

## FREQUENCY OF SIGNIFICANT LEFT MAIN CORONARY ARTERY STENOSIS IN PATIENTS OF ACUTE CORONARY SYNDROME WITH ST-SEGMENT ELEVATION IN LEAD aVR

AZHAR SHAHZAD<sup>1</sup>, BILAL AHSAN<sup>2</sup>, MUHAMMAD FAROOQ SAEED<sup>3</sup>

**Objective:** The objective of this study was to determine the frequency of significant left main coronary artery stenosis in patients of acute coronary syndrome with ST segment elevation in lead aVR.

**Study Design:** Cross sectional study.

**Setting:** The study was conducted in department of cardiology in Chaudhary Pervaiz Elahi Institute of cardiology (CPEIC), Multan.

**Duration of Study:** Six months from 14 December 2010 to 13 June 2011.

**Methods:** A total of Sixty two patients of acute coronary syndrome with ST segment elevation in lead aVR in standard twelve lead ECG were selected for study through emergency department of CPEIC, Multan. The troponin-T was sent 12 hours after onset of chest pain. Coronary angiography was performed in all selected patients within 72 hours

after admission. The significant LMCA stenosis was determined by coronary angiography.

**Results:** There were 62 patients with a mean age of  $61.73 \pm 7.095$  years. Out of 62 patients 47(76%) were males and 15(24%) were females. 24(38.7%) patients were <60 years and 38(61.3%) were >60 years of age. The significant LMCA stenosis was detected in 48(77%) patients of ACS with ST-segment elevation in lead aVR. Troponin-T was positive in 63%; among Troponin-T positive patients 90% had significant LMCA stenosis.

**Conclusion:** This study suggests that in patients of ACS, ST-segment elevation in lead aVR is associated with significant LMCA stenosis.

**Key Words:** Acute coronary syndrome, ST-segment elevation in lead aVR, Left main coronary artery stenosis.

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### INTRODUCTION

Acute coronary syndrome (ACS) is a unifying term representing a common end result of acute myocardial ischemia. Those patients with suspected ACS should be managed immediate with antiplatelet and anticoagulant therapies and

considered for immediate revascularization mechanically or pharmacologically if new ST-elevation is noted<sup>1</sup>. An ECG should be obtained and accurately interpreted within ten minutes. In the majority of individuals the LMCA supplies approximately 75% of the left ventricular myocardial mass. Significant stenosis, both in stable coronary artery disease and acute coronary syndrome (ACS), places the patient at risk of life-threatening left ventricular dysfunction, complete heart block, malignant arrhythmias and patients can die suddenly at the very beginning of a myocardial infarction.<sup>2,3</sup> Patient prognosis of LMCA disease can be improved with bypass surgery.<sup>4</sup> Percutaneous coronary intervention,

1. Post Graduate Trainee, Medical Officer Cardiology.
2. Associate Professor of the Cardiology Department,
3. FCPS (Cardiology), Medical Officer Cardiology, Chaudhary Pervaiz Elahi Institute of Cardiology, Multan.

**Address for Correspondence:**

Dr Muhammad Farooq Saeed Khawaja  
MCPS (Medicine), FCPS (Cardiology),  
Medical Officer Cardiology, CPEIC Multan,  
Saeed Cloth House, Kotla Mughlan Road Jampur, District Rajanpur.  
Cell: 0333-4974840

especially with drug-eluting stents has increasingly been used as an alternative, particularly in patients who are poor candidates for surgery.<sup>5</sup>

The 12-lead ECG is a widely available inexpensive bedside tool that helps in rapid diagnoses such as dysrhythmias, acute myocardial infarction, and conduction abnormality.<sup>6</sup> The ECG is sensitive and valuable for detecting ACS. It shows ST-segment elevation in patients with acute STEMI and horizontal ST-depression in those with acute NSTEMI and unstable angina. However lead aVR is mostly ignored but very valuable lead for detecting the LMCA stenosis in ACS.<sup>7</sup> It represents abnormalities of the right upper side of heart (Right ventricular outflow tract) and basal part of the interventricular septum. ST-segment elevation in lead aVR determined myocardial ischemia or infarction of the basal part of the interventricular septum and coronary lesions in patients with ACS. These lesions are LMCA stenosis, proximal LAD occlusion and triple vessel coronary artery disease.<sup>8</sup>

