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CME Article

Electrocardiographical case. An elderly lady with chest pain

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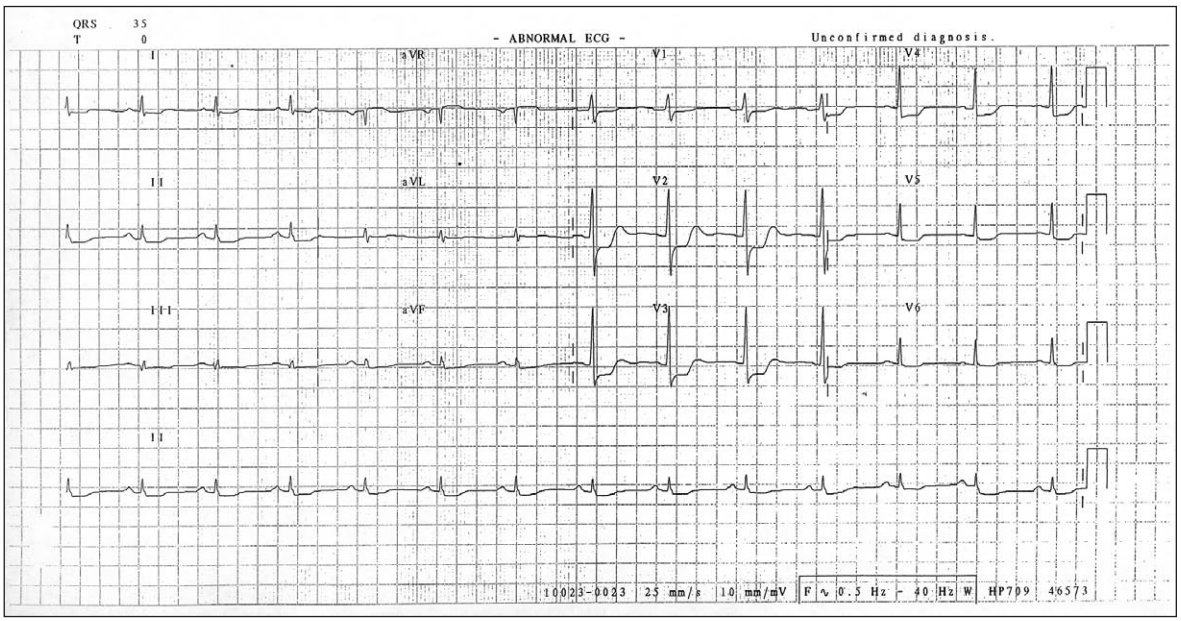

Fig. 1 12-lead ECG.

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CLINICAL PRESENTATION

A 72-year-old Chinese woman complained of intermittent chest pain for three days, which became severe and continuous four hours before presentation. This was associated with diaphoresis. Her cardiovascular risk factors were Type 2 diabetes mellitus for 30 years, hypertension for ten years, and dyslipidaemia. Her blood pressure was 148/74 mmHg, and pulse rate was 82/min. The rest of the examination was unremarkable. The electrocardiogram (ECG) done in the emergency room is shown (Fig. 1). What is the diagnosis?

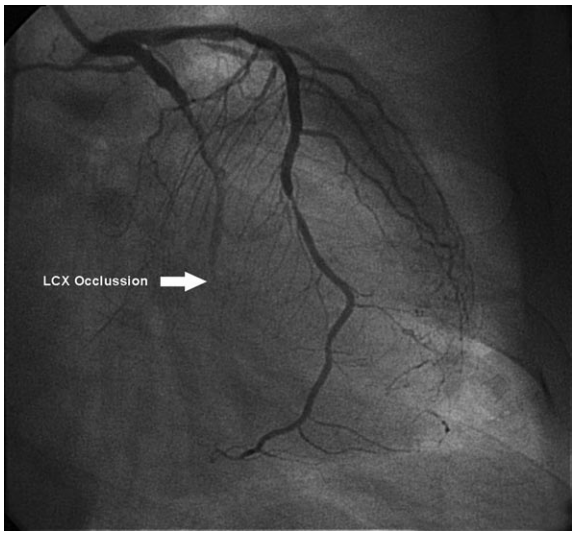

Fig. 2a Coronary angiogram (right anterior oblique view) shows LCX occlusion.

