



Acute Inferior ST-elevation Myocardial Infarction Arising from Wrap-Around Left Anterior Descending Artery Occlusion

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Abstract

p-ISSN: 2301-4369 e-ISSN: 2685-7898
<https://doi.org/10.36408/mhjcm.v11i2.1114>

Accepted: March 22th, 2024
Approved: July 02nd, 2024

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Background : Acute myocardial infarction (AMI) remains a leading cause to global morbidity and mortality. Inferior MI predominantly stems from the right coronary artery (RCA) in more than 80% of instances, the left circumflex coronary artery (LCx) in fewer than 20% of cases, and infrequently from the left anterior descending artery (LAD). This case report aims to highlight a rare occurrence of LAD occlusion initially manifested as inferior MI.

Case : A 56-year-old male presented with typical chest pain lasting for 6 hours. Vital signs were within normal range. Initial electrocardiogram (ECG) revealed ST-segment elevation in inferior leads (II, III, aVF). Laboratory tests indicated elevated troponin levels (>25ng/mL). Coronary angiography identified the culprit lesion as the LAD, which wrapped around the apex.

Discussion: While ECG alterations are valuable in identifying thrombosed vessels during AMI, the presence of simultaneous ST elevation in both inferior and anterior leads can hinder clinicians' ability to determine the specific artery affected by the infarction. Our case, depicting a scenario where both the right and left coronary arteries are co-dominant, showed complete occlusion at the mid-distal wrap-around LAD, resulting in ST-elevation observed in both inferior and anterior leads.

Conclusion : The existence of inferior ST-segment elevation alongside alterations in anterior leads could imply occlusion of the wrapped LAD.

Keywords : Inferior ST elevation; total occlusion, acute myocardial infarction; wrap around LAD

INTRODUCTION

Acute ST-segment elevation myocardial infarction (STEMI) stands as a predominant cause of global morbidity and mortality. This condition arises when coronary artery blockage triggers transmural myocardial ischemia, leading to myocardial necrosis or injury. The interplay of inflammation and instability of coronary atherosclerotic plaque contributes to thrombus formation, a hallmark of acute MI.¹

Inferior STEMI represents approximately 40 to 50% of all STEMI occurrences, boasting a relatively low mortality rate below 10%. However, the presence of complicating factors such as cardiogenic shock, cardiac arrhythmia, heart block, and right ventricular infarction can heighten morbidity and mortality. Inferior MI predominantly stems from the right coronary artery (RCA) in more than 80% of instances, the left circumflex coronary artery (LCx) in fewer than 20% of cases, and infrequently from the left anterior descending artery (LAD).^{2,3} We present a rare occurrence of LAD occlusion initially manifested as inferior MI.

CASE REPORT

A 56-year-old male was referred to our hospital with retrosternal chest pain radiating to both shoulders, accompanied by nausea and diaphoresis six hours before admission. He was an active smoker with a ten-year history of diabetes mellitus. Upon physical examination, his pulse was 68 beats/min, blood pressure 130/80 mmHg, and oxygen saturation 96% on room air. There were no signs of tachypnea, cardiac murmurs, abnormal breath sounds, or peripheral edema.

Initial electrocardiography (ECG) conducted one hour after symptom onset at the district hospital revealed ST-segment elevation in the inferior leads (II, III, aVF) and occasional premature ventricular complexes (PVCs). Subsequent ECG six hours post-onset depicted ST-segment elevation in both inferior and anterior leads (V2-V4) without evolution in inferior leads. Follow-up ECG at six hours post-onset revealed slight ST elevation in precordial leads (Figure 1).

Laboratory investigations demonstrated a high troponin level (>25 ng/mL), while complete blood count and metabolic panel tests were within normal range. Chest X-ray findings were unremarkable. Initial management in the emergency room comprised antiplatelet therapy and intravenous heparin before transfer to the catheterization laboratory, with a door-to-wire time of within 45 minutes.

Coronary angiogram revealed a normal left main artery, total occlusion (thrombus type) at the mid-distal LAD, proximal narrowing of 60–70% in the LCx artery, and 70% distal stenosis in the RCA (Figure 2). Primary percutaneous coronary intervention (PPCI) of the mid-distal LAD was performed using two drug-eluting stents, ensuring perfusion to the myocardial wall (Figure 3).

