

Atypical Presentation of Acute Myocardial Infarction in a Young Man Diagnosed by Multidetector Computed Tomography

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Multidetector-row computed tomography has been validated as a useful non-invasive diagnostic method in patients with various cardiac diseases. Thanks to its high spatial and temporal resolution, MDCT is able to provide detailed information on cardiac morphology and on the coronary arteries at the same time. We describe a case of acute myocardial infarction diagnosed by this new imaging modality.

Patient Description

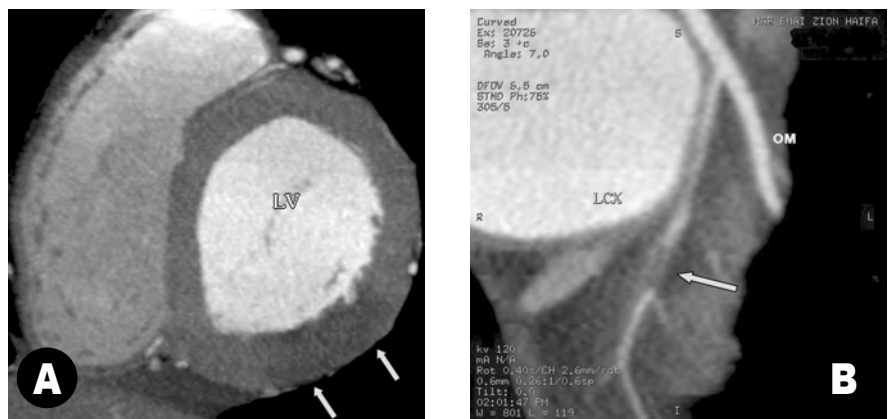
A 23 year old man with a history of untreated hyperlipidemia presented to the emergency department complaining of intermittent left-sided atypical chest pain radiating to the left jaw. Physical examination was unremarkable. Electrocardiographic examination showed sinus rhythm with no evidence of ischemic changes. Transthoracic echocardiography did not reveal an area of wall motion abnormality. At the time of admission cardiac troponin and creatine kinase-MB tests were within normal limits.

He was given 300 mg of oral acetylsalicylic acid and was admitted to the Internal Medicine department. Six hours later blood tests revealed elevated serum levels of troponin and CK-MB, however no changes consistent with acute myocardial infarction were observed on repeat ECG. Clinical myocardial infarction was diagnosed and after cardiologic

consultation the patient was transferred to the cardiology intensive care unit for medical treatment. Initial medical treatment included subcutaneous Clexane® (enoxaparin) 80 mg twice per day in addition to oral acetylsalicylic acid 100 mg/day. A repeated TTE was interpreted by the echocardiologist as within normal limits. Taking into consideration the young age of the patient, the atypical chest pain and the discrepancy between his blood tests, ECG and echocardiographic results, cardiac CT angiography examination was performed using a 16-row multidetector scanner (General Electric Lightspeed-pro, USA) (16 x 0.625 mm detector collimation, gantry rotation time 0.44 sec, tube voltage 120 kV and pitch 0.26). Images were reconstructed at the diastolic phase. The short-axis reformatted view [Figure A] showed a postero-lateral wall transmural hypodense

area, suggesting vascular obstruction. The wall thickness in the infarcted area was normal. Arterial multiplanar and maximum intensity projection reconstructions demonstrated an intraluminal filling defect in the mid-left circumflex artery consistent with acute thrombus causing complete occlusion, corresponding to the infarct-related finding in the myocardium [Figure B]. Cine-MDCT evaluation revealed a postero-lateral wall hypokinetic area.

Conventional coronary angiography was performed 24 hours later and demonstrated an acute occlusion of the mid-LCx artery segment. The left ventricular angiography confirmed the hypokinesia demonstrated by cine-MDCT. Percutaneous intervention was not performed because of the small diameter (< 1.5 mm) of the involved vessel, and medical treatment was instituted.



ECG-gated cardiac CT angiography performed with 16-row MDCT.