The typical ECG finding in cases with preserved flow through the left main is widespread ST-segment depression maximally in leads V4-V6 with inverted T waves and ST-segment elevation in lead aVR. In acute myocardial ischemia without (or with minor) myocardial necrosis, the ECG pattern is transient, whereas persistent ECG changes, usually without development of Q waves, are indicative of myocardial injury. In significant left main coronary artery stenosis, severe ischemia may be manifested in the ECG by life-threatening tachyarrhythmias, conduction disturbances, and ST-segment deviation.<sup>9</sup> Because of the potential for life-saving therapeutic options by invasive therapy, the ECG markers of the serious condition should be recognized by the medical profession. LMCA stenosis should be suspected in severely ill patients with widespread ST-segment depressions, especially in leads V4-V6 with inverted T waves or ST elevation involving the anterior precordial leads and the lateral extremity leads I and aVL. In addition, lead aVR ST

elevation accompanied by either anterior ST elevation or widespread ST-segment depression may indicate LMCA stenosis.<sup>10</sup>

## METHODS

• **Setting:** The study was conducted in department of cardiology in Chaudary Pervaiz Elahi Institute of cardiology (CPEIC), Multan.

• **Sample Technique:** Non probability, purposive sampling.

• **Inclusion Criteria:** All patients of acute coronary syndrome with ST segment elevation in lead aVR were included in the study.

• **Exclusion Criteria:**

1. Patient with prior history of myocardial infarction.
2. Patient having right or left bundle branch block as evidence by ECG.
3. Patient having previous history of percutaneous coronary intervention.
4. Patient having previous history of coronary artery bypass grafting.
5. Patient not willing for hospital admission treatment and coronary angiography.

Angiographically significant LMCA stenosis has been defined as diameter stenosis is  $\geq 50\%$ .<sup>2,3</sup>

ST segment elevation is defined as present when ST segment elevation is  $\geq 0.5$  mm in lead aVR.<sup>52</sup>

## Data Collection and Follow Up

Informed consent from patients about their inclusion in the study and approval from the ethical committee of the hospital was taken. Sixty two patients of acute coronary syndrome with ST segment elevation in lead aVR in standard twelve lead ECG were selected for study through emergency department of CPEIC, Multan.

Coronary angiography was performed in all selected patients within 72 hours after admission. The significant LMCA stenosis was determined by coronary angiography findings. All these findings were entered in the Performa.

### Data Analysis

Data was analyzed by SPSS-10.0 software. Variables of the study were age, gender and angiographic findings. Numerical variable like age was calculated by mean and standard deviation. Qualitative variables like gender and angiographic findings were calculated by frequency and percentage. Confounding variables like age and gender were controlled by making cross matched stratification tables.

### RESULTS

The total study population comprised of sixty two patients. There were 47(76%) male and

**Table 1:** Frequency of Significant Left Main Coronary Artery Stenosis in Patients of ACS with ST-Segment Elevation in Lead aVR

	Total number of patients(n=62)	Frequency
Significant left main coronary artery stenosis present	48	77%
Significant left main coronary artery stenosis absent	14	23%

**Table 2:** Gender Distribution in Study Population

	MALE	FEMALE
Total number of patients (n=62)	47	15
Frequency	76%	24%

15(24%) female patients. The age varied between 47-70 years (mean=61.73±7.095). 24(38.7%) patients were less than 60 years (<60yrs). There were 39(63%) patients with troponin-T positive and 23(37%) patients with troponin-T negative.

The incidence of significant left main coronary artery stenosis in the study population was 48(77%). Out of 47 male patients 37(79%)

showed significant left main coronary artery stenosis. While out of 15 female patients 11(73.33%) showed disease.

The incidence of significant left main coronary artery stenosis in patients with <60 years was 17(71%) while in patients >60 years it was 31(81.57%). The incidence of troponin-T positive in patients with significant left main coronary stenosis was 35(90%) while 4(10%) it was negative.

### DISCUSSION

The rapid diagnosis of left main coronary artery (LMCA) stenosis is critical to guide early intervention and appropriate disposal in many patients presenting with acute coronary syndrome (ACS). Electrocardiography (ECG) is an appropriate bedside tool used in the emergency department to make a rapid diagnosis of ACS.

The ST-segment elevation in lead aVR is important to early diagnosis in determining the LMCA stenosis in patients of ACS, which requires immediate aggressive treatment, in this extremely unstable condition.

We should also consider lead aVR as an important tool for detection of LMCA stenosis as it influences the early management decisions as well as morbidity and mortality; thus, the ability to identify LMCA stenosis is important.

In this study, the relationship between the ST-segment elevation  $\geq 0.5$  mm in lead aVR and significant LMCA stenosis was noted in ACS patients. In our study, 62 patients of ACS with ST-segment elevation in lead aVR were taken. The demographic features in patients of ACS with ST-segment elevation in lead aVR were as, male 47(76%) and female 15(24%). Out of 62 patients 24(38.7%) patients were <60 years old and 38(61.3%) were >60 years old and mean age was 61±7.095 years. Troponin-T (trop-T) was positive in 39(63%) patients and negative in 23(37%) patients.

