

Frequency of Left Main Coronary Artery Disease in Patients Presenting with Acute Coronary Syndrome Having ST Elevation in Lead aVR On Electrocardiogram

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ABSTRACT

Background: Acute coronary syndrome consists of three constituents which are unstable angina, acute ST elevation myocardial infarction and acute non-ST elevation myocardial infarction.

Aim: To determine the frequency of left main coronary artery disease (LMCAD) in patients presenting with acute coronary syndrome (ACS) having ST elevation in lead aVR on electrocardiogram (ECG).

Methodology: Cross-Sectional study was conducted in cardiology ward of Bahawalpur Victoria Hospital. from July-December 2013. Total 246 patients of both genders with age (35-55years) were enrolled in the study. All patients having STEL-aVR were undergoing coronary angiography which was a gold standard to diagnose coronary artery disease.

Results: There were 246 patients with a mean age of 52.42 ± 9.39 years. Out of 246 patients 160 (65.04%) were males and 86(34.96%) were females. 61(24.8%) patients were $>35-55$ years and 185(75.2%) were ≥ 55 years of age. Out of 246 patients, 77.20% (190) patients had STEL-aVR lead of electrocardiograph and LMCAD while 22.8 %(56) patients had not STEL-aVR lead and LMCAD. The significant LMCAD was detected in 168(68.03%) patients of ACS with STEL-aVR in ECG. There was no significant association between LMCAD and gender, age, DM, HTN, smoking and obesity ($P>0.05$) by applying Chi square test.

Conclusion: We concluded that in patients of ACS, ST-segment elevation in lead aVR is associated with significant LMCA stenosis.

Keywords: Electrocardiography(ECG), Diabetes, Hypertension.

INTRODUCTION

Coronary artery disease (CAD) is one of most frequent fatality causes in the United States¹ especially and around the globe as well. Acute coronary syndrome (ACS) consists of three constituents which are unstable angina (UA), acute ST elevation myocardial infarction (STEMI), acute non-ST elevation myocardial infarction (NSTEMI). Correct and timely identification of clinical and electrocardiographic (ECG) features indicative of significant LMCAD is extremely important, particularly in patients presenting with an acute coronary syndrome¹.

A Left Main Stem (LMS) stenosis in significant size is considered as the lesion and may occupy more than 50% of the vessel diameter. The frequency of occurrence of LMS stenosis is 4 - 6% for all patients undergoing coronary angiography ² and 30% for patients of Coronary Artery Bypass Grafting (CABG)³.

In 70% of the patients, the presence of the LMS is linked to the multi-vessel coronary artery disease (MVCAD)^{4,5}. The occlusion of this vessel results in at least 75% compromised blood flow to the left ventricle, unless protected by collateral flow or a patent bypass graft to either the Left Anterior Descending (LAD) or Circumflex artery (LCX). Most such patients are symptomatic and at high risk of cardiovascular events. Before the revascularization with CABG became the standard of care, studies revealed a poor prognosis for patients, with only average three-year survival rate which was only 37%⁶. As compared to other medical therapies, CABG has shown

significantly better outcomes in the patients with cardiovascular diseases, including mortality⁷.

In one study, the finding of STEL-aVR $\geq V_1$ on electrocardiogram, distinguished the LMS group from the LAD group with high values for diagnosing LMCAD reaching 80%^{8,9,10}. Considering this study, the rationale of the study is to evaluate the frequency of STEL-aVR with LMCA disease for the patients with ACS. Patients STEL-aVR will be further investigated with coronary angiography. If lead aVR will have diagnostic value of 80% for LMCAD, then in future this prognostic information from ECG could be taken routinely to diagnose LMCAD.

MATERIALS AND METHODS

This cross sectional was conducted in cardiology ward of Bahawalpur Victoria Hospital (BVH), Bahawalpur, Pakistan. The duration of study was of six months, i.e. from 1st July 2013 to 31th December 2013. The calculated sample size on 3% margin of error with 95% confidence level, taking 6% prevalence of LMCAD in ACS with STEL-aVR is 246 patients.

The criteria for including or excluding the patients in the study are presented below which is in line with previous researches ^{1,11,12}:

Inclusion Criteria:

- Both genders.
- Age above 35 and below 75.
- Patients presenting with ACS having STEL-aVR > 0.5 mm

Exclusion Criteria:

- Patients with chronic kidney disease who are on dialysis (GFR < 15ml/min/1.73m²)
- Patients having severe anemia (Hb< 7g/dl)
- Patients with dextrocardia defined by heart on the left side on chest x ray
- Patients who undergo circulatory collapse requiring CPR or any major complication during angioplasty like cardiogenic shock, renal failure or unconsciousness.
- Patients having ejection fraction less than 20%.
- Patients having previous history of Coronary artery bypass graft.

Two hundred and forty-six consecutive patients from Department of cardiology, Bahawal Victoria hospital, Bahawalpur were enrolled in study after fulfilling the inclusion criteria. Procedure of research was explained to the patient and informed consent had been taken by the investigator. Demographic data like name, age, gender, clinical information were recorded on the attached proforma. Identity had been kept confidential. Risks and benefits were explained to the subjects. No fatal risk is present in the study. Effect modifiers such as age, history of Diabetes, Hypertension, Smoking, and Obesity were controlled through stratification. All patients having STEL-aVR undergo coronary angiography which is the gold standard to diagnose coronary artery disease.

