ejpmr, 2021,8(1), 55-60

SJIF Impact Factor 6.222

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

Case Study

ISSN 2394-3211

EJPMR

ATYPICAL CASE OF UNSTABLE ANGINA WITH CLASSIC ELECTROCARDIOGRAM PRESENTATION OF LEFT MAIN CORONARY ARTERY DISEASE: A CASE REPORT AND A LITERATURE REVIEW

Merina Shrestha[1], Zhiquan Wang[1]* and Bigesh Man Shakya[2]

[1]Department of Cardiology of Zhongnan Hospital of Wuhan University, Wuhan 430071, Hubei, China.
[2]Department of ENT of RenMin Hospital of Wuhan University, Wuhan, 430060, Hubei, China.

***Corresponding Author: Zhiquan Wang**

Department of Cardiology of Zhongnan Hospital of Wuhan University, Wuhan 430071, Hubei, China.

Article Received on 05/11/2020 **Article Revised on 25/11/2020** **Article Accepted on 15/12/2020**

ABSTRACT

Non ST-Segment Elevation Acute Coronary Syndrome (NSTE ACS) patients with left main disease exhibit high risk of short and long term poor cardiovascular events. As compared to the clear indication for an emergent coronary angiography in ST-Segment Elevation Myocardial Infarction (STEMI) population, in NSTE ACS patients there is yet an unsureness with respect to favorable angiography timing. Due to acute Left Main Coronary Artery (LMCA) occlusion, severe hemodynamic instability commonly occurs leading to bad prognosis. Diagnosing the severity of coronary artery disease on presentation in NSTE ACS patients is helpful in guiding the treatment regarding the planning of coronary angiogram and revascularization. Therefore, the main aim of this case report is to support the previous evidence for predicting Left Main disease on the basis of classic Electrocardiogram (ECG) presentation with ST elevation in Lead aVR and favorable outcome achieved after timely done management with coronary angiography and Percutaneous Coronary Intervention in atypical Unstable Angina patients with normal lipid profile and cardiac markers.

KEYWORDS: Unstable angina, left main disease, electrocardiogram, cardiac markers.

INTRODUCTION

Cardiovascular diseases are the leading cause of death in the modern world. Among all subtype of cardiovascular diseases, Acute Coronary Syndrome (ACS) has the highest incidence and associated with a very high risk of mortality and morbidity.[1] ACS can be divided into three categories: 1) ST-Segment Elevation Myocardial Infarction (STEMI); 2) Non ST-Segment Elevation Myocardial Infarction (NSTEMI); 3) Unstable Angina (UA). Partial or intermittent obstruction of coronary artery cause UA and NSTEMI and complete obstruction of coronary artery cause STEMI.[2]

Yearly, around 6 to 7 million patient present with chest pain in United States, out of which 45 % are admitted in chest pain unit. Approximately 20% to 25% of those are diagnosed with ACS, among which about 1.1 million patients were hospitalized for NSTEMI as compared to 300,000 patients with acute STEMI and 750,000 patients with UA.[3,4] ACS has become the leading cause of death in the Asia Pacific region, which contain 60% of the global population.[5] The ratio of patients with UA and NSTEMI to those STEMI in China is 3 to 1.[6]

In the general population, coronary artery disease (coronary artery stenosis> 50%) has a 6% prevalence rate and is a major cause of morbidity.[7] Clinically significant left main coronary artery disease (LMCAD), defined as luminal narrowing of 50% or more, is seen in 5 to 7% of patients undergoing coronary angiography without a history of coronary surgery for an ischemic evaluation and is a potentially fatal condition if not promptly identified and treated.[7] It is estimated that 80% of patients with LMCAD have 2- or 3-vessel disease (VeD) with right Coronary Artery Disease involvement in 50% and at least 1 total occlusion in 50% of the patient.[8] The current guidelines suggests that LMCAD will possibly benefit from coronary angiography and revascularization.[9]

