scanner technology advanced to allow synchronization of image acquisition with the cardiac cycle. Today, ECG gating is a standard technique in CCTA, enabling precise timing during the cardiac cycle to minimize motion and improve image clarity.

The integration of ECG signals in cardiac CT scans allows clinicians to synchronize image acquisition with the cardiac cycle, which is essential for obtaining high-quality, accurate and clinically useful images of the heart at reduced radiation dose. However, when the ECG signal is unavailable, it can lead to scan failures, degraded image quality, and increased patient discomfort due to complex exam preparation.

GE HealthCare has established itself as a leader in cardiac CT technology through continuous innovation and development. This includes Unlimited 1-Beat Cardiac imaging for any heart rhythm, gold-standard image quality with TrueFidelity DL for accurate diagnoses across a wide range of patient conditions, a streamlined and intuitive workflow for every user, and continuously elevating the patient experience.

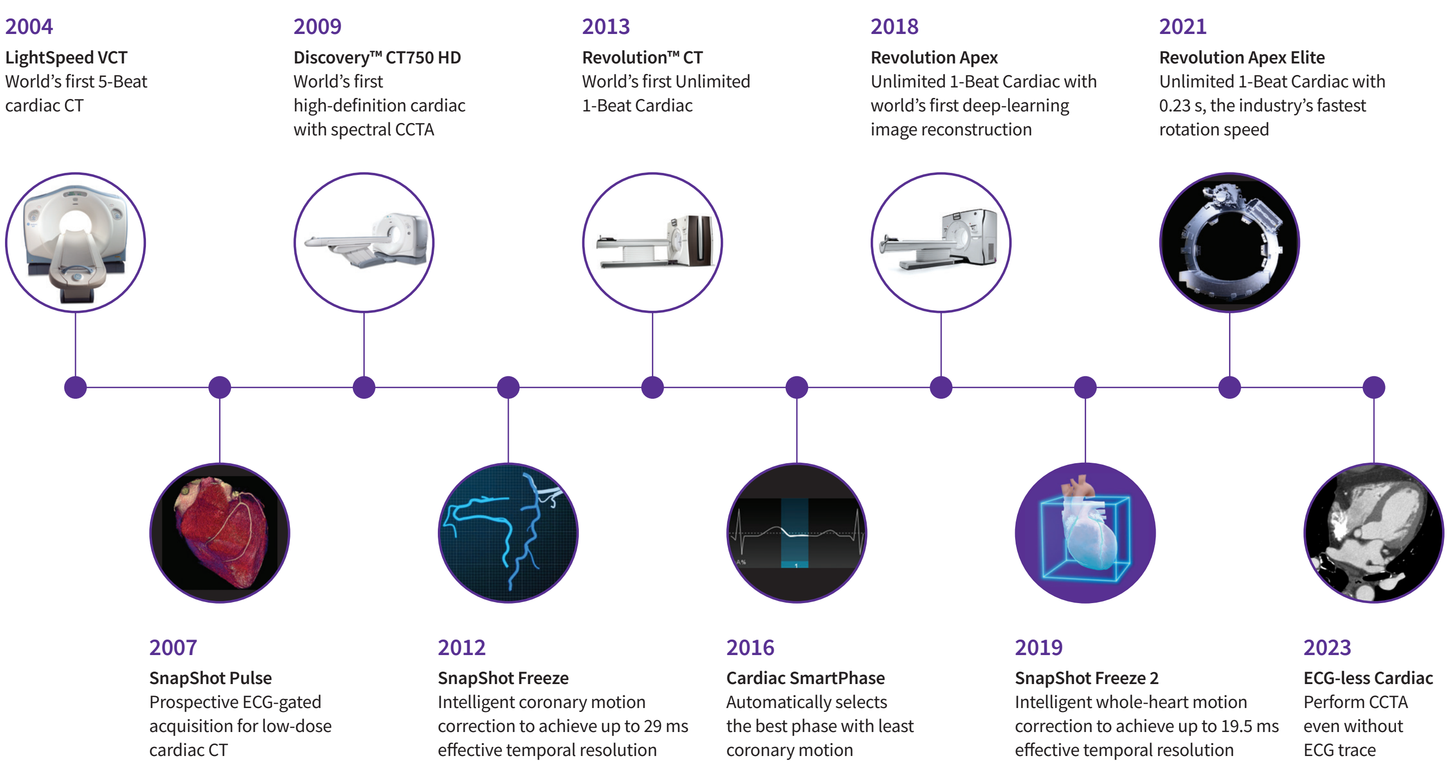


Figure 1. GE HealthCare innovation timeline in cardiac CT.

ECG-less Cardiac for streamlined scans and clear images

ECG-less Cardiac is an innovative cardiac scan technique that enables cardiac exams without the needs for ECG leads. It allows clinicians to obtain high-quality cardiac images without needing electrodes to monitor the patient's ECG signal. It's designed to address workflow challenges associated with patient prep that add to the overall cardiac exam time, including skin prep, attaching ECG patches and grounding straps and performing ECG impedance checks. For these reasons, ECG-less Cardiac could result in increased access to cardiac assessments and improved workflow for critical clinical presentations. Additionally, it might help facilitate the imaging of challenging patients.

Typical use cases could include:

- Complicated inpatient situations or Emergency Department (ED) patients who arrive to the CT suite with diagnostic ECG and other monitors already attached;
- Acute patients who require fast loading/unloading;
- Patients with various disruptive factors that prevent obtaining a good ECG signal;
- Patients who need structural heart disease assessments and planning, transcatheter aortic valve replacement (TAVR), pulmonary vein isolation ablation, etc.

Advanced features that enable the technology

CT cardiac imaging has historically used an ECG signal to trigger cardiac acquisitions and/or to gate the reconstruction. This is essential for legacy scanners (e.g., 40 mm scanners or narrow detectors) to stitch together image data acquired over multiple heartbeats to generate a full volume of heart images at a consistent cardiac phase.

40 mm CT scanner
Prospective ECG-triggered step-and-shoot axial scanning

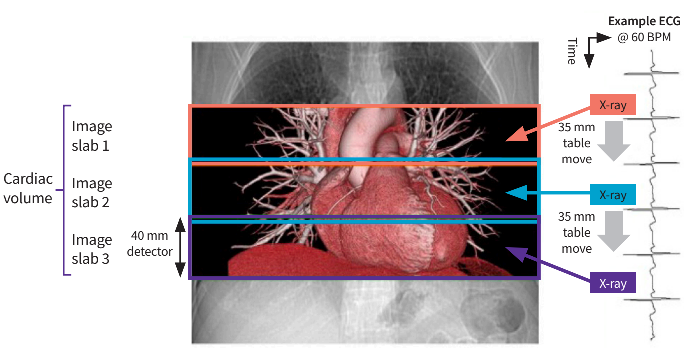


Figure 2. ECG-triggered cardiac axial.