[A] Short-axis reformatted view shows a postero-lateral wall transmural hypodense area consistent with myocardial infarction (arrows). **[B]** Curved multiplanar reformatted image demonstrating an intraluminal filling defect in the mid-LCx artery corresponding to thrombus causing a complete occlusion (arrow). OM = obtuse marginal artery, LV = left ventricle

MDCT = multidetector-row computed tomography

CK = creatine kinase

TTE = transthoracic echocardiography

LCx = left circumflex

Comment

The differential diagnosis of an otherwise healthy young man with atypical chest pain varies and includes non-ischemic myocardial disease such as myocarditis, pericardial disease such as pericarditis, abnormalities of the great vessels and, rarely, myocardial infarction, particularly in the presence of risk factors for coronary artery disease. According to the current guidelines, patients with STEMI (ST-elevated myocardial infarction) and NSTEMI (non-ST-elevated myocardial infarction), patients with unstable angina and troponin elevation, ST depression > 1 mV, as well as hemodynamic and rhythm instability should undergo cardiac catheterization, with an option for coronary intervention. Currently, considering the time constraints and the use of iodinated contrast medium, these patients are not routinely considered candidates for CCTA examination, since the clinical indications for CCTA have not yet been completely established. Patients who will most likely benefit from coronary CCTA are: a) those who have atypical symptoms and are at intermediate risk for coronary artery disease; b) patients with inconclusive test results such as nuclear cardiology test, ergometry and others; c) subjects at high risk for catheterization complications or those in whom conventional coronary angiography failed or is not feasible for technical reasons; and d) those with follow-up of coronary

artery bypass. Ongoing investigation will probably guide future recommendations regarding the role of this technique in the evaluation of patients with low risk for coronary artery disease.

CCTA with multidetector-row CT has been validated as a useful non-invasive diagnostic method in patients with various cardiac diseases. Considering the fast rotation time, multislice acquisition and the high spatial resolution, MDCT is able to provide detailed information about cardiac morphology (including regional changes of myocardial density or thickness) and the coronary arteries at the same time [1,2]. The infarcted region is visualized as an area of hypoattenuation in comparison with the normally enhanced myocardium during the arterial phase, representing either edematous imbibition of the necrotic myocardium, usually observed in the first 2–4 weeks after the acute event, or the consequence of necrotic tissue replacement with poorly enhancing fibrous tissue, which occurs in the chronic phase of the MI [3,4]. Based on the study by Fancone and colleagues [3], the normal wall thickness of the infarcted segment is consistently associated with a recent event (as reported in our case) and might be a useful criterion to differentiate recent (< 1 month) from non-recent (> 1 month) MI. Using MDCT in the detection of MI, Fancone and team [3] reported a diagnostic accuracy, sensitivity and specificity of 91%, 83% and 91% respectively. Similar results were described by other authors [4].

CCTA with MDCT is a non-invasive, three-dimensional imaging technique that has the ability to identify coronary artery disease, anomalous coronary artery origin and to evaluate myocardial infarcts and cardiac function, as well as the great vessels and the pericardium. Patients with non-characteristic signs, negative ECG, inconclusive stress test or echocardiography results, and missing cardiac enzymes may benefit from this efficient diagnostic modality.

References

1. Achenbach S, Giesler T, Ropers D, et al. Detection of coronary artery stenoses by contrast-enhanced, retrospectively electrocardiographically gated, multislice spiral computed tomography. *Circulation* 2001;103:2535–8.
2. Nieman K, Cademartiri F, Lemos PA, et al. Reliable noninvasive coronary angiography with fast submillimeter multislice spiral computed tomography. *Circulation* 2002;106(16):2051–4.
3. Francone M, Carbone I, Danti M, et al. ECG-gated multi-detector row spiral CT in the assessment of myocardial infarction: correlation with non-invasive angiographic findings. *Eur Radiol* 2005. Epub Jun 14.
4. Nikolaou K, Knez A, Sagmeister S, et al. Assessment of myocardial infarctions using multidetector-row computed tomography. *J Comput Assist Tomogr* 2004;28(2): 286–92.

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