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CASE REPORT

Myocardial Infarction with Ruptured Left Ventricle

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ABSTRACT

Myocardial rupture is one of the major complications of myocardial infarction. This report is of a patient with myocardial rupture complicating myocardial infarction. As well as reviewing the clinical details of myocardial rupture, the ability of contrast computed tomography scan to diagnose acute myocardial infarction is discussed.

Key Words: *Tomography, X-ray computed; Myocardial infarction; Ventricular rupture*

INTRODUCTION

Myocardial free wall rupture accounts for 8% to 17% of mortality after myocardial infarction.[1] This report is of a man who presented with sudden collapse, and was diagnosed to have myocardial infarction, complicated by ruptured free left ventricular wall, haemopericardium, and left haemothorax. Myocardial infarction can also be recognised by decreased contrast enhancement of myocardium. The potential use of contrast computed tomography (CT) scan for diagnosing acute myocardial infarction is discussed.

CASE REPORT

A 78-year-old man with a history of smoking and chronic obstructive airway disease presented in 2007 after sudden collapse while playing mahjong. He had a cardiac arrest during transportation to hospital and cardiopulmonary resuscitation was performed. He regained a pulse in the accident and emergency department and was intubated. Electrocardiogram (ECG) revealed sinus tachycardia, right bundle branch block, and ST depression at lead V1-6. Chest X-ray showed white-out of the left hemithorax. Left chest drain insertion yielded 1.6 L of fresh blood. Urgent bedside echocardiogram showed a thin rim of pericardial effusion and hypokinetic inferior wall. The patient underwent CT examination (without ECG-gating) in view of the haemothorax.

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CT of the thorax revealed left haemothorax and haemopericardium. Active contrast extravasation was noted at the inferoposterolateral wall of the left ventricle. There was also decreased enhancement at the inferoposterolateral wall of the left ventricle (Figures 1 and 2). The aorta was normal. A diagnosis of myocardial infarction complicated by rupture of the left ventricle was made. Cardiac enzyme blood results were: troponin I, 24.48 μg/mL (normal range, <0.6 μg/L); creatine kinase,

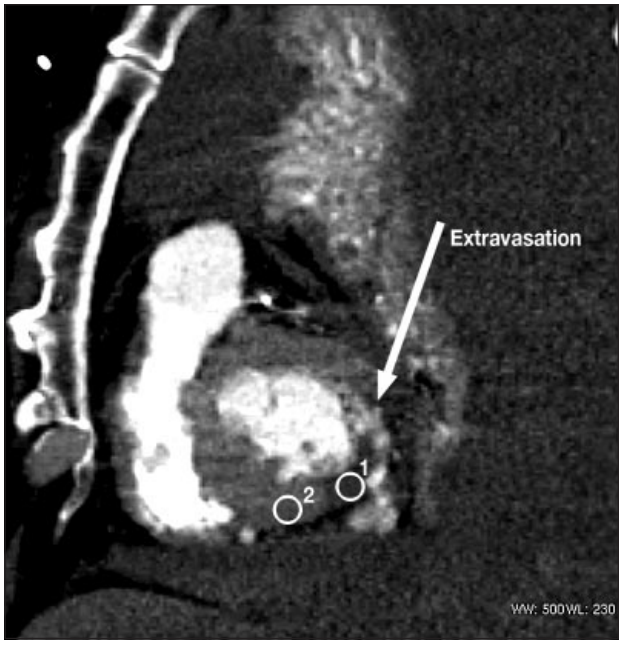

Figure 1. Computed tomography — left anterior oblique reconstructed image. Active contrast extravasation (arrow) is noted at the posterior wall of the left ventricle. Area 1 shows decreased enhancement (HU ~61.9), representing the area of myocardial infarction. Area 2 shows normal myocardial enhancement (HU ~120.0).

Figure 2. Computed tomography — coronal reconstructed image. Area 1 shows hypoenhancement in the left ventricular free wall (HU ~63.1), representing the area of myocardial infarction. Area 2 shows normal myocardial enhancement (HU ~100.8). Also note the contrast extravasation in the pericardial cavity, haemopericardium, and haemothorax.

156 U/L (normal range, 50-200 U/L); and lactate dehydrogenase, 304 U/L (normal range, 50-200 U/L).

The patient had a cardiac arrest soon after the CT examination, with a decrease in haemoglobin to 59 g/L (normal range, 140-175 g/L). Cardiopulmonary resuscitation was unsuccessful and the patient died.