40 mm CT scanner
Retrospective ECG-gated low-pitch helical scanning

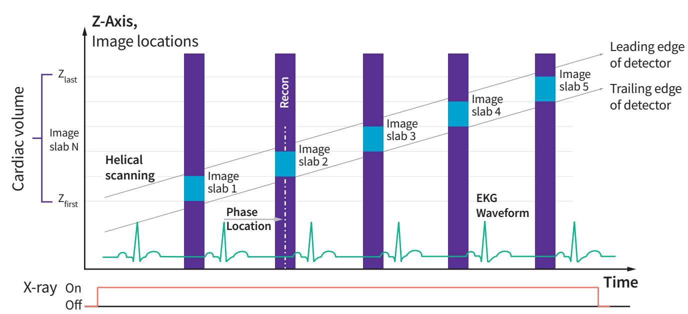


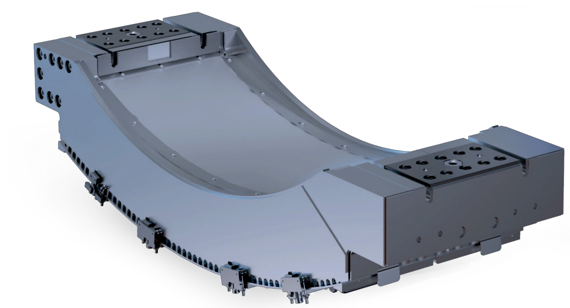
Figure 3. ECG-gated low-pitch cardiac helical.

For full-organ-coverage detector (140-160 mm coverage) CT systems, a single ECG-triggered cardiac scan is acquired with a duration determined by the desired phase range of the heart. Multiple phases of cardiac images can be retrospectively generated from within the acquired phase range. When only a very short phase range is desired (e.g., 70-80%R), the ECG-signal is necessary to determine the start time of the acquisition. When a full heart cycle of multiphase image data is desired, it is much less important when the scan starts given the periodic motion of the heart. The full heart period scan provides functional analysis information (e.g., ventricular volumes, stroke volume, ejection fraction, valve assessment) and allows coronary assessment at the most quiescent phase determined by SmartPhase, without physiological gating.

Building on the full-organ coverage capability of the Apex platform (160 mm configuration), with advances in gantry speed (0.28 second and 0.23 second per rotation), automated selection of the most quiescent cardiac phase location (SmartPhase), and robust whole-heart motion correction (SnapShot Freeze 2), with just a reasonable estimate of the patient's heart rate provided by the user prior to the scan, it is feasible to acquire approximately a full heart cycle of data without the patient ECG signal while still generating images with fully diagnostic image quality for coronary and functional assessment.

160 mm detector z-coverage

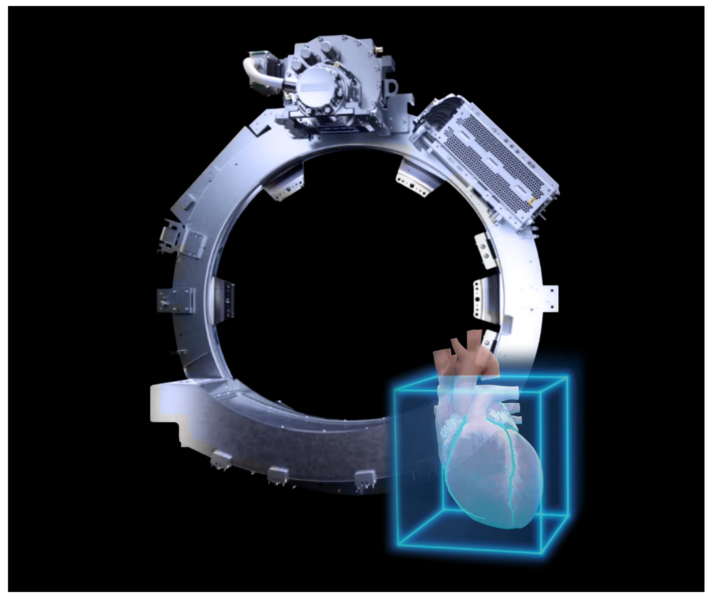
This 160 mm detector hardware breakthrough not only eliminates the stair-step artifacts commonly seen in narrow detector CT systems, but also makes whole-heart coverage in a single axial rotation a reality. Plus, it allows one-beat cardiac acquisition protocols for any heart rate and rhythm, an important enabler for Unlimited 1-Beat Cardiac acquisition.



160 mm z-coverage Clarity detector
for whole-organ coverage

The industry's fastest rotation time: 0.23 sec with 19.5 ms effective temporal resolution through SnapShot Freeze 2

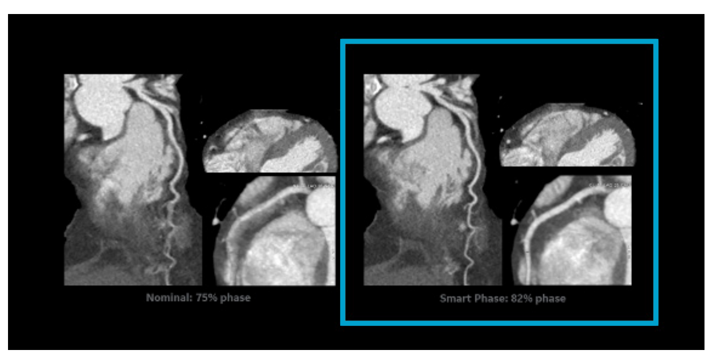
Temporal resolution is a critical factor in cardiac CT imaging because it determines the ability to freeze the motion of the beating heart, thus reducing motion artifacts and improving image clarity. The Revolution™ Apex platform (160 mm configuration) and Revolution Vibe deliver an effective cardiac temporal resolution of 19.5 msec enabled by the industry's fastest 0.23 sec gantry rotation and the SnapShot Freeze 2 (SSF2) whole-heart motion correction algorithm. This hardware-plus-software temporal resolution is crucial for the robustness of Unlimited 1-Beat Cardiac in imaging challenging cardiac patients with high or irregular heart rates. It enhances image quality by effectively freezing cardiac motion and improves the diagnostic accuracy of one-beat CCTA. For CT systems without this effective temporal resolution, clinicians often resort to using multisector reconstruction that requires multi-beat cardiac acquisition, increasing the risks of unacceptable artifacts due to beat to beat variability and higher radiation dose.