The electrocardiogram (ECG) is a rapid and noninvasive diagnostic method, which exerts a critical role in the assessment of early risk stratification. In acute left main artery occlusion, the classic ECG pattern is of wide spread horizontal ST- segment depression, which is most prominent in leads I, II, and V4–V6, ST- segment elevation in lead aVR $\geq$ 1 mm, and ST- segment elevation in lead aVR that is equal to or greater than the elevation in lead V1.[10] However, this must be viewed in other electrocardiographic leads and combined with clinical practice to make a correct differential diagnosis. STE in lead aVR may be seen in the following situation, such as aortic dissection involving left main coronary artery, acute pulmonary embolism, acute pericarditis,

critical aortic stenosis, Brugada syndrome in higher-risk patients, tricyclic antidepressants toxicity, Takotsubo syndrome and the total proximal occlusion of the left anterior descending artery (LAD). STE in lead aVR is also helpful to evaluate atrioventricular re-entry tachycardia, the origin of focal atrial tachycardia and differentiation of wide QRS complex tachycardia.[11,12]

The patient with NSTE ACS has a variable severity and prognosis. Early stratification of the patient is very important in reducing the incidence of sudden death and adverse events. Left main coronary artery (LMCA) is one of the major prognostic factor. A number of studies have shown that the STE in lead aVR had a great significance on the prediction of vascular anticipation and clinical prognosis in patients with acute myocardial infarction.[10,13] Atie found that most patients with LMCA lesions would appear to have ST-segment elevation (STE) in lead V1 and aVR and ST-segment depression in lead V3, V4 and V5 (especially in lead V4) when chest pain occurs.[14] Even though it is commonly found that STE in lead aVR suggested severe left main lesion or serious multi vessel lesions, but the results were not consistent among different studies. Morris found from review of 12 best evidence articles that in patient with ACS, STE in lead aVR can accurately identify acute myocardial infarction, cause by LMCA lesion but has only a little diagnostic value for identifying patients with stenosis of the LMCA.[15] Therefore, in this case report we summarize the usefulness of Electrocardiogram in predicting left main coronary artery disease (LMD) defined as ≧50% diameter stenosis in an Unstable Angina patient.