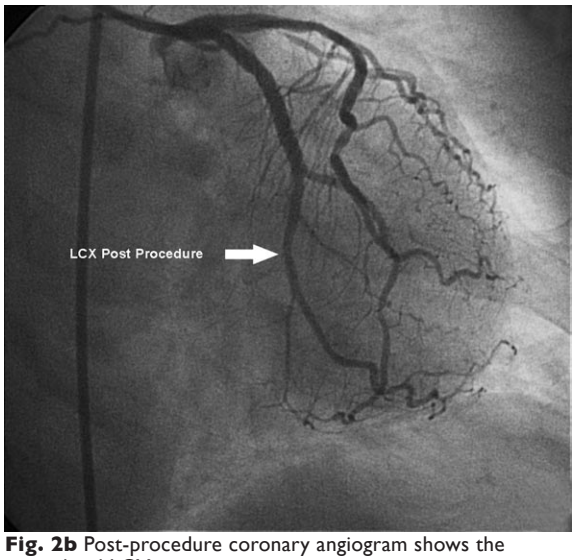

Fig. 2b Post-procedure coronary angiogram shows the recanalised LCX.

ECG INTERPRETATION

The ECG (Fig. 1) showed normal sinus rhythm, tall R waves in leads V1 and V2, R wave of 0.04s in V1 and V2, and marked ST segment depression in V1-4. The lateral and inferior leads did not demonstrate any ST elevation.

DIAGNOSIS

Isolated posterior myocardial infarct (MI).

CLINICAL COURSE

The patient was immediately taken to our cardiac catheterisation laboratory. Coronary angiogram showed a complete occlusion of the proximal left circumflex (LCX) artery – the infarct-related artery (IRA) (Fig. 2a). The left main artery was normal. There was a distal left anterior descending artery stenosis of 80%, a dominant right coronary artery with a 60-70% stenosis in the posterolateral branch. Primary stenting to the proximal LCX was performed. Balloon angioplasty was also done to the obtuse marginal branch of the LCX (Fig. 2b). A good final result with thrombolysis in myocardial infarction (TIMI) 3 flow was obtained with resolution of her chest pain.

DISCUSSION

Posterior MI occurs in the posterior or posterobasal left ventricular (LV) wall. An isolated or true posterior MI, as seen in our case, is rare, as it is usually associated with an inferior or lateral MI[1,2]. The incidence of true posterior MIs has been estimated at 3-4% of all patients with acute MI (AMI)[3].

The ECG of posterior MI as described by Schamroth[4] are: R wave of 0.04s in lead V1 or V2, upright T waves in contiguous right precordial leads, and in the acute phase, ST segment depression and an R/S ratio of ≥ 1 in leads V1 and V2. As the infarction evolves, the ST segment depression decreases and the upright T amplitude increases. It is helpful to turn the ECG upside down and look at it from the back. The changes in V1 and V2, which might be overlooked at first glance, will be seen as abnormal Q waves, ST segment elevation, and increased T wave inversion[2].

The most stringent criterion for posterior infarction, R wave duration ≥0.04s and R≥S in lead V1, showed a very high specificity (>99%), a high positive predictive value (91%), but a low sensitivity (36%). Predictably, the less stringent criterion, R wave duration ≥0.04s and R≥S in lead V2, exhibited a lower specificity (95%), a significantly lower positive predictive value (73%), but a better sensitivity (61%)[5]. However, R wave in V1 without R wave in V2 was extremely uncommon. The low sensitivity of prominent right precordial R waves was often due to vector shifts from anterior myocardial infarction or left ventricular hypertrophy[5].

The IRA in isolated posterior MIs has been found to be always due to LCX occlusion[6]. In another study, an abnormal R wave in V1 had a 96% specificity for LCX versus right coronary artery-related infarction, but a sensitivity of only 21%[7]. In addition, all patients with LCX artery-related infarct and an abnormal R wave in lead V1, had multivessel disease[7]. In spite of these, true posterior MIs are usually well-tolerated[1].

The conventional ECG, even with correct placement of the electrodes, may miss a true

posterior MI. ST segment elevation which occurs in only 48% of patients with LCX occlusion, compared to 71% in the RCA and 72% in the LAD[6]. Up to 38% of patients with LCX-related infarct had no significant ST segment changes on admission ECG[6].

The use of additional chest leads on the posterior thorax between the angle of the scapula and the vertebral column, at the level of the 5th intercostal space (leads V7-9), will increase the sensitivity through detection of Q waves[8]. In fact, some have questioned whether the conventional 1mm ST elevations in the posterior leads were appropriate. It has been found that the currently-used criterion of 1mm to detect ischaemia is inadequate to demonstrate ST segment elevation in the posterior leads during LCX occlusion. This only increased the sensitivity of detecting ischaemia from LCX occlusion from 49% on the standard 12-lead ECG to 58% in the 15-lead ECG (not statistically significant). However, when a new ischaemic criterion of 0.5mm was applied to the posterior leads, the sensitivity improved to 94% (statistically significant)[9]. Also, attention to a slurred ascending or descending limb or the R wave and presence of upright T wave in lead V1 enhances diagnostic criteria[10].