The industry's fastest rotation
0.23 sec/rotation with SnapShot Freeze 2 motion correction

Intelligent phase selection with SmartPhase

SmartPhase is a reconstruction feature designed to intelligently select the ideal cardiac phase for image reconstruction. This feature automatically analyzes the data from all the acquired cardiac phases and selects the optimal phase with least coronary motion for image reconstruction. This ensures improved image quality and enhanced workflow by reducing the need for manual phase adjustments.



SmartPhase
Intelligently select the phase with least motion

How ECG-less Cardiac works

ECG-less Cardiac enables high quality cardiac imaging without relying on ECG signals with streamlined workflow. ECG-less Cardiac begins at patient preparation, including exam preparation, breathing instructions, intravenous (IV) setup and heart rate estimation. Next, a scout scan is acquired. Then, a contrast-enhanced cardiac scan is performed by entering the estimated heart rate and selected acquisition window based on the heart rate. Image reconstruction follows utilizing SmartPhase for determining the reconstruction window, with options for Deep Learning Image Reconstruction (DLIR)/TrueFidelity DL. Finally, post-processing leverages tools like SSF2 for motion correction with further refinement.

1

Patient preparation and setup before scanning:

- Exam prep instructions
- Breathing instructions
- IV setup and contrast
- Estimate patient heart rate

2

Acquire scout scan

3

Acquire a contrast-enhanced cardiac scan

Enter the estimated heart rate, which the system firmware uses to simulate an ECG signal from an ECG monitor

4

Image reconstruction

- SmartPhase is instructed to be used as the Phase Type to determine reconstruction window
- User has the option of reconstructing with Deep Learning Image Reconstruction or ASIR-V

5

Cardiac image post processing

This includes SnapShot Freeze 2, which can be applied as desired by the user

With no physiologic signal triggering of the ECG-less acquisition, the start scan time is determined strictly by contrast timing considerations, not unlike a general (non-cardiac) CT angiography exam. While the duration of the scan is determined by the calculated heart period for 100% R-phase coverage, the effective phase range with respect to the patient heartbeat will be arbitrary. Figure 4A illustrates that an arbitrary start phase location within a given heart cycle (if the actual ECG signal were known) delivers an effective phase range that still represents a full heart cycle.

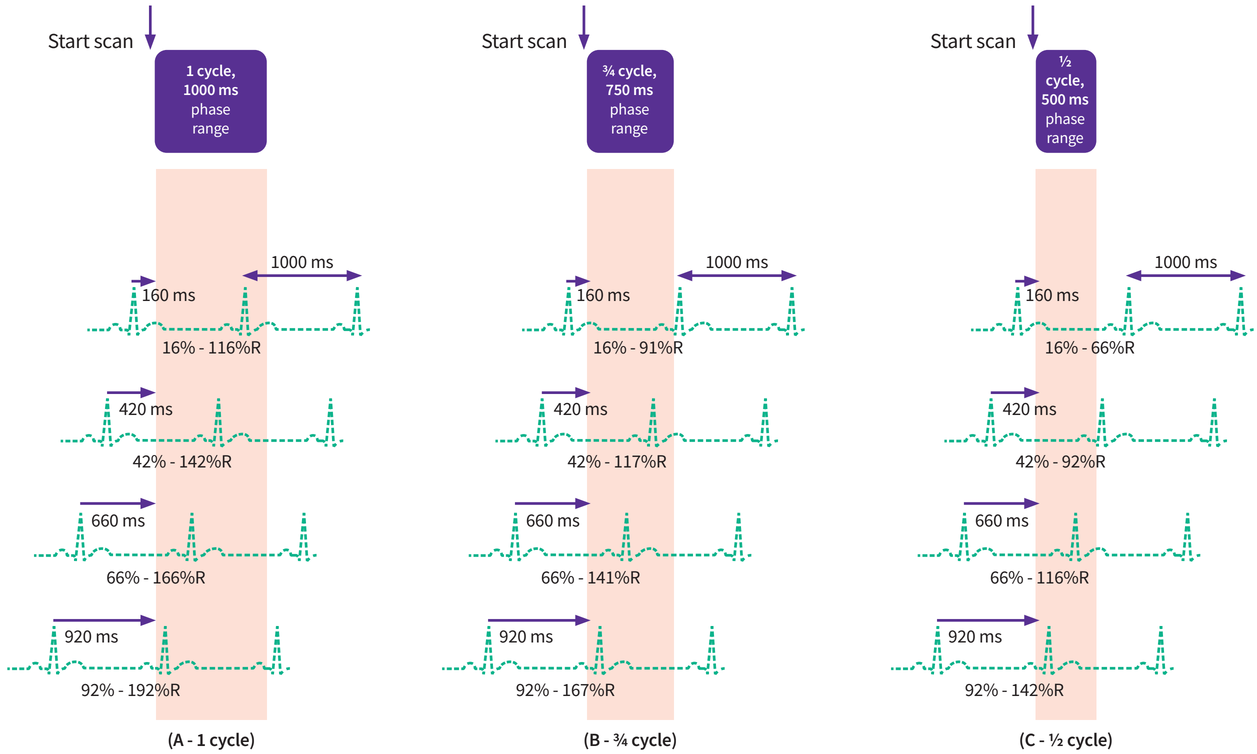


Figure 4. Effective phase range for 1 cycle, ¾ cycle and ½ cycle ECG-less Cardiac acqusition, using 60 BPM (1000 msec heart period) example illustrating the rather arbitrariness of the start phase within a given heart cycle.

In addition to a one-cycle acquisition, ECG-less Cardiac scanning can also be prescribed with shorter scan duration: ¾ cycle, ½ cycle, ¼ cycle and a single rotation. The ¾ and ½ cycle would have the same arbitrary starting phase within a given heart cycle, and duration of the scan is determined by 75% and 50% of the calculated heart period. For even shorter acquisition, ¼ cycle ECG-less Cardiac scans offer a potential low-dose option for cardiac use cases where coronary imaging is not the focus, such as in pulmonary vein ablation planning and/or ruling out left atrial appendage thrombus. Finally, a minimal-duration, single-rotation scan provides minimal dose option and that still provides halfscan temporal resolution plus the ability to apply whole heart motion correction.

ECG-less Cardiac acquisition window	Clinical use case
1 cycle	For left ventricle/wall motion/valve function and coronary assessment
¾ cycle	For coronary assessment to ensure end-systole and/or diastole phases are acquired
½ cycle	Lower dose option for coronary assessment, applicable to low heart rates (< 55 BPM)
¼ cycle	Potential choice for non-contrast and general cardiac assessments, e.g., left atrial appendage thrombus
Single rotation	Minimal dose option and still provide half-scan temporal resolution

Table 1. Considerations for different heart cycle ranges with ECG-less Cardiac.

