Original Article

Frequency of Left Main Coronary Artery Stenosis with ST-Segment Elevation in Lead aVR in Patients of Acute Coronary Syndrome

Azhar Shahzad[1], Syed Naseem Bukhari[1], Ali Bin Saeed[1], Tariq Mehmood Khan[1], Nauman Ali[2] and Muhammad Zubair Zaffar[1]

ABSTRACT

Objective: To determine the frequency of STEL-aVR with left main coronary artery (LMCA) stenosis among patients with Acute Coronary Syndrome (ACS).

Study Design: A cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Cardiology, Ch. Pervaiz Elahi Institute of Cardiology Multan from May 2020 to May 2021.

Materials and Methods: Patients from both genders within the age bracket of 35-75 years, diagnosed with Acute Coronary syndrome and having AT elevation≥ 0.5mm on aVR lead were included in the study. All the participants were then under coronary angiography to diagnose left main coronary artery (LCMA) stenosis. SPSS (version 18) was used for statistical analysis.

Results: A total of 220 patients were enrolled. Out of them, 188 (85.4%) were positive for the LCMA stenosis. Moreover, 140 (63.6%) were male that indicated male dominance. The majority 170 (77.2%) were aged above 55 years. However, no significant association was found between age and gender and LMCA stenosis. STEMI was the most frequent disorder (47.7%), so the maximum positivity rate of stenosis was found in patients with STEMI.

Conclusion: ST-elevation-aVR is an effective tool for the diagnosis of left main coronary artery stenosis in patients suffering from the acute coronary syndrome.

Key Words: Acute coronary syndrome, left main coronary artery stenosis, electrocardiography (ECG), STEL>aVR, cardiac disorders.

INTRODUCTION

Coronary artery disease (CAD) is one of the major causes of mortality in the United States [1] and across the world. Acute coronary syndrome (ACS) is categorized into three types: acute ST-elevation myocardial infarction (STEMI), acute non-ST elevation myocardial infarction (NSTEMI), and unstable angina (UA). In cardiac disease patients, especially with ACS, accurate and timely diagnosis of significant left main coronary artery disease is very important [1, 2].

1. Department of Cardiology, Ch. Pervaiz Elahi Institute of Cardiology, Multan.
2. Department of Cardiology, Bahawalpur Victoria Hospital, Bahawalpur

Correspondence: Syed Naseem Bukhari, Department of Cardiology, Ch.Pervaiz Elahi Institute of Cardiology, Multan.
Contact No: 03067302600
Email: drnaseem11322@gmail.com

A Left Main Stem (LMS) stenosis is defined as a lesion when its size grows significantly larger to an extent that mostly 50% of the vessel is occupied. About 4-6% and 30% of all the patients undergoing coronary angiography[3] and Coronary Artery Bypass Grafting (CABG), respectively, demonstrates LMS stenosis[4,5]. In 70% of cases, LMS is associated with multi-vessel coronary artery disease (MVCAD) [6, 7]. The affected obstructed vessel can compromise up to 75% of blood flow to the left ventricle if left unprotected by a patent bypass graft in the Left Circumflex artery or the Left Anterior Descending (LAD) artery or through collateral flow. Such unprotected patients are at high risk of experiencing severe cardiovascular events. Before the practice of revascularization with CABG as standard care, patients with ACS had a poor prognosis with only a 37% of survival rate [8]. CABG has significantly improved the clinical outcomes and fatality rate related to cardiovascular diseases [9].

In one of the previous studies, patients within the LMS group were distinguished from those in the LAD group with the electrocardiogram finding of ST-Segment elevation-aVR≥V1[10]. Based on these results, we have designed this study to evaluate the frequency of STEL-

aVR with left main coronary artery stenosis among patients with ACS. Patients with comorbidity of these two clinical features will then undergo coronary angiography. Accessing the diagnostic value of lead aVR for LMCA stenosis will underscore the diagnostic ability of ECG for this disorder.

MATERIALS AND METHODS

A cross-sectional study was conducted from 11th May 2020 to 11th May 2021at the department of Cardiology in Ch.Pervaiz Elahi Institute of Cardiology Multan. A sample size of 220 patients was calculated for the study by considering 6% prevalence of LMCA stenosis with STEL-aVR in ASC, 3% margin of error, and 95% confidence interval. Patients aged between 35 to 75 years, diagnosed with ACS and presenting STEL-aVR>0.5mm were included in the study. Whereas, patients with chronic kidney disease; those with severe anemia; those with dextrocardia; those who had the experience of circulatory shock or any other major complication during angioplasty; those with left ventricular ejection fraction (LVEF)<20%, and patients with the history of coronary artery bypass graft (CABG). After passing through the inclusion and exclusion criteria, 220 patients visiting the cardiology department were consecutively enrolled. Participants of the study were informed of the research objectives and their consent was sought. The study was approved by the ethical committee of the Hospital. Initially, baseline data included demographics and clinical history of all participants was collected. The possible effect of confounding variables such as gender and age was controlled by stratification. All the patients then coronary angiography-a gold standard for diagnosis of coronary artery disease.

