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St-Segment Elevation In Lead Avr As A Marker Of Severe Coronary Artery Disease: A Case Report

Ait Kajate Oussama, A. Zbitou, A. Bouzerda, A. Khatouri
Avicenne Military Hospital, Marrakech, Morocco

Abstract
Background: *ST-segment elevation in lead aVR is a well-recognized electrocardiographic marker associated with significant coronary artery disease, particularly left main coronary artery (LMCA) stenosis or severe multivessel disease.*
Case presentation: *We report the case of a 65-year-old man, with poorly controlled type 2 diabetes and active smoking, admitted after 24 hours of chest pain. ECG revealed ST elevation in lead aVR with widespread ST depression. Echocardiography showed anterior wall hypokinesia (LVEF 45%). Coronary angiography demonstrated severe three-vessel disease. PCI with two drug-eluting stents was performed on the LAD and diagonal branch, with staged PCI planned for the remaining lesions. The hospital course was uneventful.*
Conclusion: *This case highlights the diagnostic and prognostic value of ST-segment elevation in aVR as a marker of severe coronary artery disease requiring urgent invasive management.*
Keywords: *ST-segment elevation, aVR, left main coronary artery disease, three-vessel disease, acute coronary syndrome, case report*

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I. Introduction

Electrocardiography (ECG) remains a cornerstone in the initial evaluation of acute coronary syndromes (ACS). Among the various patterns, ST-segment elevation in lead aVR has gained increasing attention as a marker of severe coronary artery disease, especially left main coronary artery (LMCA) involvement or three-vessel disease. Its recognition can guide urgent risk stratification and management strategies.

We present a case illustrating how ST elevation in aVR, associated with diffuse ST depression, reflected severe multivessel coronary artery disease requiring prompt intervention.

II. Case Presentation

A 65-year-old man, with poorly controlled type 2 diabetes mellitus and an active smoking history, without prior medical or surgical conditions, was admitted 24 hours after the onset of infarct-like chest pain.

On examination, vital signs and clinical findings were unremarkable. ECG demonstrated ST-segment elevation in lead aVR and widespread ST-segment depression affecting inferior, septal, apical, and lateral leads (Figure1). Echocardiography revealed anterior wall hypokinesia with a left ventricular ejection fraction of 45%. Cardiac troponin was elevated.

Coronary angiography showed severe three-vessel disease: two significant stenoses of the ostial and proximal–mid LAD and the first diagonal branch, a critical stenosis of the first obtuse marginal branch (Figure 2), and a tight stenosis of the mid-right coronary artery (Figure 3).

PCI was performed with implantation of two drug-eluting stents in the LAD and diagonal branch, yielding an excellent final angiographic result (Figure 4). Staged PCI of the remaining lesions was planned one month later. The patient had a favorable in-hospital outcome.

III. Discussion

ST-segment elevation in lead aVR, particularly when associated with widespread ST-segment depression, is a powerful electrocardiographic marker of severe ischemia. Unlike classical ST-elevation myocardial infarction (STEMI), where localized ST elevation points to an occluded coronary artery, the pattern of diffuse ST depression with reciprocal elevation in aVR reflects global subendocardial ischemia due to critical reduction in coronary perfusion. This is most commonly observed in the setting of left main coronary artery (LMCA) stenosis, proximal left anterior descending artery (LAD) obstruction, or severe three-vessel coronary artery disease [1,2].

The pathophysiology of this finding is related to the resultant vector of ischemic injury currents. In diffuse subendocardial ischemia, the ST depression vector points away from the left lateral wall (toward leads II, V4–V6), while the reciprocal positive deflection is directed toward lead aVR, which faces the right upper side of the heart [3]. Consequently, ST elevation in aVR is not an isolated abnormality, but rather a mirror of diffuse ischemic burden.

Several studies have validated the clinical and prognostic significance of this pattern. Yamaji et al. demonstrated that ≥1 mm ST elevation in aVR, greater than that in V1, was a strong predictor of LMCA disease or triple-vessel disease, with a specificity approaching 95% [4]. Similarly, Taglieri et al. found that patients with non-ST-elevation ACS and ST elevation in aVR had higher rates of LMCA involvement and worse short-term outcomes [5]. These observations underscore the importance of aVR, a lead often overlooked in daily practice.

From a prognostic standpoint, ST elevation in aVR has been consistently associated with increased in-hospital mortality, arrhythmic complications, and need for urgent revascularization [6,7]. Wong et al. further emphasized its prognostic role in ST-elevation myocardial infarction (STEMI), showing that patients with concurrent ST elevation in aVR experienced larger infarct size and poorer outcomes [8].

Our patient illustrates the clinical relevance of this pattern. Despite the absence of hemodynamic compromise and normal physical examination, the ECG raised suspicion for severe underlying coronary disease, later confirmed as three-vessel disease on coronary angiography. Early recognition of this high-risk ECG feature justified urgent invasive evaluation and prompt revascularization, which was performed successfully. Staged PCI was planned for residual lesions, highlighting a strategy of complete revascularization in multivessel disease, known to improve prognosis compared to culprit-only intervention in selected patients [9].

This case reinforces two key clinical lessons:

1. **Lead aVR should not be ignored** – its abnormalities can serve as a red flag for high-risk coronary anatomy.
2. **Early invasive strategy is warranted** – patients with ST elevation in aVR and diffuse ST depression benefit from urgent coronary angiography, as the likelihood of LMCA or three-vessel disease is high.

