Case study

Cardiac CT on arrhythmic and high heart rate patients with Revolution™ CT

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Low dose Cardiac CT exam in a patient with high BMI, high heart rate, highly calcified coronary arteries and paroxysmal atrial fibrillation

Heart rate 85-136 BPM

Patient history
Patient in his 70s with paroxysmal atrial fibrillation was referred to CT for assessment of chronic coronary artery disease before pulmonary vein ablation.

Acquisition
One-beat cardiac acquisition:
- 160 mm axial scanning with ECG and Auto Gating
- 100 kV and 542 mA
- BMI: 34 (101 kg, 172 cm)
- ASiR™-V² to lower dose
- 0.28 sec rotation speed
- Heart rate: 85 - 136 BPM
- 70 cc of contrast media (400 mg I/ml, flow 4 cc/s) including SmartPrep phase triggering
- DLP 92 mGy-cm
- 1.2 mSv²

Results

Curved - LAD
Curved - RCA
Volume rendering of the left atrium

Conclusion
This cardiac CT scan did not show any signs of disease in the pulmonary veins, the left atrium and the included parts of the lungs. The physician also reported a strong coronary atherosclerosis.

“Even on challenging patients for cardiac CT, a comprehensive analysis of the coronary arteries is possible with Revolution CT. Thanks to the combination of the one beat cardiac scanning mode, the high definition imaging and the arrhythmia management, we can deliver confident diagnosis even of patient with arrhythmia or high heart rates, and still at low doses.”

Prof. Dr. Rainer Schmitt
Low dose Cardiac CT on a patient with persistent atrial fibrillation
Heart rate 71 - 153 BPM

Patient history
Male patient in his 60s with persistent atrial fibrillation and dispnea during exercise. The patient, with arterial hypertension and diabetes mellitus, was referred to CT for pulmonary vein assessment before ablation.

Acquisition
One-beat cardiac acquisition:
- 160 mm axial scanning with ECG and Auto Gating
- 100 kV and 544 mA
- BMI: 35
- ASIR™-V 1 to lower dose
- 0.28 sec rotation speed
- Heart rate: 71 - 153 BPM
- 60 cc of contrast media (400 mg I/ml, flow 4 cc/s) including SmartPrep phase triggering
- DLP 124 mGy-cm
- 1.7 mSv

Results

Conclusion
On this cardiac CT exam, an anatomical and morphometric analysis of the left atrium was performed. The results showed a dilatation of the left atrium as well as one accessory right pulmonary vein. The physician also reported a left ventricular hypertrophy and a minor coronary atherosclerosis.

Thanks to the one-beat cardiac acquisition and the new iterative reconstruction technology, ASIR-V, Revolution CT delivers at low dose an excellent coronary vessel visualization even on patients such as this one with persistent atrial fibrillation and high heart rates during the scan acquisition.

Prof. Dr. Rainer Schmitt
Patient history

A woman in her 50s with persistent atrial fibrillation was referred to CT for pulmonary vein assessment before ablation.

Acquisition

One-beat cardiac acquisition:
- 160 mm axial scanning with ECG and Auto Gating
- 100 kV and 520 mA
- BMI: 27
- ASIR™-V to lower dose
- 0.28 sec rotation speed
- Heart rate: 63 - 123 BPM
- 60 cc of contrast media (400 mg I/ml, flow 4 cc/s) including SmartPrep phase triggering
- DLP 140 mGy-cm
- 1.9 mSv²

Results

Conclusion

The CT scan of the pulmonary veins and coronary arteries displayed a late (common) confluence of the upper right and the lower pulmonary veins, as well as a dilatation of the right and left atria. The coronary analysis showed a nonstenotic calcified plaque in the proximal left anterior descending artery.

Now with Revolution CT, on cardiac exams such as this one, where the primary indication is the detection of the pulmonary veins, a comprehensive analysis of the coronary arteries is also possible using the same acquisition, independently of heart rate or any arrhythmia conditions.

Dr. med. Matthias Wagner
Cardiac CT on a patient with absolute arrhythmia and atrial fibrillation

Heart rate 64 - 116 BPM

Patient history
An obese patient in his 70s with cardiac risk factors, atrial fibrillation and suspected chronic coronary artery disease, was referred to CT for pulmonary vein and coronary artery assessment.

Acquisition
One-beat cardiac acquisition:
- 160 mm axial scanning with ECG and Auto Gating
- 120 kV and 445 mA
- BMI 33 (100 kg, 176 cm)
- ASiR™-V to lower dose
- 0.28 sec rotation speed
- Heart rate: 64 - 116 BPM
- 60 cc of contrast media (400 mg I/ml, flow 4 cc/s) including SmartPrep phase triggering
- DLP 256 mGy-cm
- 3.5 mSv

Results

Volume Rendering of the coronary tree
Curved - RCA
Curved - LAD
Curved - 1st Diagonal

Conclusion
This Cardiac CT exam did not show any sign of relevant coronary vessel stenosis. On this patient with known arterial hypertension, a slight elongation of vessels and a dilatation of the left atrium were reported.

With the help of the arrhythmia management system, an automatic retrigged scan can be performed on patients with severe arrhythmia. This helps to ensure a reliable reporting on coronary vessels, within one single injection, in this case even on a patient with adverse conditions for cardiac CT exam. This enables in a significant increase of consistent results in coronary CTA cases.

Anna Matveeva, M.D.
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