We describe a case of 78-year-old man who presented with myocardial infarction and heart failure with cardiomegaly. 64 multidetector computed tomography (64-MDCT) and echocardiography showed a LV pseudoaneurysm, probably due to cardiac inferolateral wall rupture. The complex anatomy of the LV pseudoaneurysm was shown in detail by 64-MDCT using multiplanar reconstruction and 3D volume rendering techniques. MDCT is a useful tool for the non-invasive diagnosis of cardiac rupture.

The development of left ventricular (LV) pseudoaneurysm is a rare disorder that usually occurs after transmural myocardial infarction or cardiac surgery [1, 2]. Free wall rupture usually results in cardiac tamponade and death. Less frequently, cardiac rupture is contained by adherent pericardium or scar tissue, and pseudoaneurysm of the left ventricle occurs. Thus, unlike a true LV aneurysm, a LV pseudoaneurysm contains no endocardium or myocardium.

The natural history of a chronic pseudoaneurysm is not clearly understood. However, the danger of secondary rupture is real for a large pseudoaneurysm, but uncertain for small ones [2, 4]. Although LV pseudoaneurysm is clinically uncommon, the mortality rate is very high due to secondary rupture [2, 3].

In this report, we present a patient with a large LV pseudoaneurysm on the posterior wall due to a myocardial infarction, which was repaired successfully. The complex anatomy of the ventricular pseudoaneurysm was shown in detail by multidetector computed tomography (64-MDCT) using multiplanar reconstruction and 3D volume rendering techniques. MDCT is a useful tool for the non-invasive diagnosis of cardiac rupture.

CASE REPORT

A 78-year-old man was admitted to our hospital because of progressive chest pain for 4 days followed by shortness of breath. Rest did not relieve the discomfort. On admission, the electrocardiogram showed ST-segment elevation and the laboratory data revealed elevated troponin-I levels. At that time, his chest X-ray showed increased cardiothoracic ratio, interstitial pulmonary edema and mild bilateral pleural effusions. Echocardiography demonstrated an abnormal hypoechoic lesion adjacent to the
inferolateral wall of the left ventricle with extrinsic compression of the left atrium (Fig. 1). Doppler echocardiography also showed to-and-fro signals within a myocardial defect in the inferolateral wall.

Cardiac MDCT was performed using a 64-MDCT scanner (Philips, Brilliance 64) with both arterial and venous phases without ECG gating. A total of 80 milliliters (ml) of non-ionized contrast medium was injected through the patient’s left antecubital vein at a rate of 3 ml/sec and flushed with 20 ml saline. Scan parameters included 0.625 mm section width, 400 milliseconds gantry rotation time, a tube voltage of 120 kVp, and a tube current of 300 mAs. The arterial phase was scanned automatically when the contrast density in the descending aorta reached 120 HU, and the venous phase was scanned after an 80 second delay after the arterial phase.

Reconstructed three-dimensional volume-rendered images clearly demonstrated interruption of the ventricular wall and a large contrast containing lesion along the inferolateral wall of the left ventricle representing a ventricular pseudoaneurysm (Fig. 2). The short axis two-dimensional multiplanar reformat of the heart revealed an area of poor contrast enhancement over the inferolateral wall of the left ventricle on the venous phase (Fig. 3a, 3b), which was highly suspicious of myocardial infarction, which was followed by myocardial wall rupture and pseudoaneurysm formation.

Conventional coronary angiography showed total occlusion of the proximal segment of the left circumflex artery (LCX) with collaterals. Coronary intervention was not indicated. Several calcified plaque shadows along the lateral aspect of the right heart were seen representing calcified pericardium. The right coronary artery and left anterior descending artery were normal. Ventriculography was not performed due to fear of recurrent rupture. These findings support the diagnosis of LV pseudoaneurysm following myocardial infarction, due to LCX occlusion.

The patient underwent emergent cardiac surgery with successful repair of the pseudoaneurysm in the left ventricular free wall. The fibrous pericardium adherent to the aneurysmal wall was found at surgery. The myocardial-perforated defect (2 cm long) was repaired via endoventricular circular patch plasty. The section of pseudoaneurysm (about 6 x 4 x 3.5 cm in size) was removed and sent for histological examination. Histological result showed that the specimen consisted of fibrous wall with formation of fibrin thrombi. Postoperative echocardiography demonstrated no residual leak from the repair site. Five months after operation, the patient was well without any recurrent symptoms of chest pain.