**Table 3:** Distribution of Significant Left Main Coronary Artery Stenosis in Male and Female Patients

	<b>Significant left main coronary artery stenosis present</b>	<b>Significant left main Coronary artery stenosis absent</b>
Total male patients (n=47)	<b>37(79%)</b>	<b>10(21%)</b>
Total female patients (n=15)	<b>11(73.33%)</b>	<b>4(26.66%)</b>

**Table 4:** Age Distribution in Study Population

	<b>&lt;60 years</b>	<b>&gt;60 years</b>
Total number of patients (n=62)	<b>24</b>	<b>38</b>
Frequency	<b>38.7%</b>	<b>61.3%</b>

**Table 5:** Distribution of Significant Left Main Coronary Artery Stenosis by Age Group

	<b>Significant left main coronary artery stenosis present</b>	<b>Significant left main coronary artery stenosis absent</b>
Patient <60 years (n=24)	<b>17(71%)</b>	<b>7(29%)</b>
Patient >60 years (n=38)	<b>31(81.57%)</b>	<b>7(18.42%)</b>

**Table 6:** Trop-T Distribution in Study Population

	<b>Trop-T positive patients</b>	<b>Trop-T negative patients</b>
Total number of Patients (n=62)	<b>39</b>	<b>23</b>
Frequency	<b>63%</b>	<b>37%</b>

**Table 7:** Distribution of Significant Left Main Coronary Artery Stenosis in Trop-T Positive and Trop-T Negative Patients

	<b>Significant left main coronary artery stenosis present</b>	<b>Significant left main coronary artery stenosis absent</b>
Trop-T positive Patients (n=39)	<b>35(90%)</b>	<b>4(10%)</b>
Trop-T negative patients (n=23)	<b>10(43.47%)</b>	<b>13(56.52%)</b>

In our study, out of 62 patients, 48(77%) patients showed significant LMCA stenosis. This finding is consistent with study by Hengrussamee et al, in which significant LMCA was present in

80% of patients.<sup>8</sup> Similarly; Rostoff et al<sup>11</sup> determined that the ST-segment elevation in lead aVR was 2 times more common in the patient population with LMCA involvement (70%), as

opposed to those with involvement of a different vessel (35%).

Kosuge et al<sup>12</sup> undertook a study in which he used ECG as an early, simple, and noninvasive predictor of LMCA stenosis in patients presenting with ACS. He found that ST-segment elevation  $\geq 0.5$  mm in lead aVR to be the strongest predictor of LMCA stenosis. Statistical analysis of this study revealed that significant LMCA stenosis was present in 78% of the study population.

In this study, the incidence of significant LMCA stenosis was higher in male as compared with female i.e. 79% vs 73.33%, and also higher in older age group as compared with adult patients i.e. 81.57% vs 71%. This is consistent with the studies done by Yamaj et al<sup>13</sup> and Hengrussamee et al<sup>8</sup> showing significant LMCA stenosis is mostly common in male and older age group.

Also, the incidence of significant LMCA was higher in patients with positive troponin-T as compared with patients negative troponin-T i.e. 90% vs 10%. This finding was also shown by Kosuge et al<sup>14</sup> in his study he examined the admission ECGs and biochemical markers of 333 patients with diagnosed NSTEMI acute coronary syndromes. He found that patients with ST-segment elevation in lead aVR and positive troponin-T were determined to have the highest rates of LMCA stenosis.

Our study indicates that ST-segment elevation in lead aVR on admission is a simple and useful clinical tool for early identification of significant LMCA stenosis in patients of ACS, especially in male with old age and positive troponin-T.

With this finding in the ECG, the clinician should be more vigilant about presence of significant LMCA stenosis in patients of ACS with ST-segment elevation in lead aVR. So, that, these patients should undergo emergent coronary arteriogram and early invasive procedure of coronary artery revascularization.

This study may help to establish the protocol to screen all patients of ACS with ST-segment elevation in lead aVR regarding the presence of significant LMCA stenosis.

### Study Limitation

The ECG findings in the patients who had collateral artery may be different from those without collateral arteries. Patient not willing for hospital admission, treatment and coronary angiography were not included.

### CONCLUSIONS

This study indicates that ST-segment elevation in lead aVR on admission is a simple and useful clinical tool for early identification of significant LMCA stenosis in patients of ACS, especially in male with old age and positive troponin-T.

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