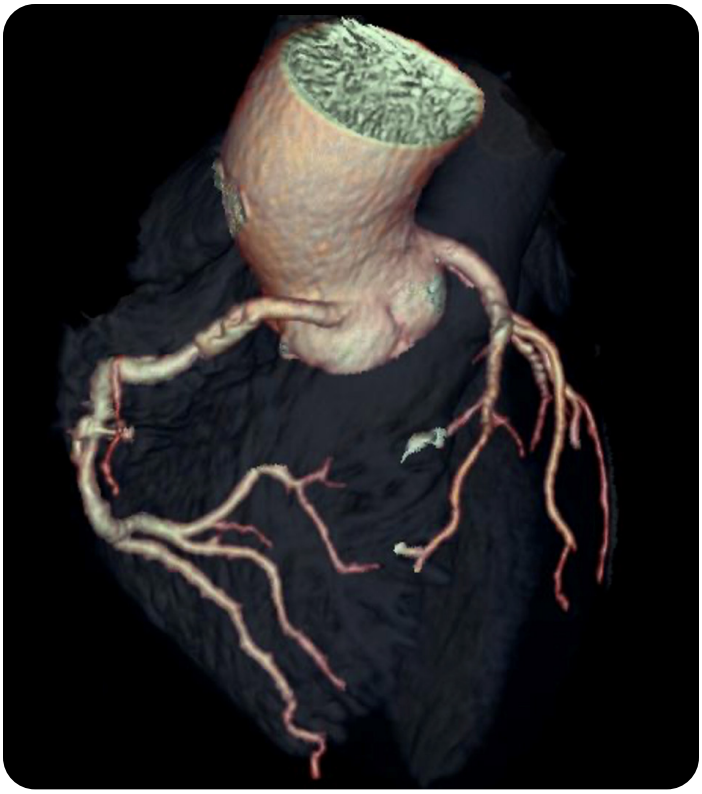
GE HealthCare

ECG-less Cardiac: A new era in CT heart imaging

The Nantes University Hospital (NUH) in the Upper Brittany region of western France provides routine and highly specialized medical and surgical services for approximately 300,000 patients per year. It's an international center of excellence in several areas, including cardiology. The hospital's cardiovascular imaging service implemented ECG-less Cardiac from GE HealthCare, a groundbreaking solution for challenging cardiac CT examinations without an ECG signal. This case study summarizes the early results of ECG-less Cardiac at NUH.



Cardiac CT imaging

Cardiac computed tomography (CT) is a non-invasive imaging modality used to rapidly identify for coronary artery disease. Cardiac CT scans traditionally rely on ECG signals to synchronize image acquisition with the cardiac cycle to deliver high-quality, accurate images with reduced radiation dose. However, acquiring an ECG can be time consuming might not be accessible in some situations, leading to scan failure and degraded image quality.

The studies varied by clinical indications, study protocols and comparison methods. The results and conclusions obtained in these studies are applicable to the specific studies cited and may not be generalizable or reproducible in every practice.

Introducing ECG-less Cardiac

With ECG-less Cardiac, clinicians have the flexibility to acquire scans of different durations, from a single rotation to a full cycle. It allows clinicians to meet the clinical needs for dose, image quality and cardiovascular function without the patient's ECG signal, while generating diagnostic-quality images for coronary and functional assessment. It also addresses workflow challenges associated with patient preparation, including prepping the skin, attaching ECG patches and grounding straps, doing an impedance check, and ensuring the ECG trace is displayed on the operator console – all of which adds to the overall exam time.

ECG-less Cardiac leverages the Revolution™ Apex Elite system's 160 mm coverage, 0.23 sec gantry rotation speed, SmartPhase automatic cardiac phase selection, and SnapShot Freeze 2 (SSF2) whole-heart motion correction to acquire diagnostic-quality images without an ECG signal, using a reasonable estimate of the patient's heart rate provided by the user prior to the scan.

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 imaging 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. In addition, discussions with technologists have shown faster installation and greater patient comfort, as well as a time saving per examination of around 2 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.

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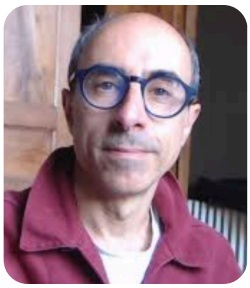
The future of Cardiac CT: High-quality Cardiac imaging without ECG trace

ECG-less Cardiac helps NUH clinicians address challenging cardiac exams, resulting in excellent cardiac assessments and streamlined workflow within the cardiac imaging service.