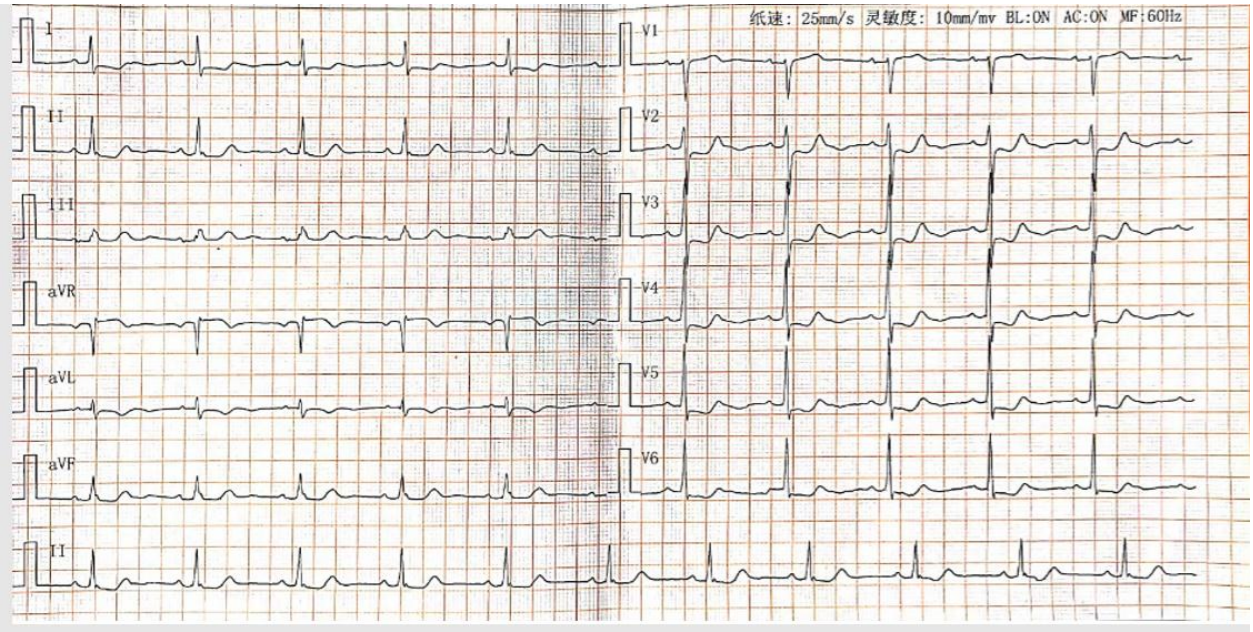
CASE PRESENTATION

A case of 64 years old Chinese male was presented to outpatient department with the chief complaint of chest pain on exertion since three years with progressive increase in chest pain since three months.

According to the patient, he was in usual state of health before three years when he first experienced retrosternal pain on exertion, pain ranging wide area, radiating to neck which lasted for about ten minutes. The severity of pain also increased along with numbness of bilateral upper limbs. However, there is no chest dullness or difficulty in breathing; no palpitation, dizziness, blackouts, blurriness of vision, tinnitus, no cough and fever. Patient denied history of dyslipidemia, diabetes, and hypertension. Patient is a smoker and non-alcoholic.

There was no abnormality in physical examination.

The Outpatient laboratory test showed Hypersensitive Troponin I (HSTNI) as 35.8 pg/ml (0-26.2pg/ml),

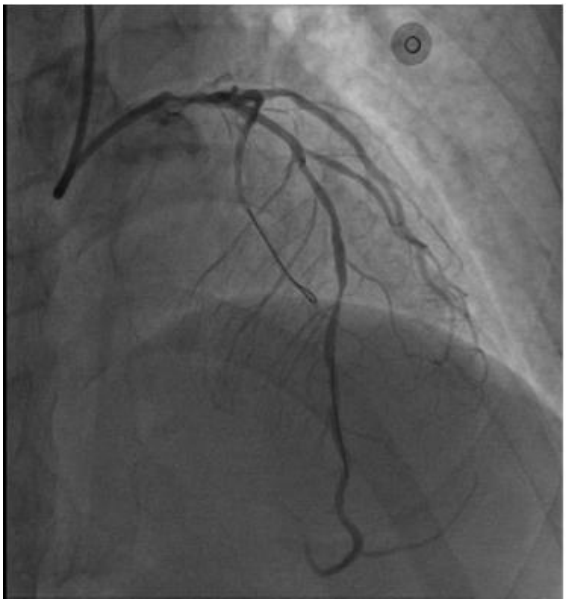


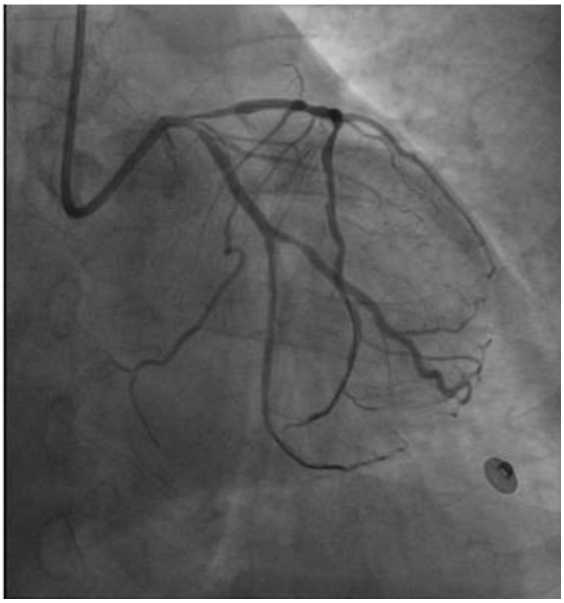
ECG showed sinus rhythm, ST elevation in aVR (0.1 mv), ST depression (0.05-0.15 mv) in I, II, aVL, V2-V6. Echocardiography showed left ventricular hypertrophy (53mm), mild mitral valve regurgitation and normal Ejection Fraction (EF) of 50%.