**DISCUSSION**

Left ventricular (LV) pseudoaneurysms form when cardiac rupture is contained by adherent pericardium or scar tissue [1]. Thus, unlike a true LV aneurysm, a LV pseudoaneurysm contains no
endocardium or myocardium [1,2]. Pathologically, pseudoaneurysms are characterized by a small, narrow-necked channel that connects the ventricle to a larger aneurysmal sac, containing blood and thrombus, that is lined by fibrous pericardial tissue without any myocardial elements [4]. It has been reported that pseudoaneurysm of the left ventricle generally occurs after inferior myocardial infarction due to occlusion of the left circumflex artery [2, 4]. The prediction of inferior myocardial infarction, which results in LV pseudoaneurysm, is consistent with the location of pseudoaneurysms on the posterior, lateral apical, or inferior surface of the left ventricle, and not on the anterior surface [2, 4]. Anterior wall rupture tends to be characterized by a more acute hemodynamic effect and catastrophic outcome, whereas rupture of the inferior or posterior wall tends to be contained; this difference may explain the observed incidence [5].

The accepted explanation for the development of pseudoaneurysms after myocardial infarction is that the cardiac rupture is limited by pre-existing adhesions between the epicardium and the pericardium.

Various imaging methods have been used to diagnose pseudoaneurysm, including two-dimensional echocardiography, computed tomography, magnetic resonance imaging and left ventricular angiography. Angiographic findings that help distinguish false aneurysms include a narrow orifice leading into a saccular aneurysm and the lack of surrounding coronary arteries [7].

Echocardiography and left ventriculography are considered to be the best available diagnostic tests for left ventricular pseudoaneurysm [6]. Unfortunately, there is a small field of view on echocardiography and the technique is technician dependent. In addition, ventriculography is invasive and prone to repeated rupture.

During the past few years, evolving DMCT technology, with its improved spatial and temporal resolution, has enabled the acquisition of accurate anatomical and functional information concerning heart chamber, myocardium and pericardium [8-11]. The advantage of the 64-MDCT over MRI imaging is the higher spatial resolution, which enables accurate assessment of the coronary artery system [12].

In this patient, the formation of LV pseudoaneurysm was detected using 64-MDCT and echocardiography. The diagnosis of a pseudoaneurysm must be considered due to its serious complications. Echocardiography combined with color Doppler is a reliable tool for a rapid diagnosis. As compared with echocardiography, 64-MDCT allows a rapid noninvasive scan, with better spatial resolution and more accurate delineation of the size and shape of a pseudoaneurysm, and can render its three-dimensional

Figure 3. a. 64-MDCT 2D short-axis multiplanar reformation in arterial phase demonstrates the narrow neck (black arrow) of the pseudoaneurysm in the posterior wall of the left ventricle. RV = right ventricle. b. 64-MDCT 2D short-axis multiplanar reformation in venous phase demonstrates decreased enhancement of the posterior wall of the left ventricle (small black arrow) representing the myocardial infarction.
structure. In the present case, the pseudoaneurysm along the posterior wall of the left ventricle was clearly demonstrated by 64-MDCT, which also provided surrounding anatomic structure.

**CONCLUSION**

The LV pseudoaneurysm in this case developed after rupture of the infarcted myocardium when the rupture was slightly compressed by adhesions from the surrounding pericardium. 64-MDCT is a useful, noninvasive tool for the diagnosis of LV pseudoaneurysm. As soon as pseudoaneurysm is diagnosed, it should be surgically repaired to avoid secondary rupture.

**REFERENCES**

心肌梗塞後之左心室假性動脈瘤：64切電腦斷層的影像表現

廖瓊櫻¹  何上芸¹  夏建勳²  楊文義³  楊良友¹  李國維¹

彰化基督教醫院 影像醫學部¹  心臟內科²  心臟外科³

我們報告一例個案是心肌梗塞後伴隨著左心室假性動脈瘤。一位78歲男性表現心肌梗塞和心臟衰竭。64切電腦斷層和心臟超音波顯示心肌梗塞後導致後心壁破裂形成左心室假性動脈瘤。電腦斷層之多切面重組影像和三維立體重組影像可清楚呈現左心室假性動脈瘤之複雜結構。心臟電腦斷層檢查是一種很好用的非侵入性檢查工具來診斷心肌破裂。