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 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".



Pr. Jean-Michel Serfaty

Eliminating the need for an ECG signal marks a significant progression in cardiac CT scanning in terms of workflow efficiency and patient satisfaction.

"You don't even need to know the frequency of the patient when you went to acquire one phase of the cardiac cycle. You just scan your patient without any cardiac-related information, which reduces acquisition time for our patients".

Patients also feel more comfortable because ECG-less Cardiac eliminates placing electrodes on patients' chests during the scan.

"The less elements you stick on the patient, the better the experience – especially in situations where it might be difficult to stick electrodes."

Technologists appreciate the technology because it simplifies the entire cardiac imaging process.

"Technologists react positively to the opportunity to acquire an image without the ECG, which is why I'm using it for imaging before radiofrequency ablation."

Pr. Serfaty shared a case where he chose to order an ECG-less Cardiac exam because the junior CT technician didn't have extensive experience performing cardiovascular exams.

"I gave him 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. ECG-less Cardiac was very helpful in this case."

In another case, clinicians were unable to get an accurate ECG signal from a patient who needed a cardiac CT exam. After 10 minutes of repositioning the electrodes for an ECG-gated CT scan without a useful reading, they chose to perform a scan with ECG-less Cardiac.

"We abandoned the ECG-gated CT and jumped to the ECG-less Cardiac acquisition, which in the end gave us the image we were looking for. Again, this technology was useful."

Now he believes ECG-less Cardiac represents the future of cardiac CT imaging.

"With ECG-less Cardiac, we're pioneering the very start of something. I'm beginning to foresee potential applications that give a future to this technology."

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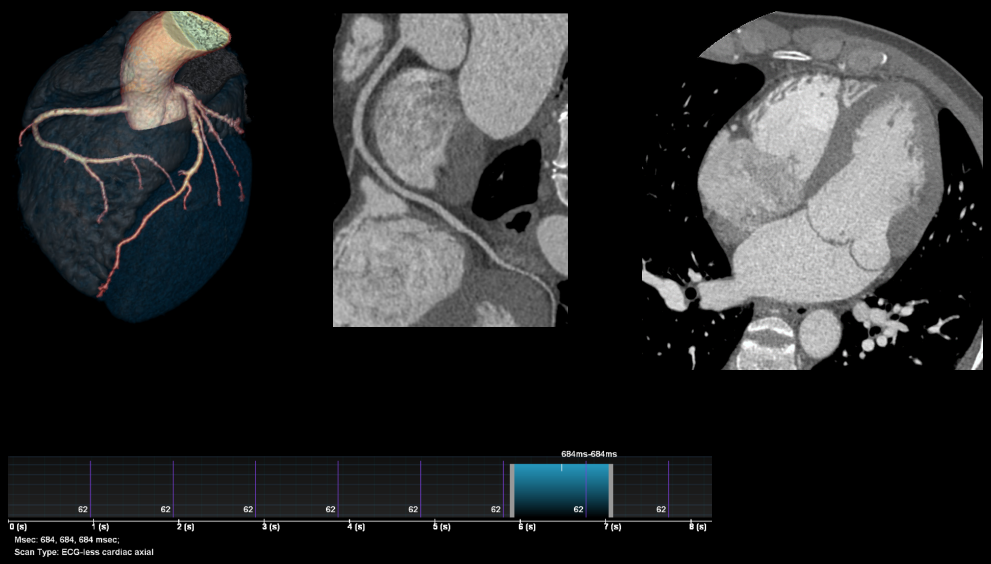
The future of Cardiac CT: High-quality Cardiac imaging without ECG trace *(cont.)*

ECG-less Cardiac for patient with heart failure



ECG-Less Cardiac	
Rotation time, s	0.23
BPM	60
Slice, mm	0.625
Reconstruction	TF-M
kV	80
mA	1145
Noise index	22
Contrast	
ml	60
mgl/ml	350
Algorithm	Std
CTDi, mGy	25
DLP, mGy-cm	402

History: Dyspnea NYHA3
Pre-surgery assessment

Findings: Mitral Prolapse

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