

Case 8

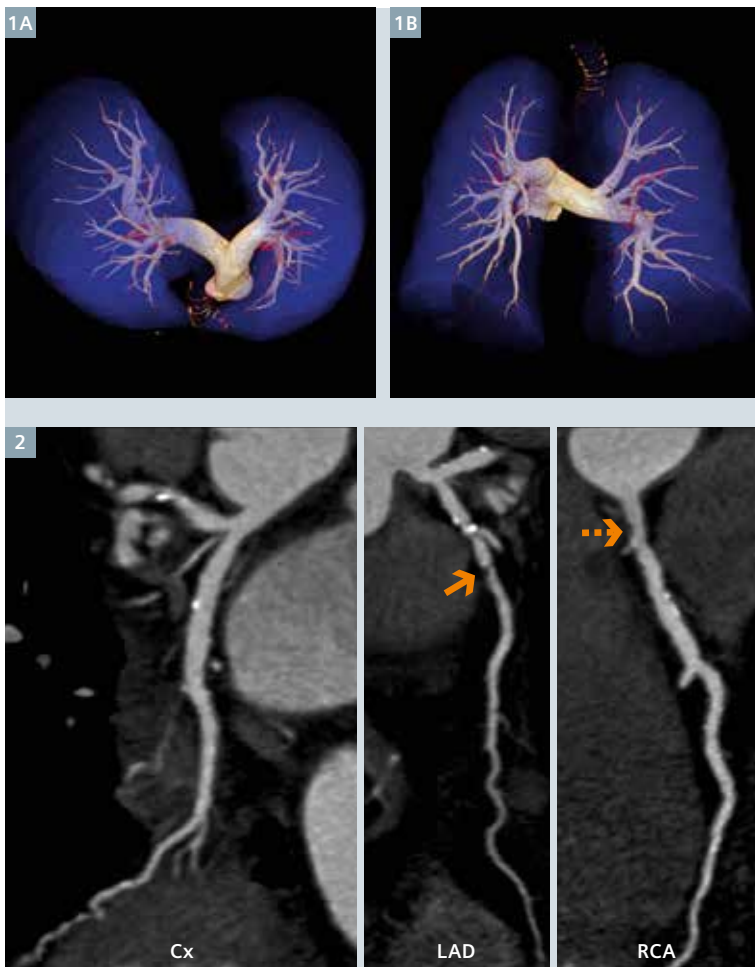
Double Flash Scan with Single Contrast Bolus for Triple Rule Out

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1 VRT images show the normal pulmonary arteries.

2 Curved MPR images show a moderate stenosis in the proximal LAD (arrow), a mild stenosis in the proximal RCA (dashed arrow), and multiple calcified plaques in all three coronary arteries.

History

A 76-year-old male patient, with a known history of hypertension and dyslipidemia, was presented to the emergency department complaining of acute retrosternal chest pressure. The pressure began three hours previously, radiated to the back, was accompanied by dyspnea, nausea and profuse perspiration and lasted for 20 minutes. The initial electrocardiogram and biomarkers were normal. A CT examination was requested to rule out coronary artery disease, pulmonary embolism and/or aortic dissection (triple rule out).

Diagnosis

The images acquired from the initial Flash scan showed contrast enhancement solely in the pulmonary arteries with no signs of pulmonary embolism (Fig. 1). The coronary CT angiography (cCTA) images, acquired from the second Flash scan, showed a moderate stenosis in the left anterior descending artery (LAD) and a mild stenosis in the proximal right coronary artery (RCA) (Figs. 2 and 3). No stenosis was seen in the left main coronary artery (LM) nor in the left circumflex artery (Cx). An Agatston calcium score of 154 was calculated. There were no signs of aortic dissection (Fig. 4).

The patient was diagnosed with unstable angina and was referred for an interventional coronary arteriogram which confirmed the moderate stenosis

Examination Protocol

Scanner	SOMATOM Definition Flash	
	Scan area	Thorax (pulmonary arteries)
Scan length	329.2 mm	329.2 mm
Scan direction	Cranio-caudal	Caudo-cranial
Scan time	0.72 s	0.72 s
Tube voltage	100 kV	120 kV
Tube current	370 mAs	400 mAs
Dose modulation	CARE Dose4D	CARE Dose4D
CTDI _{vol}	3.59 mGy	6.48 mGy
DLP	140 mGy cm	254 mGy cm
Effective dose	1.95 mSv	3.55 mSv
Rotation time	0.28 s	0.28 s
Pitch	3.4	3.4
Slice collimation	128 × 0.6 mm	128 × 0.6 mm
Slice width	0.6 mm	0.6 mm
Reconstruction increment	0.4 mm	0.4 mm
Reconstruction kernel	B26f, I26f	B26f, I26f
Heart rate	55–61 bpm	50–61 bpm
Contrast		
Volume	60 mL	
Flow rate	5 mL/s	
Start delay	Test bolus (pulmonary trunk) + 4 s	
Test bolus	(ascending aorta) + 4 s	

The outcomes by Siemens' customers described herein are based on results that were achieved in the customer's unique setting. Since there is no "typical" hospital and many variables exist (e.g., hospital size, case mix, level of IT adoption) there can be no guarantee that other customers will achieve the same results.

in the LAD. A drug-eluting stent was implanted and the patient recovered uneventfully.

Comments

cCTA has become a reliable, non-invasive imaging method for ruling out suspected coronary stenosis. However, in the emergency department, a triple-rule-out protocol for simultaneous evaluation of life-threatening conditions such as acute coronary syndromes, acute aortic syndromes and pulmonary embolism has unclear indications in the present guidelines. Multiple CT examinations require more contrast volume and result in higher radiation

exposure and in compromised image quality.

In this case, a double Flash scan protocol was introduced to reduce the scan time (0.72 s), the radiation dose (5.5 mSv) and the volume of contrast agent used (60 mL). An initial test bolus with 10 mL of contrast was used to determine the peak enhancement in the pulmonary trunk and in the ascending aorta. Four seconds were added to the peak enhancement time so as to determine the start delay time. A double Flash scan of the thorax was then performed using only 60 mL of contrast. The first scan (cranio-caudal) was aimed at acquiring images

with contrast enhancement only in the pulmonary arteries, whereas the second scan (caudo-cranial) was to acquire images with contrast enhancement in the coronary arteries and the aorta. Taking into consideration that the patient had a moderate calcium score, a higher kV was applied in the second Flash scan to avoid potential beam hardening artifacts caused by calcified plaques in the coronary arteries.

All three vascular systems were successfully evaluated, which reduced the patient's time to diagnosis, time to stay and, in the long run, the costs to the emergency department. ■



3 VRT images show a moderate stenosis in the proximal LAD (Fig. 3A, arrow), a mild stenosis in the proximal RCA (Figs. 3B and 3C, dashed arrow).

4 VRT images reveal a normal aorta.