Introducing a new way to image the heart

Selecting the optimal cardiac phase for image reconstruction is essential for achieving high-quality coronary images. It is well understood that mid-diastole and end-systole are considered the best phases of the cardiac cycle for coronary imaging, although patient-specific variations can occur. This roughly corresponds to 70%R-80%R and 40%R-55%R, respectively, of the R-R interval, with nominal phase locations of 75%R and 45%R (R wave).

SmartPhase is an image based processing technique that does not utilize specific ECG wave timing but intelligently searches for the most quiescent phase location within the acquired dataset.

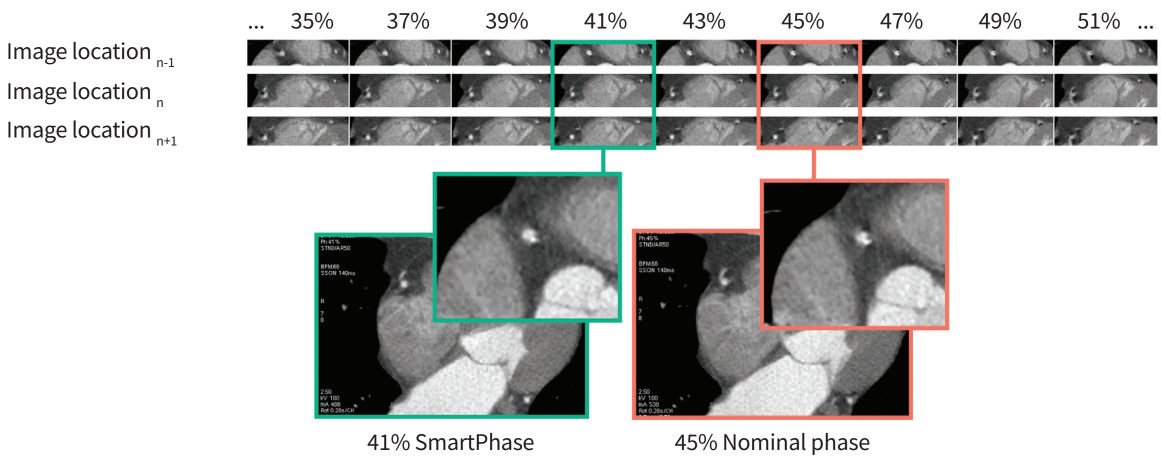


Figure 5. Single-beat-coronary-specific image quality assessment within the wide cone reconstruction process.

SmartPhase is inherently compatible with ECG-less Cardiac and enables the automated search for the suggested best phase for images reconstruction (i.e., the phase location of least coronary motion) within a prescribed phase range—typically the full phase range that was acquired.

ECG-less Cardiac demonstration with phantom

A demonstration of ECG-less Cardiac scanning was conducted with the commercially available Quantitative Standard Pulsating Phantom (QSP-1, Fuyo Corporation (FYC), Japan), designed to simulate organ movement. In addition to the motion phantom apparatus, the attached physical phantom included three inserts to model the three coronary arteries, as described in Figure 6. The axial image locations of the three inserts are roughly consistent with that of the three major vessels in a patient scan, i.e., the RCA, LAD and LCx. The motion phantom moved in a periodic up-and-down motion with vertical travel of 20 mm and a 70 BPM frequency. To simulate ECG-less Cardiac at a challenging scenario for minimizing motion, SmartPhase was applied to ½ cycle phase ranges (separately to the first half and then to the second half of the overall phase range) to determine a phase location of least motion.

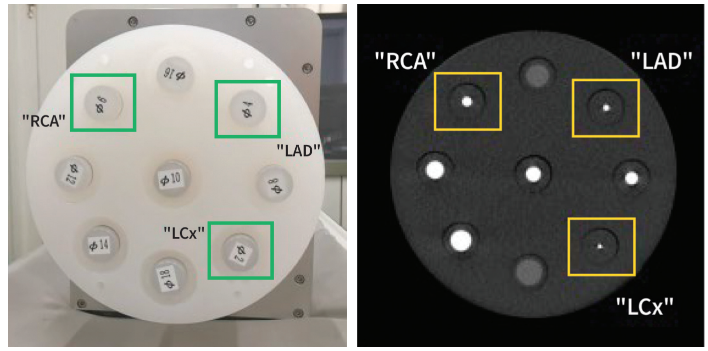


Figure 6: Physical phantom included three inserts to model the three coronary arteries.

The overall phase range was 860 ms, approximately the period of a 70 BPM heart rate, spanning 170 ms to 1030 ms. For the first ½ cycle window of 170 ms to 600 ms, SmartPhase identified phase location 227 ms (equivalently 27%R) as the phase of least motion. For the second ½ cycle window of 600 sm to 1030 ms, SmartPhase identified phase location 709 ms (equivalently 83%R) as the most quiescent phase. As a very slight degree of residual motion was observed, this target phase was further processed by SSF2. ECG-less Cardiac achieved excellent image quality using a motion phantom with a simulated 70 BPM heart rate.

