

ST Elevation in Lead aVR and Its Association with Clinical Outcomes

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ABSTRAK

Laporan kasus ini bertujuan menilai peran ST elevasi di lead aVR dan manifestasi perbedaannya diantara dua kasus. Ada beberapa tanda elektrokardiogram (EKG) yang tidak khas yang membutuhkan manajemen segera pada pasien dengan manifestasi klinis iskemia seperti elevasi ST di sadapan aVR. Pada laporan ini kami, menyajikan seorang wanita, 68 tahun mengalami sesak napas dan tidak nyaman di dada, dan diagnosis syok kardiogenik dan edema paru, elevasi ST di anterior luas dan sadapan aVR, dan oklusi left artery descendent (LAD) dan left circumflex artery (LCX) dengan killip 4 dan skor thrombolysis in myocardial infarction (TIMI) 8. Kasus kedua, seorang pria, 57 tahun mengeluh nyeri dada khas saat istirahat, 2 jam sebelum ke RS. Tidak hilang dengan nitrat. elevasi ST di sadapan inferior dan aVR, dan oklusi di LCX. Kedua pasien dilakukan primary percutaneous coronary intervention (PPCI) dan mengalami perbaikan kondisi serta perbaikan ST elevation in Myocardial infarction (STEMI) di sadapan aVR.

Kata kunci: elevasi ST, aVR, PPCI, oklusi arteri koroner.

ABSTRACT

The purpose of this case reports are to evaluate the role of ST elevation in aVR lead and to make analysis between both cases. There are some atypical electrocardiogram (ECG) presentations which need prompt management in patient with ischemic clinical manifestation such as ST elevation in aVR lead. In this case study, we report a 68-year old woman with chief symptoms of shortness of breath and chest discomfort. She was diagnosed with cardiogenic shock, with Killip class IV, and TIMI score of 8. The second case is a 57-year-old man with typical chest pain at rest which could not be relieved with nitrate treatment. He was diagnosed with ST elevation in inferior and aVR lead, and occlusion in left circumflex artery (LCX). Both patients underwent primary percutaneous coronary intervention (PPCI). Subsequently, both cases presented remarkable clinical improvements and improved ST elevation myocardial infarction (STEMI) in aVR lead.

Keywords: ST elevation, aVR, PPCI, occlusion coronary artery.

INTRODUCTION

Electrocardiography (ECG) remains one of the most valuable diagnostic and prognostic tools that can be used by clinicians for evaluating patients with angina at rest.¹ Precordial leads and

limb leads (e.g. I, II, III, aVF and aVR) have been known as reliable diagnostic tools for evaluating any cardiac impairment; however, changes in lead aVR as well as its interpretation in patients with acute coronary syndrome (ACS) has not

been extensively studied and the issue currently has become the subject of investigations in numerous clinical studies.^{2,3}

The augmented vector right (aVR) lead enables assessment of cardiac electrical activity in the right superior part of the heart.²⁻⁴ ST elevation in lead aVR can be accompanied by ST segment depression in leads I, II, and V4-V6. It indicates that there is a possibility of significant left main coronary artery stenosis (LMCAS) or three-vessel diseases, which has been reported in some literatures.²⁻⁵

CASE ILLUSTRATION

Case 1

A 68-year-old woman came to our hospital with a sudden onset of shortness of breath and chest discomfort since two hours before admission. She also felt dyspnea on exertion since one month ago. She had two risk factors for heart disease, i.e. the uncontrolled hypertension and diabetes. On admission, she suffered cardiogenic shock and lung edema. The ECG revealed extensive ST elevations in anterior part and lead aVR; while the coronary angiography demonstrated occlusions of the left artery descendens (LAD) and left circumflex artery (LCX).

Case 2

A 57-year-old man complained a typical chest pain at rest since two hours before his

admission. The pain could not be relieved by nitrate medications. He had some risk factors for heart disease including hypertension, diabetes, smoking, obesity and family history of coronary heart disease. On ECG examination, he had ST

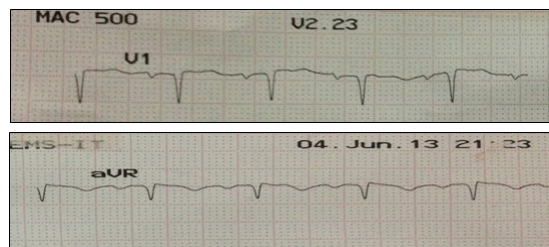


Figure 1. ST elevation (STE) morphology in AVR > V1 leads. These pictures were obtained before intervention procedure in the first patient.

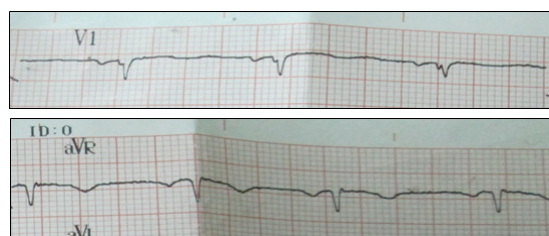


Figure 2. ST elevation (STE) morphology in AVR is the same as in V1 leads. These pictures were obtained before intervention procedure in the second patient.

