Ventricular septal rupture complicating myocardial infarction: Comprehensive assessment of cardiac coronary arteries, anatomy, perfusion and function by multidetector computed tomography

Eduard Gherlin MD^{1,4,5}, Jonathan Lessick MD DSc^{2,4}, Sobhi Abadi MD¹, Yoram Agmon MD^{2,4}, Zvi Adler MD^{3,4}, Ahuva Engel MD^{1,4}, Simcha Milo MD^{3,4}

A 38-year-old man was referred for electrocardiogram (ECG)-gated multidetector computed tomography (MDCT) coronary angiography following detection of ventricular septal rupture (VSR) on transthoracic echocardiography 24 h after admission for an acute inferior wall myocardial infarction. He had been treated with primary angioplasty and stenting of a tight distal right coronary stenosis. Detailed, comprehensive evaluation of the VSR, myocardium and coronary arteries was performed with ECG-gated MDCT coronary angiography using a Brilliance 16-slice scanner (Philips Medical Systems, USA). MDCT coronary angiography showed a patent stent and a proximal heterogeneous plaque of borderline significance (Figure 1). The measured global left ventricular function, using the MDCT data, disclosed a mildly reduced ejection fraction of 47%. Regional functional analysis using cine films of the MDCT data depicted regional akinesis of the inferior and inferoseptal mid- and basal segments, manifesting as a marked reduction in myocardial

thickening during systole (Video 1 – [click here to view](#)). Furthermore, first-pass myocardial perfusion analysis depicted a well-defined, nearly transmural enhancement defect parallel to the akinetic myocardial region (Figure 2). Further detailed analysis of the interventricular septum at end-diastole showed a full-thickness rupture in the mid-inferior septum (Figures 3A and 3B). Of note, the septal rupture occurred at the junction of the normally enhancing anterior septum and the hypoperfused, necrotic, inferior septum and inferior myocardial segments, indicating that this junction line appears to act as a locus minoris resistentiae. The VSR demonstrated near-complete lumen obliteration during peak systole (Figures 3A and 3B), suggesting that at least part of the bordering myocardium (anterior septum) was contracting and, thus, viable. Because the described VSR was small and of no hemodynamic significance, based on imaging findings, it was managed conservatively with follow-up echocardiography. There was no change during a three-month follow-up period.

Figure 1) Curved multiplanar reformation of multidetector computed tomography coronary angiography of the right coronary artery demonstrating a patent stent in the distal artery (white arrow) and a proximal heterogeneous plaque of borderline significance (black arrow)

Figure 2) Vertical long-axis reformation of the left ventricle and atrium demonstrating a prominent myocardial enhancement defect affecting the inferior mid- and basal segments. The defect was transmural in the inferior basal segment (large white arrowhead) and subendocardial in the inferior mid-segment (small white arrowhead). Note the enhancement defect affecting the anterior papillary muscle (black arrowhead)

¹Department of Diagnostic Imaging; ²Department of Cardiology; ³Department of Cardiac Surgery, Rambam Health Care Campus, B Rappaport School of Medicine; ⁴Technion – Israel Institute of Technology, Haifa, Israel; ⁵Leonard M Miller School of Medicine, University of Miami, Miami, Florida, USA
Correspondence: Dr Eduard Gherlin, University of Miami School of Medicine, Department of Diagnostic Radiology, Jackson Memorial Hospital, JMH WW 279, 1611 Northwest 12th Avenue, Miami, Florida 33136, USA. Telephone 305-585-6894, fax 305-325-8591, e-mail e_ghersin@rambam.health.gov.il

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Figure 3) **A** and **B** Vertical short-axis multiplanar reformations at end-diastole and peak systole, respectively, demonstrate a full-thickness rupture in the inferior septum measuring 4 mm in its maximal diameter (arrowhead in **A**). This rupture occurred at the junction of the normal enhancing anterior septum and the hypoperfused, ischemic, inferior septum and inferior myocardial segments (arrow in **A**). Note the near-complete obliteration of septal defect lumen during peak systole (arrowhead in **B**)

The present case emphasizes the current capabilities of ECG-gated MDCT coronary angiography in offering comprehensive evaluation of cardiac coronary arteries, anatomy, perfusion and function following acute myocardial infarction (1-5).

REFERENCES

1. Mollet NR, Cademartiri F, van Mieghem CA, et al. High-resolution spiral computed tomography coronary angiography in patients referred for diagnostic conventional coronary angiography. *Circulation* 2005;112:2318-23.
2. Nikolaou K, Sanz J, Poon M, et al. Assessment of myocardial perfusion and viability from routine contrast-enhanced 16-detector-row computed tomography of the heart: Preliminary results. *Eur Radiol* 2005;15:864-71.
3. Sato Y, Matsumoto N, Ichikawa M, et al. Efficacy of multislice computed tomography for the detection of acute coronary syndrome in the emergency department. *Circ J* 2005;69:1047-51.
4. Ghersin E, Litmanovich D, Dragu R, et al. 16-MDCT coronary angiography versus invasive coronary angiography in acute chest pain syndrome: A blinded prospective study. *AJR Am J Roentgenol* 2006;186:177-84.
5. Belge B, Coche E, Pasquet A, Vanoverschelde JL, Gerber BL. Accurate estimation of global and regional cardiac function by retrospectively gated multidetector row computed tomography: Comparison with cine magnetic resonance imaging. *Eur Radiol* 2006;16:1424-33.