IV. Conclusion

ST-segment elevation in lead aVR is an important but often overlooked ECG finding. It is strongly associated with LMCA or severe three-vessel disease, conditions that carry high mortality if not promptly managed. Early recognition of this pattern should alert clinicians to the need for urgent invasive evaluation and revascularization.

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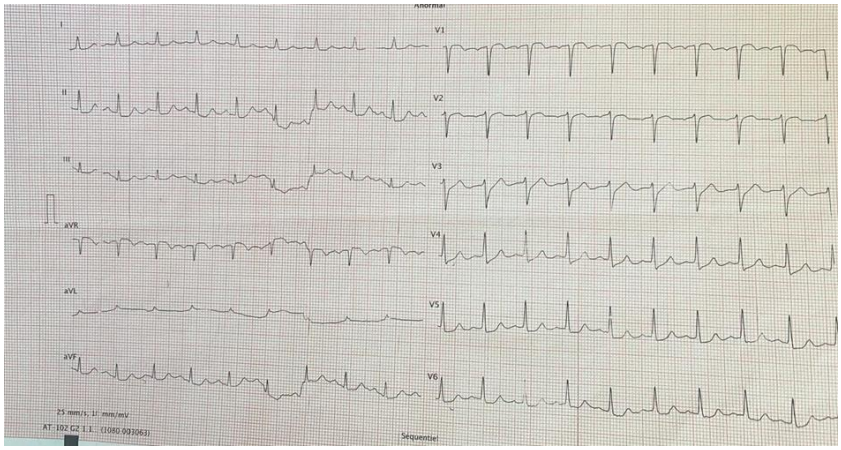

Figure1: ECG demonstrated ST-segment elevation in lead aVR and widespread ST-segment depression affecting inferior, septal, apical, and lateral leads

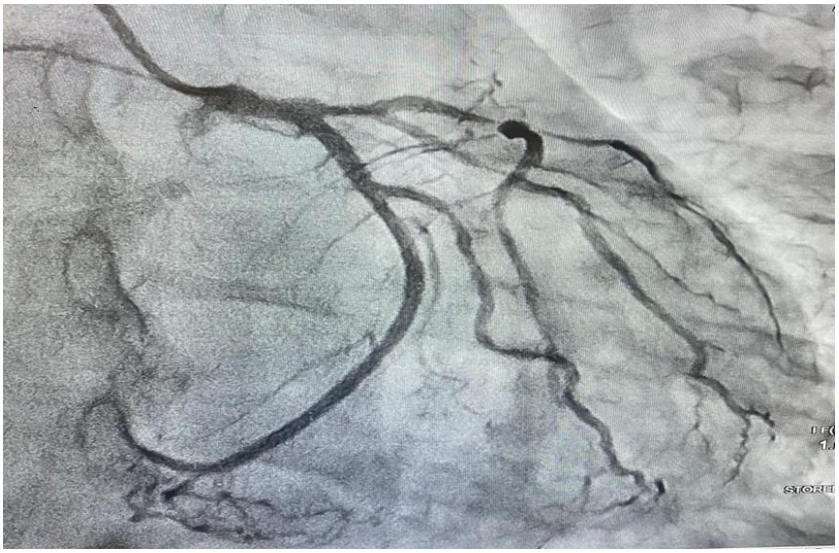

Figure2: The right anterior oblique (RAO) caudal projection revealed an ostial and proximal–mid stenosis of the left anterior descending artery (LAD), a severe stenosis of the diagonal branch, and a critical stenosis of the obtuse marginal branch.

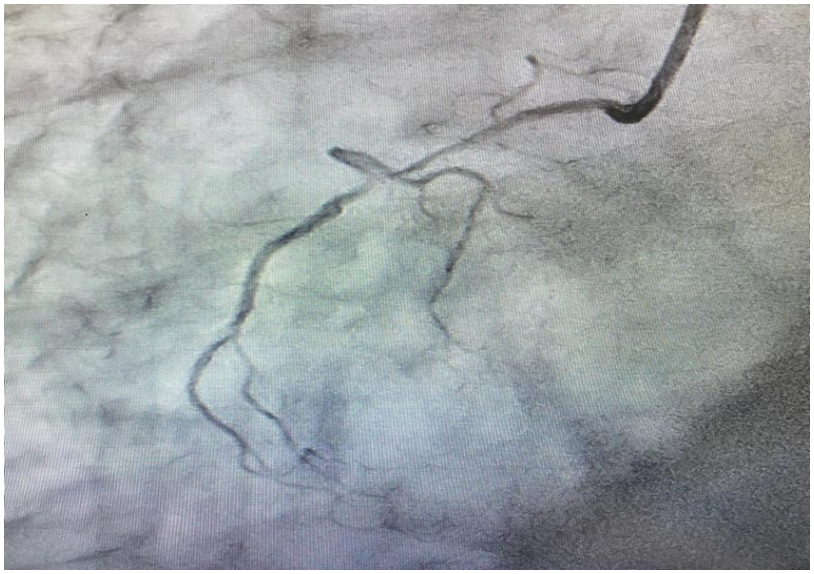

Figure3: The left anterior oblique (LAO) projection demonstrated a critical stenosis of the mid-right coronary artery (RCA).

Figure4: implantation of two drug-eluting stents in the LAD and diagonal branch, yielding an excellent final angiographic result.