

CASE REPORT

Left ventricular pseudoaneurysm or diverticulum: differential diagnosis and dynamic evaluation by catheter left ventriculography and ECG-gated multidetector CT

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ABSTRACT. We present a case report of the findings of a left ventricular diastolic out pouching in a patient following acute myocardial infarction diagnosed by catheter left ventriculography and electrocardiography (ECG)-gated multidetector computed tomography (MDCT) findings. Left ventriculography demonstrated a small left ventricular diastolic out pouching, while MDCT enabled accurate evaluation of both left ventricular myocardium and lumen, establishing the diagnosis of an intramural small left ventricular pseudoaneurysm. This case illustrates the full capabilities of MDCT in the evaluation of left ventricular pseudoaneurysms.

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We describe a post-myocardial infarction patient with significant coronary artery disease and left ventricular pseudoaneurysm evaluated by catheter left ventriculography and electrocardiography (ECG)-gated multidetector computed tomography (MDCT). MDCT documented significant two-vessel coronary artery disease as well as a small pulsating inferior wall left ventricular pseudoaneurysm. To the best of our knowledge such an analysis has not been described previously with ECG-gated MDCT.

Case report

A 56-year-old man with post-infarction angina pectoris and a positive stress test for myocardial ischaemia was admitted for invasive coronary angiography. Seven months earlier he had suffered an acute inferior wall, ST-segment elevation myocardial infarction, with increased cardiac troponin I (cTnI) levels (12.7 ng ml^{-1}). The patient was treated with intravenous thrombolysis using tissue plasminogen activator (tPA), which resulted in ST-segment resolution. The patient was discharged and was referred for ambulatory follow-up. During this period the patient experienced effort angina and a stress test was positive for ischaemia. The patient was admitted electively for an invasive coronary angiography which revealed significant two-vessel disease involving the left main coronary artery (LMCA), the left anterior descending (LAD) and the left circumflex (LCX) coronary arteries. Left ventriculography demonstrated normal left ventricular

systolic function with a small, pulsating, inverted heart-shaped, diastolic out pouching of contrast material at the left ventricular inferior/medial wall, best noted on the right anterior oblique (RAO) view (Figure 1). At this point the suggested differential diagnosis included a congenital left ventricular diverticulum or a small pseudoaneurysm. For further evaluation ECG-gated cardiac MDCT was performed with a Brilliance TM 16-slice scanner (Philips Medical Systems, Cleveland, OH). The post-processing reformations were performed on a Brilliance Extended Workspace™ workstation (Philips Medical Systems). The average heart rate during image acquisition was 65 beats per minute. CT coronary angiography disclosed significant stenotic lesions of the LMCA and proximal and mid LAD. The left circumflex coronary artery was not adequately visualized due to extensive and diffuse calcium burden. The global left ventricular ejection fraction, measured using end-diastolic and end-systolic reformats of the CT data, was 63%. Slab maximal intensity projection (MIP) reformats in the RAO view demonstrated a small left ventricular diastolic out-pouching lumen with a maximal diameter of 13 mm and a 5 mm feeding neck in the inferior apical wall of the left ventricle, adjacent to the inferior right ventricular wall insertion. The left ventricular diastolic out pouching was pulsating, expanding during diastole and collapsing during systole. Even during maximal distension, the left ventricular diastolic out pouching lumen was within the intramural portion of the myocardium without significant extra myocardial out pouching (Figure 2). Cine imaging through cardiac cycle clearly depicted the pulsating nature of the left ventricular diastolic out pouching and demonstrated normal global and regional myocardial function. Although the left ventriculography and the MDCT did not reveal inferior