Possible mimics of ECG changes in a posterior MI include other causes of tall R waves in V1 – such as right ventricular hypertrophy, right bundle branch block, Wolf-Parkinson-White syndrome and normal variants – can be differentiated since they do not cause ST segment elevation or significant Q waves in leads V7-V9[11]. Ischaemia of the anterior wall of the LV also produces ST segment depression in leads V1-3 and this must be differentiated from posterior MI. This has a great impact on the treatment rendered, as emergent re-perfusion of LCX related posterior infarction without ST segment elevation is beneficial[12].

In conclusion, this is an interesting case of an isolated posterior MI, which is uncommon in clinical practice. It is imperative to interrogate possible concomitant involvement of the inferior and lateral wall of the LV, as well as the right ventricle[1]. Anterior wall ischaemia must also be differentiated from true posterior MI as it influences treatment modality.

ABSTRACT

An 72-year-old woman with diabetes mellitus, hypertension and dyslipidaemia presented with severe chest pain of four hours duration. Her electrocardiogram (ECG) showed tall R waves in leads V1-2, and ST segment depression in leads V1-4, consistent with an isolated posterior myocardial infarction (MI). Emergency coronary angiogram showed an occluded left circumflex coronary artery, and primary angioplasty and stenting was performed. The ECG criteria for isolated posterior MI and pitfalls in using the conventional 12-lead ECG are discussed.

Keywords: coronary artery, electrocardiogram, myocardial infarction, posterior myocardial infarct

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SINGAPORE MEDICAL COUNCIL CATEGORY 3B CME PROGRAMME
Multiple Choice Questions (Code SMJ 200602B)

	True	False
Question 1: The criteria for isolated posterior MI include:		
(a) R/S wave ratio ≥1 in leads V1 and V2.	❑	❑
(b) ST segment depression in leads V1 and V2.	❑	❑
(c) Inverted T wave in the right precordial leads.	❑	❑
(d) R wave of 0.04 sec in leads V1 and V2.	❑	❑
Question 2: The following statement is true of posterior MI:		
(a) Almost always due to left circumflex coronary artery occlusion.	❑	❑
(b) The conventional ECG has a very high diagnostic accuracy.	❑	❑
(c) Leads V7-9 are not useful to aid diagnosis.	❑	❑
(d) It affects the posterior or posterobasal wall of the left ventricle.	❑	❑
Question 3: Regarding posterior MI:		
(a) It usually occurs with an inferior MI.	❑	❑
(b) It usually occurs with a lateral MI.	❑	❑
(c) Isolated posterior MIs have an incidence of 10-15%.	❑	❑
(d) Most often not well tolerated by the patient.	❑	❑
Question 4: Causes of tall R waves on the ECG include:		
(a) Left ventricular hypertrophy.	❑	❑
(b) Right bundle branch block.	❑	❑
(c) Wolf-Parkinson-White syndrome.	❑	❑
(d) Normal variant.	❑	❑
Question 5: Regarding treatment for posterior MI:		
(a) Need to differentiate from anterior LV wall ischaemia as treatment differs.	❑	❑
(b) Thrombolysis can be given to all patients.	❑	❑
(c) Thrombolysis is contraindicated if no ST segment elevation is present.	❑	❑
(d) Primary angioplasty is an alternative treatment.	❑	❑

Doctor's particulars:

Name in full:_____

MCR number:_____ Specialty:_____

Email address:_____

Submission instructions:

A. Using this answer form

1. Photocopy this answer form.
2. Indicate your responses by marking the "True" or "False" box ☑
3. Fill in your professional particulars.
4. Post the answer form to the SMJ at 2 College Road, Singapore 169850.

B. Electronic submission

1. Log on at the SMJ website: URL <http://www.sma.org.sg/cme/smj> and select the appropriate set of questions.
2. Select your answers and provide your name, email address and MCR number. Click on "Submit answers" to submit.

Deadline for submission: (February 2006 SMJ 3B CME programme): 12 noon, 25 March 2006

Results:

1. Answers will be published in the SMJ April 2006 issue.
2. The MCR numbers of successful candidates will be posted online at http://www.sma.org.sg/cme/smj by 20 April 2006.
3. All online submissions will receive an automatic email acknowledgment.
4. Passing mark is 60%. No mark will be deducted for incorrect answers.
5. The SMJ editorial office will submit the list of successful candidates to the Singapore Medical Council.