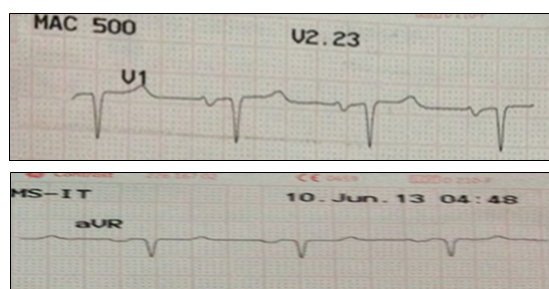


Figure 3. ST elevation (STE) morphology in AVR > V1 leads. These pictures (ECG) were obtained after PTCA intervention in the first patient.

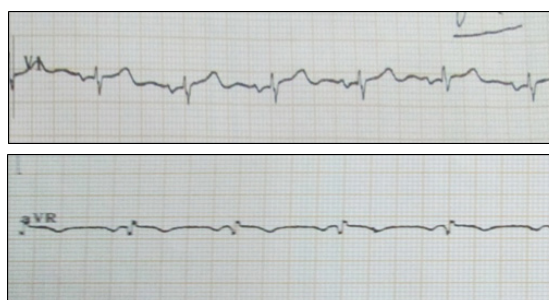


Figure 4. ST elevation (STE) morphology in AVR is equal with V1 leads. These pictures of ECG were obtained after PTCA intervention in the second patient.

Table 1. The clinical manifestation and PTCA interpretation of cases

	First case	Second case
Clinical Manifestation	Sudden onset of dyspnea, cardiogenic shock with Killip Class IV and the patient was intubated Obvious ST Elevation in anterior lead	Typical chest pain, Killip I and stable. Suspicious ST elevation in inferior and right leads
Interpretation percutaneous transluminal coronary angioplasty (PTCA)	ST elevation in lead aVR > V1 Acute on chronic disease in LAD and LCX Less support from RCA	ST elevation in aVR = V1 Chronic disease in LAD (chronic total occlusion/ CTO) Enough support from RCA

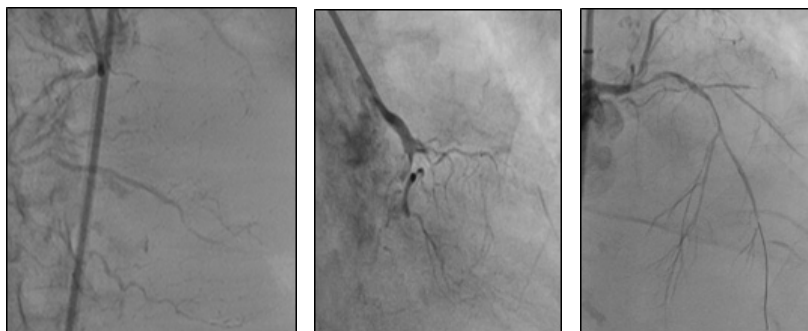


Figure 5. In the left and middle pictures acute on chronic disease in left artery descending (LAD) and left circumflex artery (LCX) are seen. In the right picture reduce supply by right coronary artery (RCA) is seen. These pictures were observed during PTCA intervention in the first patient.



Figure 6. In the left and middle pictures chronic disease (Chronic total occlusion/ CTO) in left artery descending (LAD) can be seen. In the right picture, we can see better supply by right coronary artery (RCA). These pictures were observed during PTCA intervention in the second patient.

elevation in inferior and aVR leads; whereas his coronary angiography showed occlusion of the LCX. Patients in both cases received PPCI treatment.

DISCUSSION

ST elevation in lead aVR appeared in both cases. It could be used to determine the severity of onset, particularly in the first case. The patient presented in Case 1 had a morphology of ST elevation in lead aVR, which was wider than that of V1 lead; while the patient in the second case, who had worse onset than the first patient, demonstrated a different morphology of ST elevation, which seemed similar in both aVR and V1 leads.

The percutaneous coronary angiography in Case 1 revealed that there was arterial stenosis of LAD and LCX, which indicates that the patient's coronary circulation was less supported by the right coronary artery (RCA). On the contrary, the

angiography of the second case showed different characteristics including that the stenosis was only found in LAD and therefore, there was adequate support of coronary circulation provided by the RCA.

Considering the morphology of ST elevation in both cases, we can say that ST elevation which appears in lead aVR should rise our awareness on the occurrence of stenosis or obstructed coronary artery.¹⁻⁵ Moreover, it can also be used to determine the severity of coronary impairment and prognosis of the patients. However, further studies need to be done to confirm the definitive correlation.

CONCLUSION

We conclude that ST elevation, which appears in lead aVR of an electrocardiogram, is a very important clue for a probable occurrence of left main (LM) equivalent coronary artery lesions. It may also show greater severity of

ischemic area since successful revascularization treatment can improve ST elevation in lead aVR.

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