DISCUSSION

Myocardial rupture may follow myocardial infarction, trauma, infection, primary or secondary cardiac tumour, infiltrative disease of the heart, and aortic dissection. The frequency of rupture of the left ventricular free wall or interventricular septum among fatal cases of acute myocardial infarction (AMI) ranges from 4% to 24%, with a mean of 8%.[2,3] Approximately 90% of the ruptures occur during the first 2 weeks after infarction, with 22% occurring in the first 24 hours.[3] The most common site of rupture is the mid-lateral left ventricular free wall (32%) and this is usually in the setting of an inferoposterolateral infarction related to acute circumflex artery occlusion.[4]

Myocardial rupture is 3 times more likely to occur during a first AMI than with healed infarcts.[2] Clinically, myocardial free wall rupture should be suspected in patients with recent AMI, who present with persistent or recurrent chest pain, haemodynamic instability, syncope, pericardial tamponade, or transient pulseless electrical activity. Urgent echocardiogram will show pericardial effusion or pericardial thrombus, together with other evidence of myocardial dysfunction. In up to 40% of patients, death occurs subacutely over hours instead of minutes after myocardial rupture.[1] Surgical exploration and myocardial repair is the definitive diagnostic and therapeutic procedure.

Diagnosis of AMI should be based on clinical presentation, ECG changes, and cardiac enzymes. Although ECG-gated CT is well established for assessing coronary artery stenosis in patients with stable angina, it is not routinely used to diagnose AMI.[5] Nevertheless, contrast CT of the thorax is commonly used to evaluate conditions such as pulmonary embolism and aortic dissection that present with similar symptoms to those of AMI. The potential ability of contrast CT scan to detect a clinically overlooked AMI should be considered. Studies have been conducted to evaluate the role of contrast CT in differentiating cardiac and non-cardiac causes of acute chest pain in emergency settings.[6,7] Many authors image the coronary arteries as well as paying attention to the enhancement pattern of the myocardium.[5-7] Further studies are necessary to identify CT features giving a high accuracy for diagnosing AMI.[5]

To date, only a few reports have been published concerning the detection of AMI by contrast CT scan. Described CT features of AMI include low density of infarcted myocardium on pre-contrast images and hypoenhancement or paradoxical hyperenhancement on post-contrast images.[5,8-12] These features usually correspond to the relevant coronary arterial distribution.[8,9] It has been proposed that hypoenhancement of infarcted myocardium may be due to occlusion of the corresponding coronary artery, while paradoxical hyperenhancement may be due to delayed wash-in and wash-out of contrast, loss of cell membrane integrity, and increased extracellular space because of interstitial oedema.[9] In addition, ECG-gated CT coronary angiogram helps to evaluate the status of the coronary arteries, which may be helpful to exclude significant coronary artery stenosis or occlusion in patients with inconclusive clinical and ECG findings.[5,6] To date, there is no major study evaluating which CT feature is most reliable for the diagnosis of AMI.

In conclusion, contrast CT scan can accurately detect myocardial rupture in AMI. CT scan also has the potential to diagnose AMI, which warrants further

investigation in future studies. More studies are necessary to evaluate the predictive values of different CT features of AMI and further trials may be warranted to assess the effectiveness of contrast CT scan for the diagnosis of AMI in emergency settings.

REFERENCES

1. Raitt MH, Kraft CD, Gardner CJ. Subacute ventricular free wall rupture complicating myocardial infarction. Am Heart J. 1993; 126:946-55.
2. Reddy SG, Robertos WC. Frequency of rupture of the left ventricular free wall or ventricular septum among necropsy cases of fatal acute myocardial infarction since the introduction of coronary care units. Am J Cardiol. 1989;63:906-11.
3. Lewis AJ, Burchell HB, Titus JL. Clinical and pathologic features of postinfarction cardiac rupture. Am J Cardiol. 1969; 23:43-53.
4. Oliva PB, Hammill SC, Edwards WD. Cardiac rupture, a clinically predictable complication of acute myocardial infarction: report of 70 cases with clinicopathologic correlation. J Am Coll Cardiol. 1993;22:720-6.
5. Hoffmann U, Pena AF, Cury RC. Cardiac CT in emergency department patients with acute chest pain. Radiographics. 2006; 26:963-80.
6. Johnson TR, Nikolaou K, Wintersperger BJ. ECG-gated 64-MDCT angiography in the differential diagnosis of acute chest pain. AJR Am J Roentgenol. 2007;188:76-82.
7. White CS, Kuo D, Kelemen M. Chest pain evaluation in the emergency department: can MDCT provide a comprehensive evaluation? AJR Am J Roentgenol. 2005;185:533-40.
8. Gosalia A, Haramati LB, Sheth MP. CT detection of acute myocardial infarction. AJR Am J Roentgenol. 2004;182: 1563-6.
9. Ko SM, Seo JB, Hong MK. Myocardial enhancement pattern in patients with acute myocardial infarction on two-phase contrast-enhanced ECG-gated multidetector-row computed tomography. Clin Radiol. 2006;61:417-22.
10. Godwin JD, van Moore A, Ideker RE. Prospective demonstration of myocardial infarction by CT. AJR Am J Roentgenol. 1984;143:985-6.
11. Paul J, Dambrin G, Caussin C. Sixteen-slice computed tomography after acute myocardial infarction: from perfusion defect to the culprit lesion. Circulation. 2003;108:373-4.
12. Hilfiker PR, Weishaupt D, Marincek B. Multislice spiral computed tomography of subacute myocardial infarction. Circulation. 2001;104:1083.