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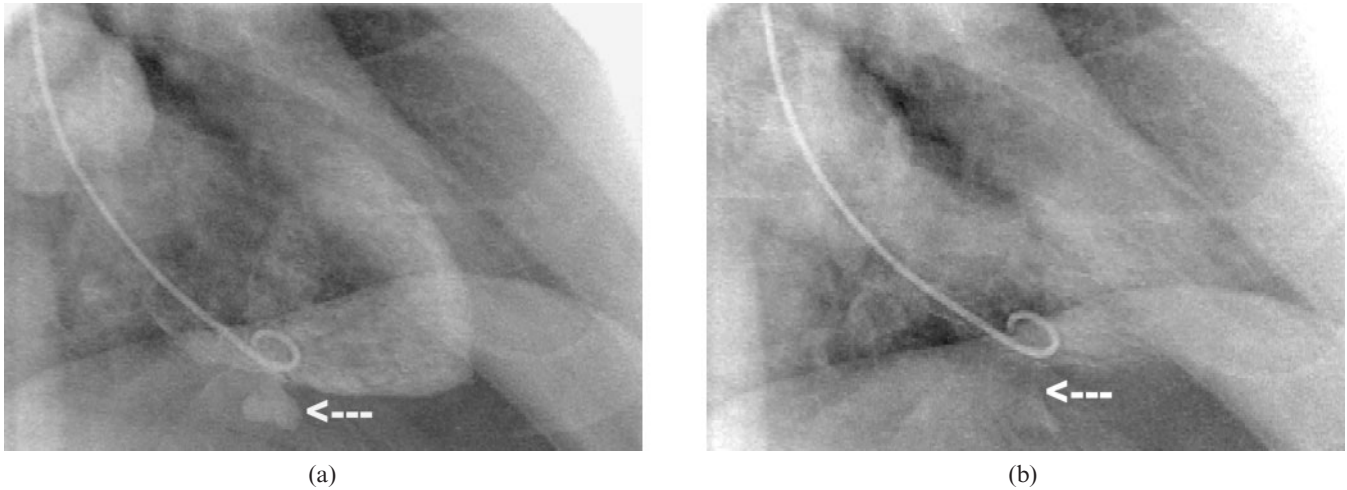


Figure 1. (a) Right anterior oblique (RAO) view of contrast left ventriculography at peak diastole demonstrates a small diastolic out-pouching of contrast material at the left ventricular inferior/medial wall (dotted arrow). (b) RAO view of contrast left ventriculography at peak systole demonstrates almost complete collapse of the previously denoted small diastolic out-pouching of contrast material at the left ventricular inferior/medial wall (dotted arrow).

wall regional myocardial dysfunction, the myocardial discontinuity denoted by MDCT, favoured the diagnosis of a small intramural inferior wall left ventricular pseudoaneurysm with an extremely narrowed neck that collapsed during systole and expanded during diastole. The potential diagnosis of a left ventricular true aneurysm was dismissed since true aneurysms are characterized by a wider neck. Owing to the presence of significant left main coronary artery disease, the patient was referred for coronary artery bypass graft surgery and surgical repair of the pseudoaneurysm. During the bypass surgery, careful and meticulous inspection of the left ventricular walls failed to demonstrate the previously diagnosed intramural small left ventricular pseudoaneurysm. The

patient underwent left internal mammary artery graft to the left anterior descending artery and two saphenous vein grafts to first marginal and first diagonal coronary arterial segments, respectively. The post surgical period was uneventful, and the treating physicians decided to follow up the left ventricular pseudoaneurysm with ECG-gated MDCT.

Discussion

Left ventricle pseudoaneurysm is an uncommon complication of myocardial infarction, which occurs in 0.1% of cases [1]. Others causes include cardiac surgery, surgical