Follow-up ECG demonstrated Q-wave evolution and ST-T changes in anterior leads (V2-V4) without evolution in the inferior leads, consistent with LAD as the culprit lesion.

The patient received aspirin, ticagrelor, statins, beta-blockers, and ACE inhibitors. He remained in the coronary care unit for two days before discharge in good general condition, with scheduled outpatient follow-ups.

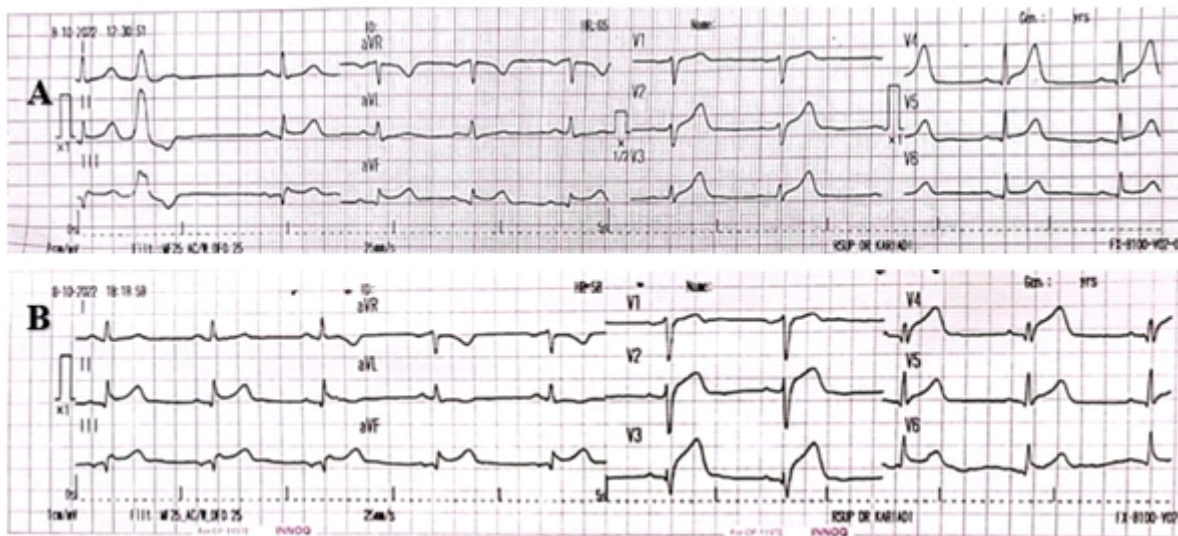


Figure 1. ECG at one hour onset showed ST-elevation in the inferior lead with occasional PVCs(A). Subsequent follow-up ECG at 6 hours after onset revealed ST elevation in the precordial leads (B).

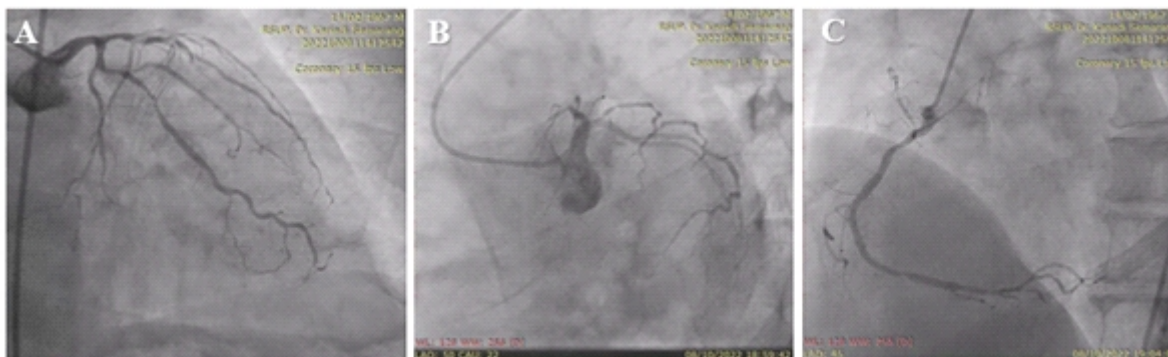


Figure 2. Coronary angiogram, showing a 60–70% stenosis at the proximal LCx (A), total occlusion at the mid-distal LAD (B), and a 70% stenosis at the distal RCA (C).

