

ECG Diagnosis: Isolated Posterior Wall Myocardial Infarction

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Acute posterior wall myocardial infarction (PMI) occurs in up to 20% of cases of acute myocardial infarction (MI), with the vast majority occurring along with inferior or lateral acute MI.¹ A true PMI is considered more rare, with an incidence of approximately 3.3%.² The term PMI is used for necrosis of the part of the left ventricle located beneath the atrioventricular sulcus.³ The majority of patients with the typical electrocardiogram (ECG) abnormalities of PMI have a stenosis or occlusion of the left circumflex coronary artery.⁴ The ECG diagnosis of PMI is difficult because no specific leads of the standard ECG directly represent this area.⁵ In addition, the lack of ST-segment elevation (as seen in typical ST-elevation MI) combined with misinterpreting the anterior ST-segment depressions as indicating ischemia rather than posterior infarction frequently lead to missing the diagnosis of PMI.

In PMI, there is loss of electrical forces in a dorsal direction, so the typical infarction pattern only appears in the electrodes placed dorsally between the spine and left scapula on the ECG. On the standard ECG of a true PMI, the leads V₁ and V₂ are a mirror image of the V₁ and V₂ leads of the anterior MI, resulting in ST-segment depression in leads V₁ and V₂ in PMI (Figure 1) rather than ST-segment elevation seen in acute anterior MI.⁵

The QRS complex on the vector cardiogram points ventrally during PMI because of losses of normally dorsally aimed electrical forces, resulting in a prolonged R wave. An increase in the R/S ratio > 1.0 can occur in leads V₁ and V₂ as a case of PMI evolves.^{3,5} The

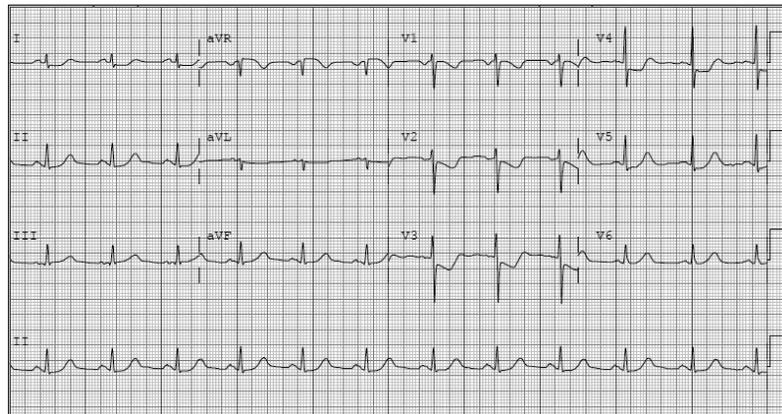


Figure 1. 12-lead electrocardiogram from a 71-year-old woman with multiple cardiac risk factors presenting to the Emergency Department with 90 minutes of chest discomfort. Figure demonstrates a normal sinus rhythm with deep ST-segment depressions in leads V₂-V₄. Findings are consistent with an acute posterior wall myocardial infarction.

increase of the R wave during PMI is the opposite to the Q wave associated with traditional ST-segment elevated MI. The ST segment points in the direction of the infarcted area, and ST-segment depression occurs in the precordial leads in the acute phase.³ The T wave points away from the infarcted area. As a result, a forward movement of the T wave can frequently be seen in patients with PMI. The combination of right precordial horizontal ST-segment depression with tall, upright T waves indicates an early ECG sign of acute ischemia of the posterior wall during a progressive PMI.⁶

The addition of posterior leads V₇ to V₉ significantly increases the ability to detect posterior injury patterns compared with the standard 12-lead ECG.^{5,7} Lead V₇ should be placed at the level of lead V₆ at the posterior axillary line, lead V₈ on the left side of the back at the tip of the scapula, and lead V₉ halfway

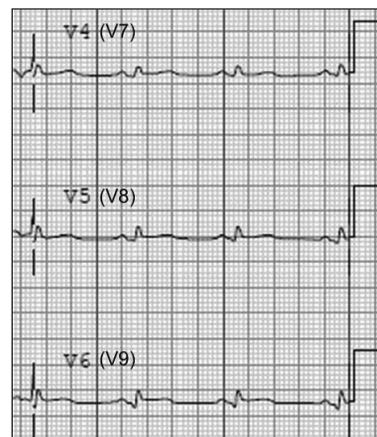


Figure 2. Posterior electrocardiogram leads V₇-V₉ from same patient, obtained shortly after the initial electrocardiogram (Figure 1). Figure 2 demonstrates 0.5 mm ST-segment elevation in leads V₈ and V₉, confirming the posterior wall myocardial infarction.

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between lead V_8 and the left paraspinal muscles. When using posterior leads to diagnose PMI, ST-segment elevation in leads V_7 through V_9 is defined as elevation of at least 0.5 mm in 2 or more of the leads (Figure 2), on the basis of the increased distance between the posterior chest wall and the heart.⁷ Posterior ECG leads greatly improve sensitivity and specificity when identifying patients with isolated PMI.⁷ ❖

Disclosure Statement

The author(s) have no conflicts of interest to disclose.

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