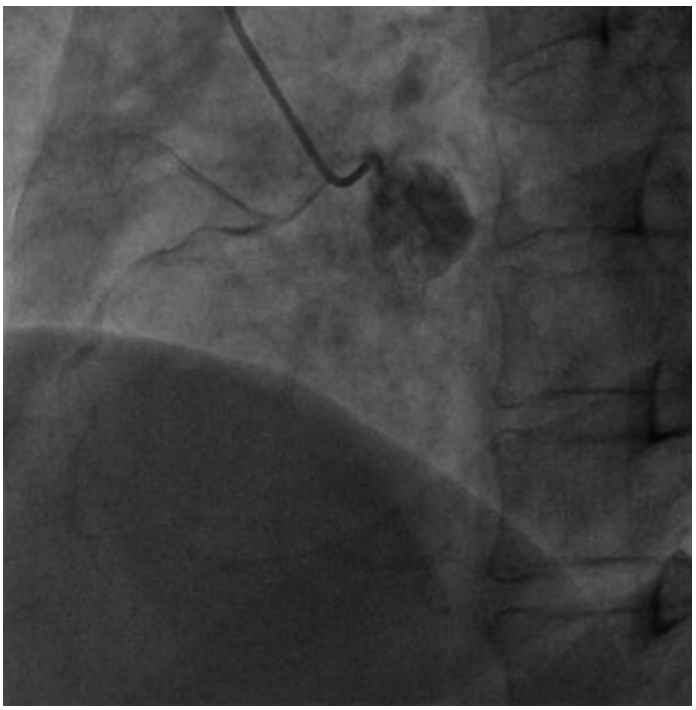
The patient was admitted with the provisional diagnosis of Acute Coronary Syndrome (ACS) .During hospital stay, patient was kept on bed rest, treated with Dual antiplatelet therapy (DAPT) with Aspirin and Clopidogrel; anticoagulant with Heparin; statins and oxygen therapy. The laboratory tests on 2nd hospital day revealed : Hypersensitive Troponin I (HSTNI) : 28.1 pg/ml (0-26.2pg/ml); Creatinine Kinase MB Isoenzyme (CK-MB) : 0.7 ng/ml (0-6.6ng/mL), Myoglobin: 27.3ng/ml (<140.1ng/ml), Total Cholesterol (TC): 5.19 mmol/L (<5.18mmol/L), Triglyceride (TG) : 1.52mmol/L (<1.70), High Density Lipoprotein (HDL) : 0.86 mmol/L (>1.04mmol/L), Low Density Lipoprotein (LDL) : 3.21 mmol/L (<3.37mmol/L). There was no

abnormality in total blood count, coagulation cascade, Brain Natriuretic Peptide (BNP), Renal Function Test (RFT) and electrolytes.

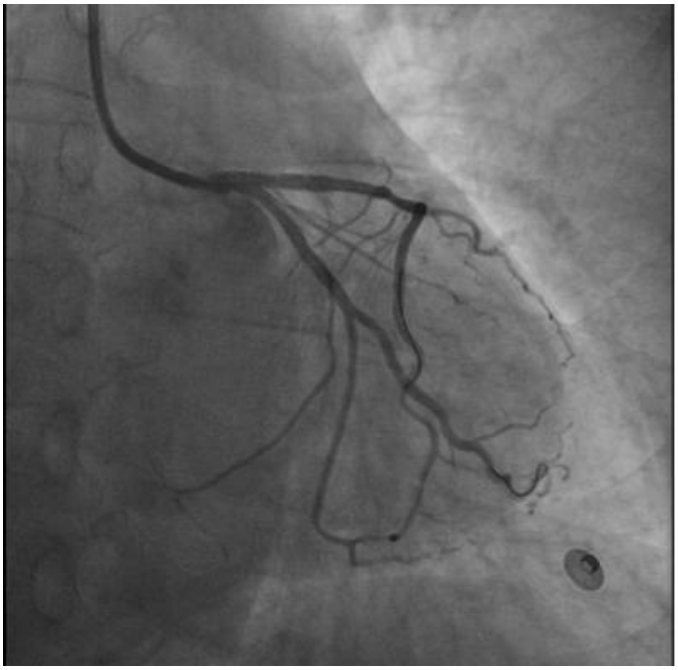
Coronary angiography was planned on 5th hospital day.