SPSS (version 18) was used for the statistical analysis of the data. Categorical data were presented as frequency and percentage. Whereas, continuous data were presented as mean with standard deviation. Data were stratified for gender and age. The significance of the data was assessed through Pearson's chi-square test. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 220 with ACS and STEL-aVR were consecutively enrolled. Coronary angiography demonstrated LCA stenosis in 175 (79.5%) patients who presented with STEL-aVR lead of ECG. Among the participants, 140 (63.6%) were male and 80 (36.3%) were female, indicating male dominance among the patients with ACS. The majority of patients 170 (77.2%) were aged between 55 years. 105 (47.7%) had STEMI, 86 (39%) had NSTEMI, and 29 (13.1%) had unstable angina. (Table I). 100 (95.2%) with STEMI, 72 (83.7%) with NSTEMI, and 16 (55.1%) with UA were positive for LMCA stenosis.

Table No.1: Data stratification of the participants

		Frequency	age (%)
Gender	Male	140	63.6%
	Female	80	36.3%
Left main coronary artery stenosis	Yes	175	79.5%
	No	45	20.5
Age	>35-55	50	22.7%
	>55	170	77.2%
Diagnosis	STEMI	105	47.7%
	NSTEMI	86	39%
	UA	29	13.1%
Total		220	100

Table No.2: Frequency of Left Main Coronary Artery Stenosis among patients with ACS

Provisional Diagnosis		Left main coronary artery stenosis		Total
		Yes	No	
STEMI	Count	100	5	105
	age (%)	95.2%	4.76%	100%
NSTEMI	Count	72	14	86
	age (%)	83.7%	16.2%	100%
UA	Count	16	13	29
	age (%)	55.1%	44.8%	100%
Total	Count	188	32	220
	age (%)	85.4%	14.5%	100%

Table No.3: Gender and Left Main Coronary Artery Stenosis

Gender		Left Main Coronary Artery Stenosis		Total
		Yes	No	
Male	Count	125	15	140
	Percentage	89.2%	10.7%%	
Female	Count	63	17	80
	Percentage	78.7%	21.2%	100%
Total	Count	188	32	220
	Percentage	85.4%	14.5%	100%

Table No.4: Age and Left Main Coronary Artery Stenosis

Age brackets	Left Main Coronary Artery Stenosis		Total
	Yes	No	
>35-55	35	15	50
Percentage	70%	30%	100%
>55	153	17	170
Percentage	90%	10%	100%
Total	188	32	100%
Chi-square	0.13	1	0.63

	Value	Df	p-value
Chi-square	0.72	1	0.49

Table 3 presents the correlation of gender with LCA stenosis. 125 (89.2%) patients of the total male population and 63 (78.7%) of female patients were positive for LCA stenosis. However, no significant association is found between gender and LCA stenosis (p>0.05). Similarly, no significant association was found between age and LMCA stenosis (p=0.63) (Table 4).

DISCUSSION

Left coronary artery diseases like stenosis in patients with ACS require a timely diagnosis for better management and reduction of associated mortality rate. ECG is the most frequently used bedside tool for the rapid diagnosis of ACS in emergency cases. However, diagnosis of LMCA stenosis in ACS is majorly associated with the ST-elevation in lead aVR which then suggests the need for urgent and aggressive interventions. Moreover, the indication of lead avR is also considered a major factor in initial management choices and greatly influences mortality and morbidity rate. Thus its ability to correctly diagnose LMCA stenosis is very significant in the good prognosis of the disease.

This study has assessed the significance of association between LMAC stenosis and STEL≥0.5 mm in lead aVR in patients with ACS. Out of the total of 220 patients, 188 (85.4%) were positive for LMCA. This result shows that a significant number of patients with STEL in lead aVR were positive for LMCA stenosis which demonstrates earlier as a strong predictor of the analyzed disease in the patients. This finding complies with the earlier studies conducted by Kosuge et al [11] and Barrabes et al [12] who declared ST-elevation –aVR as the strongest predictor of the existence of stenosis in the left coronary artery.