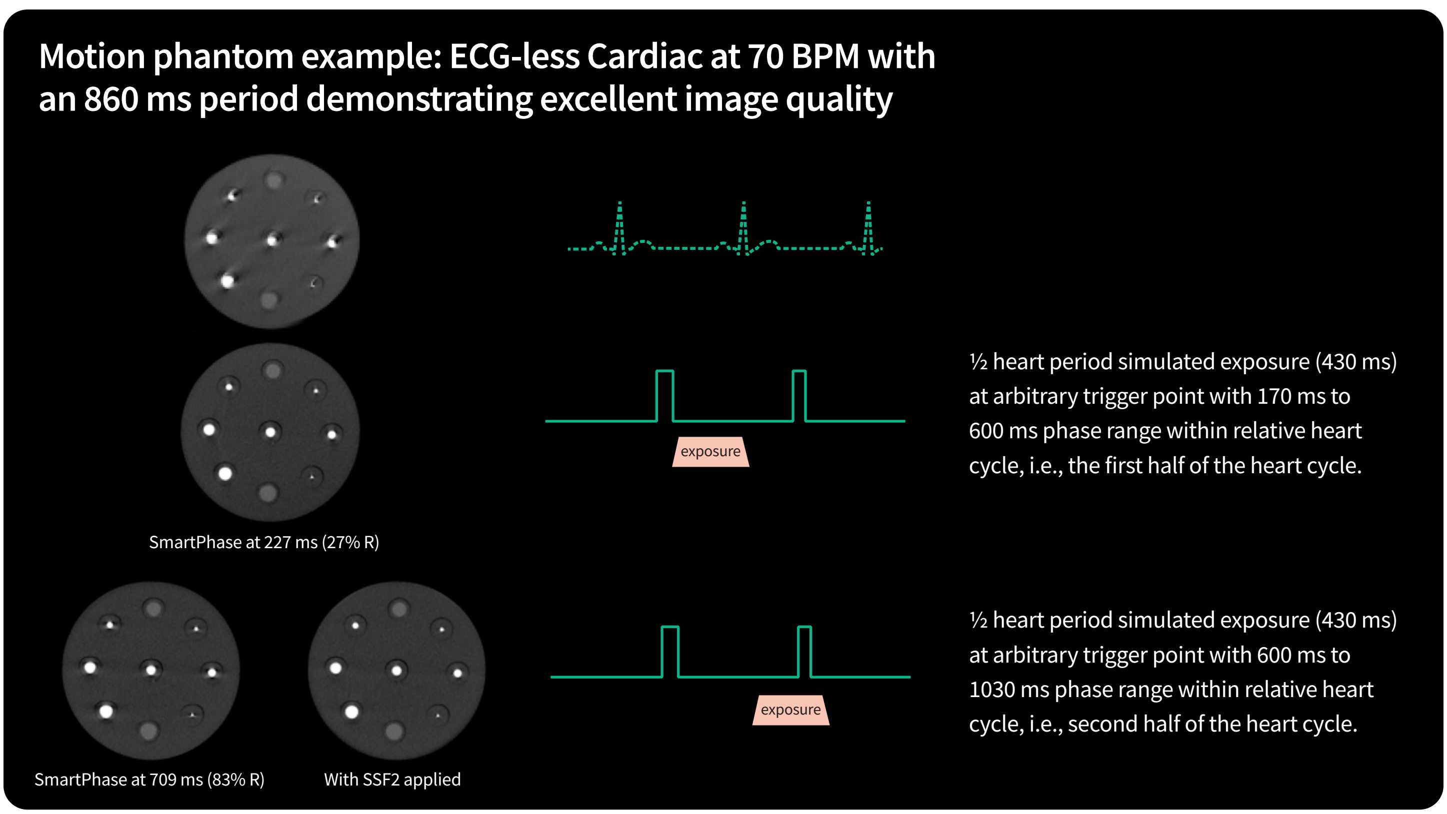


Figure 7. SmartPhase output images for 70 BPM motion phantom example.

ECG-less Cardiac dose evaluation

The radiation dose delivered during an ECG-less Cardiac acquisition is linked to the acquisition time, which is determined by the inputted estimated heart rate in combination with the selected effective acquisition window phase range, e.g., one heart cycle, ¾ cycle, ½ cycle, etc. To characterize the dose of ECG-less Cardiac scanning, a set of acquisition parameters consistent with standard protocols was utilized. These included benchmark protocol 100 kVp (a typical value for CTA exams), a peak of 500 mA, 140 mm collimation for whole-heart coverage and 0.23 sec rotation time. Additional parameters included a large cardiac scan FOV and SSF2 whole-heart motion correction with the complete phase range acquired.

The Table 2 shows a detailed comparison of ECG-less Cardiac dose (mSv) for each available phase range (one full cycle, ¾ cycle, ½ cycle, ¼ cycle and single rotation) against three reference ECG-gated cardiac axial exams' doses (mSv) and two reference cardiac helical exams' doses (mSv) for six heart rates ranging from 45 to 95 BPM for a reference use case. To summarize the comparison table:

- The ECG-less effective dose with heart rate-optimized scan duration is comparable to the cardiac helical scan mode (even with mA modulation).
- This dose is significantly lower than the cardiac helical scans without mA modulation.
- ECG-less effective dose without heart rate-optimized scan duration is comparable to single-peak, full-cycle cardiac axial exams.

In summary, using the benchmark technique of 100 kVp and 500 mA, further optimization is possible. With a lower exposure technique—for example, 80 kVp and 400 mA—an average dose below 2 mSv can be achieved.

Reference use case: With heart rate variability of 3 BPM, widen SSF ON, 140 mm scan range, 100 kV, 500 mA, cardiac large SFOV	Reference ECG-gated cardiac axial dose (mSv)			Reference cardiac helical dose (mSv)		ECG-less Cardiac dose (mSv)				
	Single peak	Single peak + 20% peak mA at full cycle	Single peak at full cycle (no mA modulation)	Single peak + 20% peak mA at full cycle	Single peak at full cycle (no mA modulation)	1 cycle	3/4 cycle	1/2 cycle	1/4 cycle	Single rotation
Lower heart rate, 75%R acquisition **45 BPM** example	1.15	2.39	7.69	3.90	10.13	6.47	4.99	3.52	2.04	0.75
Lower heart rate, 75%R acquisition **55 BPM** example	0.96	1.93	6.20	3.40	8.68	5.40	4.19	2.98	1.77	0.75
Lower heart rate, 70-80%R acquisition (<= 70 BPM) **65 BPM** example	1.25	1.98	5.22	3.68	7.60	4.65	3.63	2.61	1.59	0.75
Intermediate heart rate, 40-80%R acquisition (71-85 BPM) **75 BPM** example	2.16	2.56	4.54	4.46	6.08	4.11	3.22	2.34	1.45	0.75
Intermediate heart rate, 40-80%R acquisition (71-85 BPM) **85 BPM** example	1.95	2.29	4.02	4.15	5.52	3.69	2.91	2.13	1.34	0.75
Higher heart rate, 40-60%R acquisition (> 85 BPM) **95 BPM** example	1.21	1.62	3.63	3.05	5.06	3.36	2.67	1.96	1.26	0.75

Table 2: Effective radiation dose comparsions at 0.23 sec rotation time (DLP to mSv factor of 0.014).

Initial user experience demonstrates the usage profile of ECG-less Cardiac

A first clinical evaluation of ECG-less Cardiac was conducted between four different academic hospital sites specialized in cardiac imaging. This evaluation assessed not only image quality, but also tested out the use profile on acquisition window at different heart rates and assessed the corresponding radiation dose exposure under various clinical indications.

A total of 104 ECG-less Cardiac scans including CCTA, TAVI, CCTA with late enhancement, PE with CCTA, pulmonary veins, arterial/venous scans for pre-ablation or post–atrial appendage closure assessment, CCTA with thoracic aorta, and bypass graft evaluations were performed. Patients' heart rate and BMI ranged from 35 to 200 BPM and from BMI 15 to BMI 35, respectively. Different acquisition windows (one cycle, ¾ cycle, ½ cycle, ¼ cycle and single rotation), kV settings, and collimation widths were used while all scans were performed at a 0.23 sec rotation speed. Scans were performed during free breathing or with breath hold. In conclusion, the initial users were satisfied with the image quality of ECG-less Cardiac and workflow simplification.

