

## CASE REPORT

# DIAGNOSTIC AND THERAPEUTIC IMPLICATIONS OF ST-SEGMENT ELEVATION IN LEAD aVR OF 12 LEAD ECG DURING CHEST PAIN

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'aVR' is usually not the preferred lead to diagnose myocardial infarction in clinical settings, it is rather a neglected lead in this context. We describe the case of a 44 year old male who presented with short duration chest pain and ST segment elevation in lead 'aVR'. His left heart catheterization showed left main stem equivalent disease and totally occluded right coronary artery. Patient underwent emergency coronary artery bypass-grafting with favorable outcome. This case highlights the significance of ST segment elevation in lead aVR during chest pain both in diagnosis and management of patients with acute coronary syndrome.

**Keywords:** ST segment elevation, aVR, left main stem occlusion.

## INTRODUCTION

ECG is a simple, cheap and easily accessible diagnostic tool for the diagnosis of myocardial ischemia in clinical use since 1920's. 'ST' segment deviation towards the involved myocardium has become the standard indication of the acute coronary thrombosis of threatened myocardium. 'aVR' is an augmented limb lead in which the exploring electrode (positive terminal) is attached to right arm. It faces the heart from right shoulder. As it is oriented to the cavity of the heart, both atrial and ventricular vectors are directed away from it, hence all the deflections including P, QRS and T deflections are normally negative in this lead.<sup>1</sup>

So far aVR has had very limited utility in the diagnosis of myocardial infarction. Lately, studies have provided an insight to the importance of lead aVR in the resting ECG recorded during chest pain. A characteristic pattern: ST segment depression in lead I, II and V<sub>4-6</sub> and elevation in aVR has been shown to be of value in identifying high risk patients with three vessel or left main coronary artery disease.<sup>2,3</sup>

Further refinement in this criteria has been made by the finding of lead aVR ST segment elevation greater than or equal to lead V<sub>1</sub>, distinguished left main coronary artery group from left anterior descending group with 81% sensitivity and 80% specificity and 81% accuracy.<sup>4</sup> Recently Barrabes et al. have also shown that lead aVR in patients with a first non-ST segment elevation carries important short term prognostic information.<sup>5</sup>

We present case of a patient with ST segment elevation in lead aVR highlighting the importance of this electrocardiographic sign in the management of acute coronary syndrome especially in cardiac care setup of Pakistan.

## CASE REPORT

A 44 years old male was shifted from a local hospital to our emergency room with 30 minutes duration of sudden, severe crushing left sided chest pain radiating to right arm. Risk factors included history of heavy smoking. In previous hospital he was treated with O<sub>2</sub>, low molecular weight heparin, aspirin, beta blockers and nitrates. Upon arrival he was hemodynamically stable and clinical examination was unremarkable.

He was accompanied by an ECG done at previous hospital that showed ST segment elevation of 3mm in aVR and 1.5mm in lead V<sub>1</sub>, ST segment depressions of 2-4 mm in leads I,II, aVL, aVF, V<sub>3-6</sub> (Fig-1).

Keeping in view the ominous nature of ECG changes that have been found to be a highly specific and sensitive predictor for left main coronary artery obstruction, the patient was immediately shifted to cardiac catheterization laboratory. Left heart catheterization showed normal left main coronary artery. Left anterior descending artery was completely occluded with collaterals from distal Right Coronary Artery (RCA), left circumflex artery showed 95% proximal stenosis with 80% Obtuse Marginal (OM) stenosis (Fig-2). Right coronary artery was dominant with proximal total occlusion. Distal vessel filled via left circumflex collaterals (Fig-3). Left ventriculogram showed severe anterolateral and inferior hypokinesia with an ejection fraction of 25-30%. In summary, the patient had total RCA occlusion and critical proximal disease in both left anterior descending and circumflex arteries making it left main stem equivalent disease. Patient underwent emergency coronary artery bypass-grafting (CABG). Five grafts were placed, left internal mammary artery graft to left anterior descending artery and Saphenous vein grafts to posterior descending artery, first and second OM, and Diagonal artery. Patient made an uneventful post operative recovery and was discharged after 5 days.

**Figure-1: 12 lead ECG showing ST segment elevation of 3mm in aVR, 1.5mm in lead V<sub>1</sub> and ST segment depressions of 2-4 mm in leads I, II, aVL, aVF, V<sub>3-6</sub>. Bottom strip showing magnified view of aVR.**

**Figure-2: Angiographic still frame showing total occlusion of left anterior descending artery, left circumflex artery showing 95% proximal stenosis and 80% stenosis of obtuse marginal**

**Figure-3: Angiographic still frame showing proximal total occlusion of right coronary artery with distal vessel being filled via left system**

**DISCUSSION**

Besides the diagnostic utility of ST segment elevation in lead aVR during chest pain, this case also highlights some other important issues in the management of patients with acute coronary syndrome. Although the patient's ECG showed signs of severe disease but did not have ST elevations in two contiguous leads. Hence the patient did not fulfill the criteria for pharmacological thrombolysis as described in the standard guidelines for management of acute ST elevation myocardial infarction<sup>6</sup>. So according to the guidelines this patient will be treated in the line of non-ST elevation myocardial infarction (NSTEMI). One of the important anti-platelet medications used in this scenario is clopidogrel. As these patient need urgent coronary angiography and CABG, withholding clopidogrel will be the best option, as its use is associated with the complication of excessive bleeding in CABG and this point has been highlighted by Rajdeep et al in a recent paper.<sup>7</sup>

Finally these findings have major implications in countries like Pakistan where there are limited cardiology centers with coronary artery by-pass grafting facilities and therefore prompt recognition and proper triage is the only hope for these, seriously ill patients.

## CONCLUSION

The electrocardiographic sign of ST segment elevation in aVR in 12 lead ECG in patients with acute coronary syndrome can be used as a marker to prompt early invasive approach and to withhold clopidogrel therapy particularly in anticipation of CABG surgery.

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