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Review Paper

The Role of 18-Lead ECG in Inferior and Posterior Wall Myocardial Infarction: A Review

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ABSTRACT:
Background: Inferior Wall Myocardial Infarction (IWMI) is often associated with Posterior Wall Myocardial Infarction (PWMI), which may be overlooked in a standard 12-lead electrocardiogram (ECG). An 18-lead ECG, which includes additional right-sided and posterior leads, improves diagnostic accuracy and facilitates early intervention. **Objective**: This review aims to evaluate the role of the 18-lead ECG in the detection and management of IWMI with PWMI, emphasizing its diagnostic advantages, limitations of the 12-lead ECG, and its impact on clinical decision-making. **Methods**: A systematic review of literature from databases including PubMed, Scopus, and Web of Science was conducted. Studies focusing on the diagnostic accuracy, prognostic value, and clinical outcomes of 18-lead ECG in acute myocardial infarction were included. **Results:** IWMI is characterized by ST-segment elevation in leads II, III, and aVF, with reciprocal depression in aVL. PWMI is often suggested by ST depression in V1–V3, tall R waves, and upright T waves, which can be misinterpreted as anterior ischemia. The addition of posterior leads (V7–V9) confirms ST elevation in PWMI, while right-sided leads (V3R–V5R) help diagnose right ventricular infarction (RVI). Studies demonstrate that using an 18-lead ECG significantly improves detection rates, leading to more timely reperfusion therapy and better patient outcomes. **Conclusion:** The 18-lead ECG is a valuable diagnostic tool that enhances the identification of posterior and right ventricular infarctions in IWMI patients. Its routine use can improve clinical decision-making and reduce misdiagnosis-related complications. Further large-scale studies are necessary to standardize its use in emergency and cardiology practice.

Keywords: Inferior Myocardial Infarction, Posterior Myocardial Infarction, 18-lead ECG, Right Ventricular Infarction, ST-segment Elevation, Electrocardiography

INTRODUCTION:

Inferior Wall Myocardial Infarction (IWMI) accounts for approximately 40–50% of all ST-elevation myocardial infarctions (STEMIs) [1]. It is primarily caused by occlusion of the right coronary artery (RCA) or, in some cases, the left circumflex artery (LCx) [2]. Posterior Wall Myocardial Infarction (PWMI) frequently accompanies IWMI due to the shared vascular supply but is often underdiagnosed on a standard 12-lead ECG [3].

The 18-lead ECG incorporates additional leads (V7–V9 for posterior wall detection and V3R–V5R for right ventricular involvement), improving diagnostic sensitivity and reducing the risk of missed myocardial infarctions [4]. This review explores the importance of 18-lead ECG in diagnosing IWMI with PWMI, its advantages over the traditional 12-lead ECG, and its clinical implications.

Electrocardiographic Features of IWMI and PWMI:

Inferior Wall Myocardial Infarction (IWMI):

IWMI is diagnosed by ST-segment elevation in leads II, III, and aVF [5]. Reciprocal ST depression in lead aVL is a key marker that aids in confirming the diagnosis [6]. Among inferior leads, lead III often exhibits the highest ST elevation, which is indicative of RCA occlusion [7]. In contrast, an LCx-related IWMI may show similar ST elevations in both leads II and III [8].

Posterior Wall Myocardial Infarction (PWMI):

PWMI is commonly missed in a standard 12-lead ECG since there are no direct posterior leads. Instead, it manifests as:

- Horizontal ST depression in V1–V3
- Tall, broad R waves (>30 ms) in V2–V3
- Upright T waves in V1–V3
- R/S ratio >1 in lead V2 [9]

These findings are a mirror image of ST elevation occurring in the posterior wall. The presence of these patterns should prompt clinicians to record additional posterior leads (V7–V9), where ST elevation >0.5 mm is diagnostic for PWMI [10].

Limitations of the Standard 12-Lead ECG:

A standard 12-lead ECG provides limited information about posterior and right ventricular infarctions [11]. One study found that up to 30% of IWMI cases had concomitant PWMI, which was missed in 12-lead ECG but identified using posterior leads [12]. Similarly, right ventricular infarction (RVI), a significant predictor of hemodynamic instability, is often undiagnosed without right-sided leads [13].

Advantages of the 18-Lead ECG:

Posterior Leads (V7–V9) for PWMI:

Studies demonstrate that adding leads V7–V9 increases the sensitivity for detecting PWMI from 50% (12-lead ECG) to nearly 94% [14]. This improves the identification of patients who may benefit from early reperfusion therapy [15].

Right-Sided Leads (V3R–V5R) for Right Ventricular Infarction:

Right-sided infarctions complicate 30–50% of IWMI cases and are associated with hypotension and high mortality. V3R–V5R leads detect ST elevation, aiding in early volume resuscitation and avoiding the use of nitrates, which can worsen hypotension in these patients.

Clinical Implications:

- Improved Diagnosis and Management: Early recognition of PWMI and RVI allows for tailored interventions, reducing in-hospital mortality .
- Guidance for Reperfusion Therapy: Timely detection of additional infarct zones influences treatment strategies, including primary PCI .
- Reduction of Misdiagnosis-Related Complications: Avoiding misinterpretation of PWMI as anterior ischemia can prevent unnecessary thrombolytic therapy in non-STEMI patients .

CONCLUSION:

The 18-lead ECG is a crucial tool for detecting posterior and right ventricular infarctions in IWMI patients. It significantly improves diagnostic accuracy, leading to better patient outcomes. Given its benefits, routine use in emergency and cardiology settings should be considered, and further large-scale trials are warranted to establish definitive guidelines.

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