The study also stratified the findings according to gender distribution and age but no significant association was found between these factors and the diagnosis of the LMCA stenosis. These findings go hand in hand with the results of Rostoff et al [13], Hengrussamee et al [14], and Yamaj et al [15].

The study is limited in terms of consecutive enrollment of patients instead of randomization which might produce bias in the results. Moreover, it has produced the outcome data. Therefore, further studies should be conducted to report the clinical implications of early diagnoses of LMCA stenosis through ECG including its influence on mortality rate.

CONCLUSION

ST-elevation-aVR is an effective tool for the diagnosis of left main coronary artery stenosis in patients with the acute coronary syndrome.

Author's Contribution:
Concept & Design of Study: Azhar Shahzad
Drafting: Syed Naseem Bukhari, Ali Bin Saeed
Data Analysis: Tariq Mehmood Khan, Nauman Ali, Muhammad Zubair Zaffar
Revisiting Critically: Azhar Shahzad, Syed Naseem Bukhari
Final Approval of version: Azhar Shahzad

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Members WG, Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, et al. Heart disease and stroke statistics-2016 update: a report from the American Heart Association. Circulation 2016;133(4):e38-e360.
2. Haider A, Bengs S, Luu J, Osto E, Siller-Matula JM, Muka T, et al. Sex and gender in cardiovascular medicine: presentation and outcomes of acute coronary syndrome. Eur Heart J 2020;41(13):1328-36.
3. Disney L, Ramaiah C, Ramaiah M, Keshavamurthy S. Left Main Coronary Artery Disease in Diabetics: Percutaneous Coronary Intervention or Coronary Artery Bypass Grafting? Int J Angiol 2021.
4. Vervoort D, Meuris B, Meyns B, Verbrugghe P. Global cardiac surgery: access to cardiac surgical care around the world. J Thoracic Cardiovascular Surg 2020;159(3):987-96.
5. Galiè N, Saia F, Palazzini M, Manes A, Russo V, Bacchi Reggiani ML, et al. Left main coronary artery compression in patients with pulmonary arterial hypertension and angina. J Am Coll Cardiol 2017;69(23):2808-17.
6. Taggart DP, Kaul S, Boden WE, Ferguson TB, Guyton RA, Mack MJ, et al. Revascularization for unprotected left main stem coronary artery stenosis: stenting or surgery. J Am Coll Cardiol 2008;51(9):885-92.
7. Rauniyar BK, Gautam M, Sharma R, Kansakar SBS, Rajbhandari R, Maskey A, et al. Pattern of left main stenosis at a tertiary cardiac center of Nepal. Nepalese Heart J 2017;14(1):29-30.
8. Conley M, Ely R, Kisslo J, Lee K, McNeer J, Rosati R. The prognostic spectrum of left main stenosis. Circulation 1978;57(5):947-52.
9. Alexander JH, Smith PK. Coronary-artery bypass grafting. New Engl J Med 2016;374(20):1954-64.
10. Parikh NI, Gona P, Larson MG, Fox CS, Benjamin EJ, Murabito JM, et al. Long-term trends in myocardial infarction incidence and case fatality in the National Heart, Lung, and Blood Institute's Framingham Heart study. Circulation 2009;119(9):1203-10.

11. Kosuge M, Kimura K, Ishikawa T, Ebina T, Shimizu T, Hibi K, et al. Predictors of left main or three-vessel disease in patients who have acute coronary syndromes with non–ST-segment elevation. Am J Cardiol 2005;95(11):1366-9.

12. Barrabés JA, Figueras J, Moure C, Cortadellas J, Soler-Soler J. Prognostic value of lead aVR in patients with a first non–ST-segment elevation acute myocardial infarction. Circulation 2003;108(7):814-9.

13. Rostoff P, Piwowarska W, Konduracka E, Libionka A, Bobrowska-Juszczuk M, Stopyra K, et al. Value of lead aVR in the detection of significant left main coronary artery stenosis in acute coronary syndrome. Kardiologia Polska (Polish Heart J) 2005;62(2):132-5.

14. Hengrussamee K, Kehasukcharoen W, Tansuphaswadikul S. Significance of lead aVR ST segment elevation in acute coronary syndrome. J Med Assoc Thailand 2005;88(10):1382.

15. Yamaji H, Iwasaki K, Kusachi S, Murakami T, Hirami R, Hamamoto H, et al. Prediction of acute left main coronary artery obstruction by 12-lead electrocardiography: ST segment elevation in lead aVR with less ST segment elevation in lead V1. J Am Coll Cardiol 2001;38(5):1348-54.