ECG-less Cardiac scans, heart rate, acqusition window and radiation dose distribution

The acquisition window of ECG-less Cardiac scans were selected based on the patient's heart rate (Figure 8): ¼ beat for very low HR (30–50 BPM), ½ beat for lower HR (51–60 BPM), ¾ and one beat for moderate HR (61–70 BPM), ¾ beat for intermediate HR (71-85) and one beat for higher HR (≥86 BPM). Similarly, the radiation dose level of ECG-less Cardiac varied by heart rate (Figure 9): 2–3 mSv for lower (51–60 BPM) and 3-4 mSv for moderate HR (61-70 BPM), 3–4 mSv for intermediate (71-85 BPM) and higher HR (86–200 BPM), with insufficient data for very low HR (30–50 BPM).

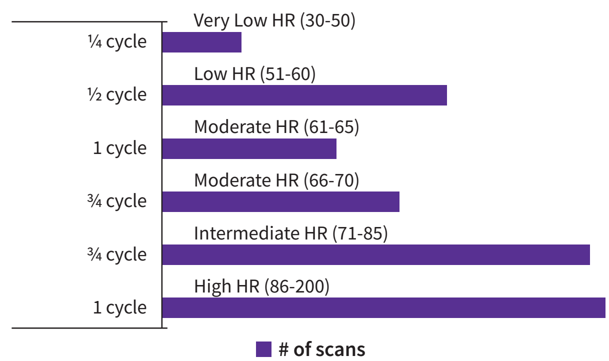


Figure 8: The heart rate and applied acquisition window.

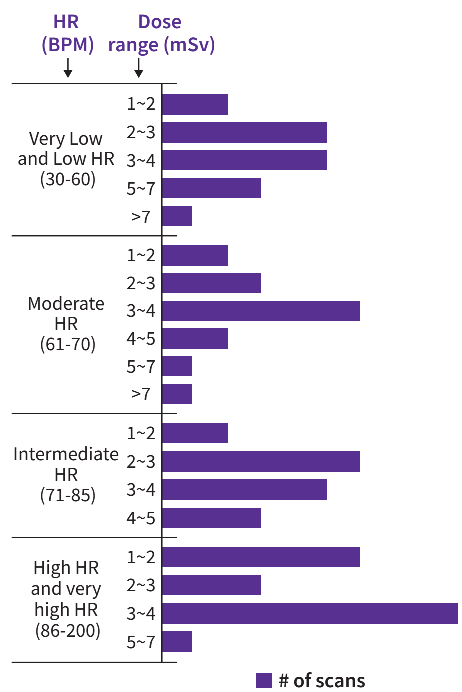


Figure 9: The heart rate and radiation dose distribution.

Early publication demonstrates the clinical performance of ECG-less Cardiac

A prospective study explored the potential of ECG-less Cardiac using modern scanner capabilities to streamline CCTA workflow while maintaining diagnostic image quality[1]. This study conducted at two centers enrolled 43 patients undergoing clinically indicated CCTA (51.2% male; mean age: 62.0 ± 12.0 years, mean heart rate: 65.3 ± 9.0 BPM, mean BMI: 28.6 ± 6.8). They were imaged on a Revolution Apex Elite system without ECG gating using a 160 mm coverage and fast gantry rotation speed (0.23 or 0.28 sec).

To demonstrate the feasibility of using ECG-less Cardiac with different acquisition durations, data were acquired during a continuous cardiac cycle (mean $CTDI_{vol}$: 42.8 ± 17.6 mGy) and images were reconstructed across seven sub-ranges of the acquired dataset : ¾ middle of the heart period, early ½ heart period and late ½ heart period, early, middle and late ¼ of the heart period (Figure 10). Three expert readers rated the images reconstructed from each cardiac heart period range (full cycle, ¾ cycle, ½ cycle and ¼ cycle) with and without SnapShot Freeze 2 motion correction algorithm using a six-point Likert scale: 0 = Assessment of motion is not feasible due to poor image quality unrelated to motion; 1 = Completely unreadable due to motion, non-diagnostic; 2 = Significant motion, limited interpretability; 3 = Motion artifact apparent, interpretable; 4 = Minor motion artifact, interpretable; 5 = Pristine, no motion artifact, interpretable.

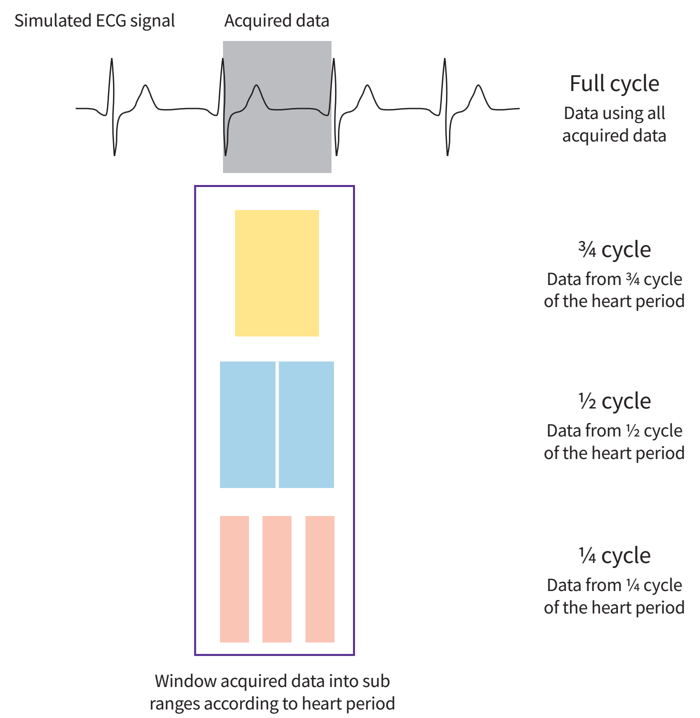


Figure 10: Illustration of imaging data acquisition and splitting of the full data into subranges. After acquiring data during a whole R-R interval, images were reconstructed using projections acquired during ¾ middle of the heart period; early ½ heart period and late ½ heart period; early, middle and late ¼ of the heart period.

While images were overall considered interpretable (mean score ≥3) the application of motion correction further improved the image quality (mean image quality score: 4.0 ± 0.95 vs 4.6 ± 0.66, respectively; p < 0.01). Image quality remained high across heart rate subgroups (≤60 BPM: 4.9 ± 0.31; 61–70 BPM: 4.5 ± 0.66; ≥71 BPM: 4.4 ± 0.78). When comparing sub-range reconstructions to the reference of full-cycle data (mean image quality score: 4.6±0.66), image quality remained similar (mean image quality score : 4.54±0.73 and 4.58±0.70, p=053 and 0.807 for ¾ and ½ range heart period; respectively), with minimal degradation noted in quarter-range reconstructions (mean image quality score : 4.32±0.87, p<0.001).