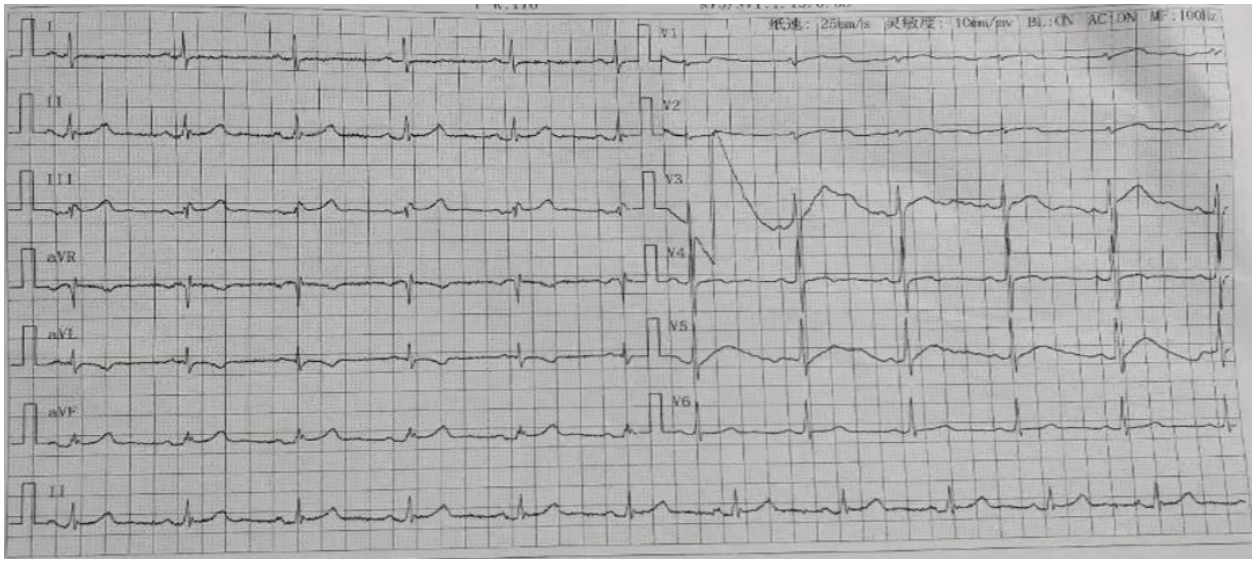




Coronary angiography revealed a common opening of left coronary artery and right coronary artery on left coronary sinus, Left Main Coronary Artery distal end showing 60% stenosis with 90% stenosis in proximal Left Anterior Descending Artery (LAD), Left Circumflex Artery (LCX) showed 80% ostial stenosis and Right Coronary Artery (RCA) proximal mid end showed 80% stenosis.



The patient underwent PCI with stents implantation to LAD-LM junction, proximal and distal end of LAD and proximal end of LCX.



ECG after PCI

After PCI, patient's symptoms were improved significantly. He was advised to quit smoking and alcohol, low salt and low cholesterol diet. Dual antiplatelet therapy (DAPT), Rosuvastatin were continued to stabilize atherosclerotic plaque. Elective PCI of RCA was planned after one month.