Data was entered and analysed using SPSS Version 11.0. Numerical data like age, duration of chest pain were presented as mean and standard deviation. Qualitative data like gender and LMCAD (yes/no) were presented on frequency tables and percentages. Data was stratified for age, gender, diabetes mellitus, hypertension, Smoking and Obesity. Chi Square test was

RESULTS

Statistical analysis of the results is presented in the tables I-VI. The Table-I shows that there are 65.04% male and 34.96% female patients which indicated higher ratio of male patients with disease. The Table-I also indicated that LMCAD is present in 77.24% patients included in the study. However, 22.76% patients in which LMCAD is not present but they presented ACS and STEL-aVR lead of ECG. The results reveal that According to the Table I, 75.2% patients are in age range of 35-55 years as compared to the patients older than 55 years which are only 24.8%. The statistical analysis shows that there are 50% patients are of STEMI as compared to NSTEMI which is only in 36.18%.

Table-I: Data set analysis based on gender, disease, age and diagnosis

		Frequency	%age
Gender	Male	160	65.04
	Female	86	34.96
Left main coronary artery disease	Yes	190	77.2
	No	56	22.8
Age	>35-55	61	24.8
	>55	185	75.2
Diagnosis	STEMI	123	50.0
	NSTEMI	89	36.2
	USA	34	13.8
Total		246	100.0

Table II: Provisional Diagnosis and Left main coronary artery disease

Provisional Diagnosis		Left main coronary artery disease		Total
		Yes	No	
STEMI	Count	121	2	123
	% within Diagnosis	98.4%	1.6%	100.0%
NSTEMI	Count	52	37	89
	% within Diagnosis	58.4%	41.6%	100.0%
USA	Count	17	17	34
	% within Diagnosis	50%	50.0%	100.0%
Total	Count	190	56	246
	% within Diagnosis	77.2%	22.8%	100.0%

Table III: Gender and Left Main Coronary Artery Disease

Gender		Left Main Coronary Artery Disease		Total
		Yes	No	
Male	Count	121	39	160
	% within Gender	75.6%	24.4%	100.0%
Female	Count	69	17	86
	% within Gender	80.2%	19.8%	100.0%
Total	Count	190	56	246
	% within Gender	77.2%	22.8%	100.0%

	Value	df	p-value
Pearson Chi-Square	0.675	1	.411

Table IV: Age and Left Main Coronary Artery Disease

Age label	Left Main Coronary Artery Disease		Total
	Yes	No	
>35-55			
Count	46	15	61
% within age label	75.4%	24.6%	100%
>55			
Count	144	41	185
% within age label	77.8%	22.2%	100%
Total		190	56
Pearson Chi-Square	0.154	1	0.695

Table-II presents a cross tabulation among provisional diagnosis and LMCAD. The results show that only 121 patients out of 249 of STEMI are true positive while only 02 are true negative. In case of NSTEMI, 52 patients are true positive and 37 are truly negative. But in USA 17 cases are true positive and 17 are true negative. Therefore, 190 patients of 249 patients are true positive who have having STEL-aVR lead and LMCAD. Table-III shows LMCAD in terms of gender. Results of the Table-III shows that there is no significant association of LMCAD and gender based on the stratification ($p>0.05$). Table IV shows LMCAD in terms of age. It is observed that there is no significant association LMCAD and age based on the stratification ($p>0.05$).

DISCUSSION

The quick diagnosis of LMCAD like stenosis is very important to drive early intervention and suitable clearance in many patients presenting with ACS. ECG is an appropriate bedside tool used in the emergency department to make a rapid diagnosis of ACS. However, the ST-segment elevation in lead aVR is critical for early

diagnostics of the LMCA stenosis in patients of ACS, which mostly requires immediate and aggressive treatment in this extremely unstable condition.

Furthermore, lead aVR as a tool for early detection of LMCA stenosis influences the initial management decisions along with morbidity and mortality. Therefore, the ability to identify LMCA stenosis is important.

In this study, the relationship between the ST segment elevation ≥ 0.5 mm in lead aVR and significant LMCAD was observed in ACS patients. The study is composed of 246 patients of ACS with STEL-aVR. Different statistics related to the gender and age of the patients are presented in the Table III-IV.

Kosuge et al¹³ and Barrabes et al¹⁷ in his study reported that ST-segment elevation ≥ 0.5 mm in lead aVR to be the strongest predictor of LMCA stenosis based on ECG as the predictor. The analysis of the study revealed that 78% of the population of the study had LMCA stenosis. However, there were no significant difference based on the gender.

In our study, the incidence of significant LMCAD stenosis was higher in male as compared with female i.e. 65% versus 34.96%, and also higher in older age group as compared with adult patients i.e. 81.57% versus 71%. The results of our study are in line with studies done by Yamaj et al¹⁴, Hengrussamee et al¹⁵ and Rostoff et al¹⁶.

CONCLUSION

Since its advent in the late 19th century, the ECG has evolved into a clinical tool that provides valuable diagnostic information in a variety of settings. Although many physicians are attuned to the most characteristic electrocardiographic patterns for common illnesses, it is important that the subtleties of examining an ECG not be forgotten. It is especially important that lead aVR not be ignored as is common fashion, because it can provide essential diagnostic and prognostic information in a range of clinical presentations, as in LMCAD.

So this study indicates that STEL-aVR is a simple and useful clinical tool for early identification of significant LMCA stenosis in patients of ACS, especially in male with old age.

Conflict of Interest: There is no conflict of interest of any author to be mention here.

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