This study demonstrated the technical feasibility of ECG-less CCTA using advanced CT hardware and software: it was feasible to obtain diagnostic quality CCTA with low or no motion artifacts without measurement of the patient's ECG signal. Eliminating the need for ECG leads may enhance patient comfort, simplify workflow, and broaden access to cardiac CT imaging—especially in settings where ECG preparation is suboptimal or infeasible.

The limited assessment of objective image quality parameters, the HR measurement through palpation and the absence of clinical findings assessment were reported as limitations.

[1] Brian Thomsen et al., *Current Problems in Diagnostic Radiology*, https://doi.org/10.1067/j.cpradiol.2025.04.019

Various use scenarios for ECG-less Cardiac

ECG-less Cardiac has been successfully implemented in hospitals across various scenarios.

Clinical benefits in emergency radiology

Universitair Ziekenhuis Brussel (UZB) is one of Belgium's premier Centers of Excellence in healthcare, biomedical research and medical education. It implemented ECG-less Cardiac in its emergency radiology department.

Hans Nieboer, MD, FASER, FESER, is an emergency radiologist at UZB who has used ECG-less Cardiac for his ED patients in combination with CTA. Dr Nieboer said:

"It can be useful in cases of acute chest pain where there is a broad differential diagnosis. We're investigating how to use it when we need to quickly rule out conditions using CTA for pulmonary embolism or aortic dissection, or to evaluate the coronary arteries to exclude an acute coronary syndrome without the need of ECG leads."

He explained that ECG-less Cardiac differs from traditional cardiac imaging methods, with unique advantages that could have an impact on diagnoses:

"It would save a significant amount of time by eliminating the need to attach ECG leads and find the optimal ECG signal. This would allow us to optimize diagnostics without any time loss. Theoretically, this approach could also be applied in cases of acute thoracic trauma and acute stroke imaging."

Workflow benefits in emergency settings

ECG-less Cardiac has helped UZB's ED improve workflow and efficiency, while streamlining the diagnostic process over traditional methods. UZB emergency CT technologist Ineke Van Haelst said that using ECG-less Cardiac is a user-friendly process that offers a streamlined approach to cardiac CT scanning, giving her extra time to focus on the patient. Adding an ECG-less acquisition to a CTA requires no additional effort, and it can be performed with the same contrast bolus. She said:

"Compared to a standard cardiac examination, we save a lot of time. I used to think cardiac examinations would be complex, but they are not at all."

Transformation of conventional chest CT

The Nantes University Hospital (NUH) in the Upper Brittany region of western France, is an international center of excellence in several areas, including cardiology. Pr. Jean-Michel Serfaty, a cardiovascular radiologist and head of the diagnostic cardiac and vascular imaging unit at NUH, said ECG-less Cardiac and the Revolution Apex Elite has the potential to transform cardiac and thoracic imaging services:

"The main transformation from this technology might be the ability to obtain a motionless cardiac image on chest CTs, adding a systematic analysis of the coronary arteries, which is currently not the case on conventional chest CTs."

Pre-evaluation of radiofrequency ablation treatments

To clinically evaluate the potential of non-ECG cardiac imaging, NUH evaluated whether it could effectively image patients with arrhythmias before they undergo radiofrequency ablation of the pulmonary veins to restore a normal heartbeat. In this indication, radiologists must rule out a thrombus in the left atrium and analyze pulmonary vein anatomy before the patient enters the cardiac catheterization laboratory (cath lab). A complete analysis of the heart and coronary arteries is also performed to rule out coronary artery disease.

Initial results using ECG-less Cardiac without prior knowledge of the patient's heart rate and using only one-phase acquisition showed excellent cardiac images to rule out left atrial appendage thrombus and assess pulmonary vein anatomy, with the ability to assess coronary arteries in most cases. Discussions with technologists have shown faster installation and greater patient comfort, as well as a time saving per examination of around two minutes, making cardiac CT imaging before pulmonary vein ablation equivalent to pulmonary embolism CT scanography. Cardiac imaging without an ECG prior to radiofrequency ablation of pulmonary veins is currently used routinely at NUH.

Easy to use—even for junior technologists

At NUH, off-site radiologist Pr. Serfaty ordered an ECG-less Cardiac exam because the on-site junior technologist did not have extensive experience performing cardiovascular exams. Pr. Serfaty said:

"I gave the junior CT technologist the protocol and he relaxed because there was no ECG. And I was able to get the high image quality that I wanted for this patient."

Patient-focused benefits

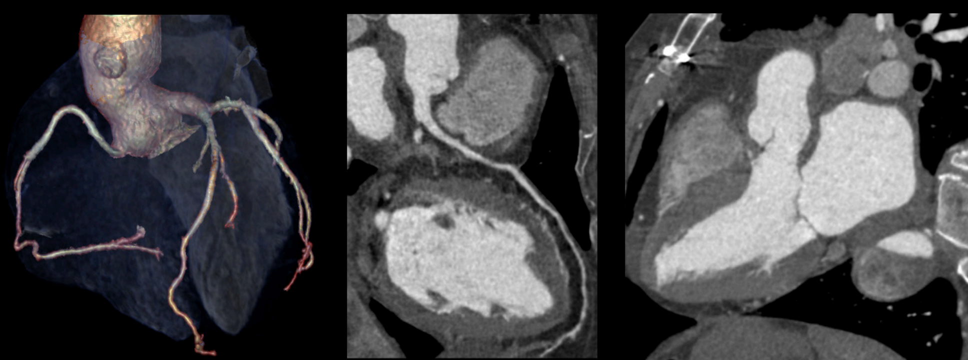
ECG-less Cardiac significantly enhances the patient experience by offering a calmer, faster, and less invasive exam—eliminating the need for beta blockers and ECG leads, while streamlining patient preparation for greater comfort and efficiency.

Removing limitations in cardiac scanning

With ECG-less Cardiac, cardiac CT can now be performed in more cases, including in patients intolerant to heart rate medication. The indication for cardiac CT has been broadened to include individuals who previously could not be scanned because they could not lower their heart rate, making ECG-less Cardiac a game-changer in cardiac CT.