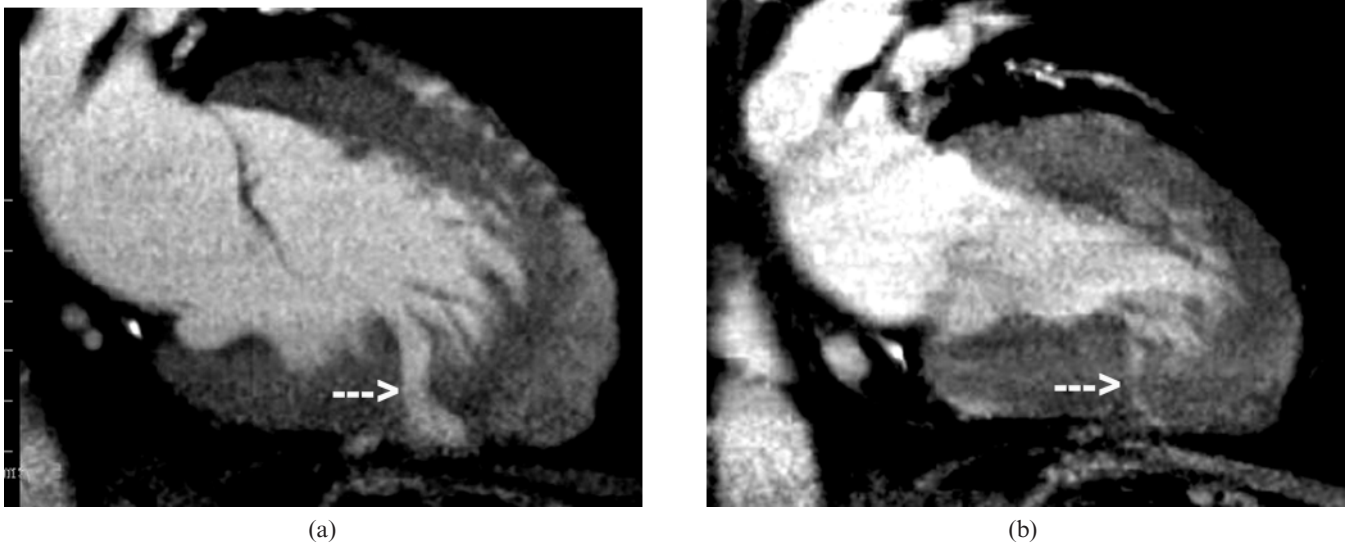


Figure 2 (a) Slab maximal intensity projection (MIP) reformat of ECG-gated MDCT in RAO view at peak diastole demonstrates tiny myocardial focal disruption and a small diastolic out-pouching of contrast material at the left ventricular inferior/medial wall (dotted arrow). Findings are consistent with a left ventricular pseudoaneurysm neck and lumen. (b) Slab MIP reformat of ECG gated MDCT in RAO view at peak systole demonstrates temporary occlusion of the neck of the small left ventricular pseudoaneurysm and almost complete collapse of the pseudoaneurysm lumen at the left ventricular inferior/medial wall (dotted arrow).

trauma, penetrating trauma and infection [2–5]. Left ventricular pseudoaneurysms, also termed false aneurysms of the left ventricle, result from focal myocardial disruption and are contained by overlying fibrosis and adherent pericardium [6]. In contrast to left ventricular pseudoaneurysm, left ventricular diverticulae are rare congenital anomalies consisting of localized protrusion of endocardium and myocardium from the free wall of the left ventricle [7]. Both entities may necessitate urgent surgical repair because of their propensity to rupture [7, 8]. Diagnosis of left ventricular pseudoaneurysm is usually made by echocardiography [6], but gated radioisotope ventriculography, contrast ventriculography, CT and cine magnetic resonance imaging have been described as diagnostic imaging modalities of left ventricular pseudoaneurysm [1, 8–10]. During the past five years, evolving MDCT technology with its improved spatial, contrast and temporal resolutions enables non-invasive coronary angiography as well as acquisition of accurate anatomical and functional information concerning heart chambers, myocardium and pericardium [11–17]. To the best of our knowledge this case report documents for the first time the application of ECG-gated MDCT in the differential diagnosis and dynamic evaluation of a left ventricular pseudoaneurysm. As demonstrated, ECG-gated MDCT was able to disclose the focal myocardial disruption, as well as to delineate the small intramural lumen and tiny neck of the left ventricular pseudoaneurysm. This is in contrast to contrast ventriculography, which demonstrated the pseudoaneurysm lumen but was unable to differentiate between left ventricular pseudoaneurysm with myocardial disruption and left ventricular diverticulum with myocardial continuity. The importance of this case report is further increased by the fact that ECG-gated MDCT enabled not only comprehensive anatomical imaging of the coronary arteries, heart chambers and pericardium, but also offered valuable dynamic information regarding myocardial function and integrity as well. Dynamic cine evaluation demonstrated the pulsating nature of the left ventricular pseudoaneurysm, with lumen collapse during systole and expansion during diastole. Such behaviour results from temporary occlusion of the pseudoaneurysm's narrow neck during systole. This is in contrast to pseudoaneurysms with larger necks, which collapse during diastole and expand during systole.

In conclusion, we demonstrated that ECG-gated cardiac MDCT is valuable in the comprehensive evaluation of post acute myocardial infarction patients. It enables CT coronary angiography, detailed anatomical information of heart chambers and pericardium and accurate dynamic evaluation of myocardial function, perfusion and integrity. Furthermore, as in our case, it can serve for non-invasive follow-up of very small left ventricular pseudoaneurysms.

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