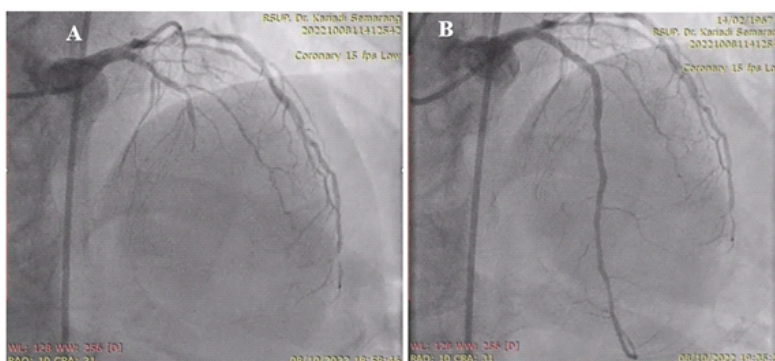


Figure 3. Total occlusion observed at the mid-distal LAD (A). Subsequent to PPCI intervention, a wrap-around LAD configuration was evident (B).

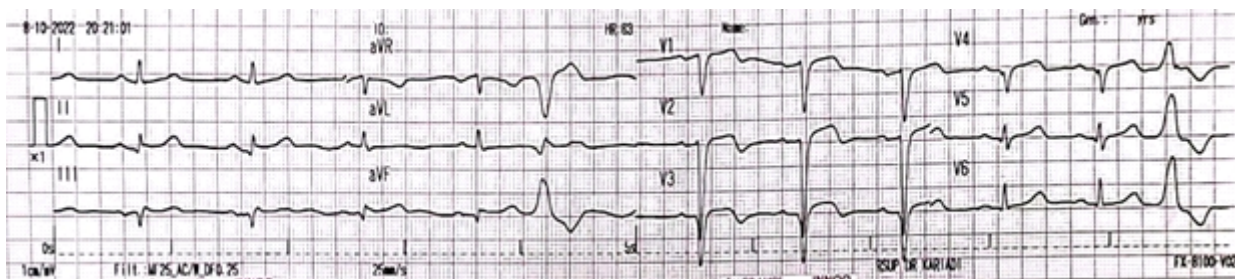


Figure 4. 12-lead ECG showed evolution in the precordial leads instead of the inferior lead after PPCI.

DISCUSSION

Twelve-lead ECG is pivotal in diagnosing patients experiencing acute myocardial infarction (AMI). In STEMI cases featuring ST-segment elevation in inferior leads (II, III, and aVF), analyzing ST elevation and depression across multiple leads aids in identifying the thrombosed artery (RCA or LCx) and even pinpointing the occlusion site. However, simultaneous presentation of ST elevation in both inferior and anterior leads on ECG can pose challenges in evaluating the true infarct-related artery.⁴⁻⁷

This scenario occurred in our patient, who presented with AMI displaying ST-segment elevation in both inferior and anterior leads concurrently. CAG revealed total occlusion solely in the LAD, which wrapped around the apex to supply both inferior and anterior myocardium a phenomenon known as a "wrap-around LAD".⁸

In cases of wrap-around LAD, anterior leads ST segment elevation is observed while remains iso-electric in the inferior leads if the occlusion is proximal to the diagonal branch (D1). However, if the occlusion is distal to D1, ST segment elevation may occur in both

anterior and inferior leads concurrently. Inferior only ST segment elevation on ECG, particularly in patients with dominant left coronary circulation, can be found when there's very distal LAD occlusion.⁹

Our case, illustrating a co-dominant right and left coronary artery with total occlusion at the mid-distal wrap-around LAD, underscores the potential for more extensive myocardial damage compared to non-wrap-around LAD occlusion. Consequently, immediate reperfusion is critical, and meticulous medication management and follow-up care are imperative, even post-discharge, to address potential heart failure complications.^{10,11}

CONCLUSION

The role of ECG for identification of the culprit occlusion site in inferior STEMI is crucial. It plays a vital role in determining the location of the culprit lesion in most instances, aiding appropriate lesion management.

Inferior ST-segment elevation in association along with changes in anterior lead may suggest wrapped LAD occlusion. Clinicians should carefully assess the underlying cause and swiftly treat the affected vessel.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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