ECG-less Cardiac clinical images

Patient with chest pain in emergency applying ECG-less Cardiac - 100 kV - 3/4 beat - free breathing - 78 BPM (1/2)



ECG-less Cardiac	
Rotation time, s	0.23
BPM	80
Slice, mm	0.625
Reconstruction	TF-H
kV	100
mA	325
Noise index	20
Contrast	
ml	80
mgl/ml	350
Algorithm	Std
CTDi, mGy	1.95
DLP, mGy-cm	137

History: PE

Findings: Aorta dissection

Patient with chest pain in emergency applying HyperDrive Aorta - 100 kV - free breathing - 78 BPM (2/2)

HyperDrive	
Rotation time, s	0.28
BPM	78
Slice, mm	0.625
Reconstruction	TF-H/M
kV	100
mA	211/396
Noise index	14
Contrast	
ml	80
mgl/ml	350
Algorithm	Std/Lung
CTDi, mGy	9
DLP, mGy-cm	144

History: PE

Findings: Aorta dissection

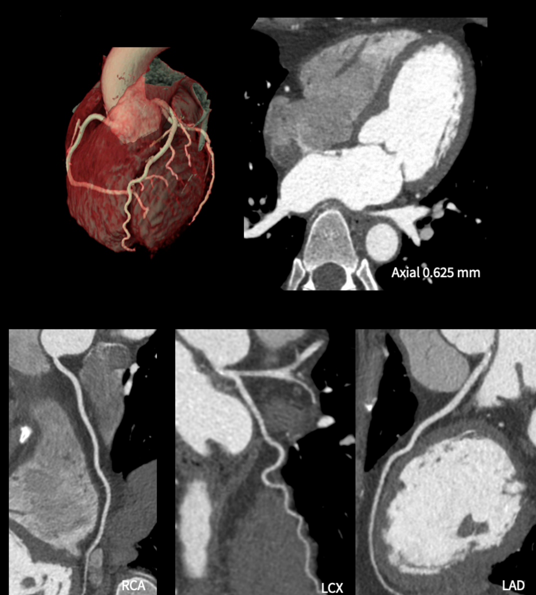
CCTA exam applying ECG-less Cardiac at 80 kV

ECG-less Cardiac	
Rotation time, s	0.23
BPM	80
Slice, mm	0.625
Reconstruction	TF-M
kV	80
mA	1145
Noise index	22
Contrast	
ml	60
mgl/ml	350
Algorithm	Std
CTDi, mGy	15,9/4,9
DLP, mGy-cm	254/207

History: CAS assessment

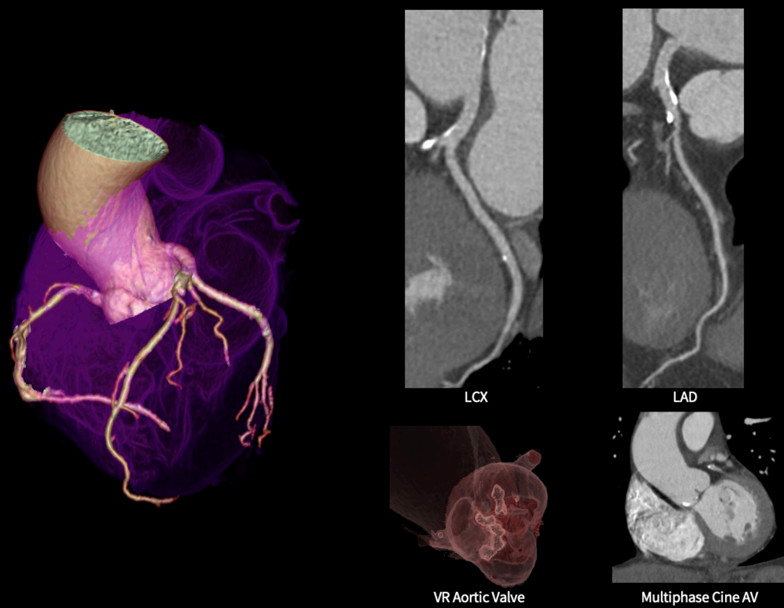
Findings: Highly calcified aortic valve
Aortic insufficiency

Exceptional CCTA achieved without ECG trace for patient with acute chest pain



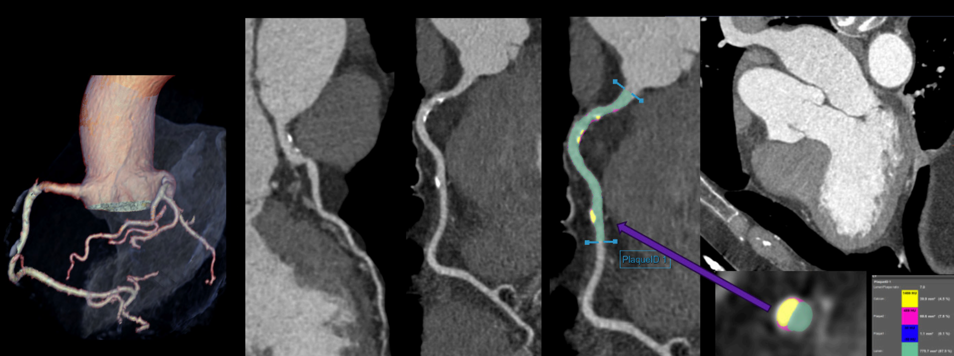
Axial 160 mm 1 beat ECG-less Cardiac	
Rotation time, s	0.23
Estimated heart rate (beats per minutes)	60
Reconstruction	DLIR-H
kV	100
mA	503
CTDI	22.46
DLP, mGy-cm	359.33
mSv (*0.014)	5.03

ECG-less Cardiac, full-cycle - 80 BPM
Calcified Aortic Valve



Axial 160 mm 1 beat ECG-less Cardiac	
Rotation time, s	0.28
Estimated BPM	80
Reconstruction	DLIR-H
kV	100
mA	323
CTDI	11.54
DLP, mGy-cm	184.57
mSv (*0.014)	2.58

ECG-less CCTA - full-cycle - free breathing - 100 BPM



ECG-less Cardiac	
Rotation time, s	0.23
Est. BPM	100
Slice, mm	0.625
Reconstruction	TF-H
kV	100
mA	244
Noise index	24,5
Contrast	
ml	60
mgl/ml	350
Algorithm	Std
CTDi, mGy	7
DLP, mGy-cm	111
mSv (*0.014)	1.55

History: PE

Findings: CAD

Conclusion

ECG-less Cardiac is a valuable tool that enables fast, efficient CCTA exams by eliminating the need for an ECG signal — redefining the cardiac CT exam.

Looking ahead, ECG-less Cardiac represents a significant step forward in streamlining cardiac imaging by reducing complexity and expanding patient access to cardiac CT. As healthcare systems continue to face increasing demand for fast, accessible and high-quality diagnostics, innovations like ECG-less Cardiac can play a pivotal role in expanding access to cardiac assessments—particularly in urgent or resource-limited settings. Coupled with ongoing advancements in cardiac CT technology, this approach has the potential to reshape cardiac imaging workflows, improve patient throughput, and ultimately contribute to more efficient and responsive cardiovascular care.

GE HealthCare

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