DISCUSSION

Left Main Coronary Artery Disease (LMD) is seen in 24% of patients with NSTE ACS. Among patients presenting alive with STEMI, acute occlusion of the left main is observed in approximately 1% of patients.[8] Prediction of LMD on time and accurately defining the severity of Left Main Coronary Artery (LMCA) stenosis is very crucial for the proper management strategy. Whereas only 60% of NSTE ACS patients were found to be undergone coronary angiography during the hospitalization according to huge registry data.[16]

In this setting constrained by the clinical significance of early recognition of patients with LMD, several useful variables have been explored and studies have shown that the most powerful predictor of LMD or 3-vessel disease is diagnosis of heart failure on admission, advanced age, male gender.[16,17,18] In addition to these well recognized predictors, many recent studies revealed the value of STE in lead aVR in predicting LMD in NSTE ACS.[19]

The mechanism of lead aVR in identifying LMD may be that lead aVR captures the electrical activity of right ventricular outflow tract and septum, which is also the right upper part of the heart. By influencing the blood flow in the LAD and its branch, the occlusion of the LMCA can cause ischemia at the bottom of the interventricular septum resulting in STE in lead Avr.[19] When a large left ventricle area is involved, as in acute coronary syndrome, due to incomplete left main obstruction (circumflex involvement), ST-T segment depression is seen in virtually all leads, except in aVR and sometimes, V1 and III. In these leads, STE is seen as a mirror pattern, since the ischemic vector is directed from the sub epicardium toward the sub endocardium in an upward, backward, and rightward direction; thus, ischemia generates a negative deflection in the majority of leads.[20]

Our patient is 64 years old male with atypical ACS presentation of chest pain on exertion but normal HSTNI and lipid profile. The patient underwent coronary angiography on the basis of his symptoms and ECG presentation and PCI was done to reperfuse the affected coronary arteries.

A meta-analysis of 27 studies (10,453patients), focusing on ACS patient group indicated that patients with STE ≥ 0.05 mV were associated with a higher incidence rate of LMD. In addition, the degree of STE in lead aVR deviating from the baseline and LMD was positively correlated. Compared to 0.05 ≤ STE<0.1 mV, the group of STE ≥ 0.1 mV was more frequently found in patients with LMD.[21] These findings were similar to those of D'Ascenzo et al. studies.[18] Evidence also showed that STE in lead aVR was more likely to reveal the LMD or 3-vessel coronary disease than ST-segment depression in other leads.[22] In our case, ECG showed sinus rhythm, ST elevation in aVR (0.1 mv), ST depression (0.05-0.15 mv) in I, II, aVL, V2-V6 and CAG revealed LMCA distal end showing 60% stenosis with 90% stenosis in proximal LAD, LCX showed 80% ostial stenosis and RCA proximal mid end showed 80% stenosis and thus presence of LMD with 3 vessel disease was identified. Therefore, STE in lead aVR was an independent predictor of LMD. In places with lack of resources the normal report would have guided the patient to be discharged with antiplatelet and statins which may have led to worse prognosis as untreated significant or critical LMCAD is associated with significant morbidity and mortality and medically treated significant LMCA stenosis has a 3-year mortality of 43%.[9] Therefore, patients with angina pain with normal cardiac markers and normal lipid profile with typical ECG presentation of LMD should be sent to higher centers in time for further management with coronary angiography and PCI if not locally available.

CONCLUSION

From our report it suggests that the early recognition with the typical ECG presentation of ST elevation in lead aVR, the risk of coronary artery stenosis especially LMD/3VD can be stratified and patient can benefit from CAG and PCI if done in time. Therefore in places with a lack of resources, the early recognition and management of Left Main Coronary Disease with a simple inexpensive and readily available ECG test with an independent predictive value can lead to a good outcome.

ACKNOWLEDGMENTS

The authors are grateful to the patient for giving her informed consent for publication.

Conflict of interest

The authors declare that there are no competing interests associated with the manuscript.

Funding

The authors declare that there are no sources of funding to be acknowledged.

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