Original Research Article

Sensitivity and Specificity of AVL depression as a Marker of Inferior MI

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Abstract

Background: AVL depression is mainly a homogenous situation in which the extent of acute inferior wall MI mostly rely on the infarct related artery in patients with inferior STEMI who also have ST depression in precordial lead. Acute myocardial infarction (AMI) is a chief component of acute coronary syndrome (ACS) which generally happens due to the involvement of anterior and inferior wall. **Methods:** This is a hospital based, retrospective, descriptive study which was conducted at the department of Cardiology in Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. The study was conducted during the period of March 2021-February 2022 (One Year). The total sample size for this study was 193. **Result:** The most 70(36.3%) were aged between 51-60 years and followed by 2(1%) were <30 years, 41(21.2%) were 31-40 years, 59(30.6%) were 61-70 years and 21(10.9%) were >70 years. Most of the respondents 149(77%) were male and 44(23%) were female. Diabetes was found in 88(45.6%) cases and followed by Hypertension in 70(36.3%), Smoking habit in 77(39.9%), Alcohol intake in 28(14.5%), Chronic kidney disease in 3(1.6%), History of exertional angina in 70(36.3%), AWMI in 104(53.9%) and IWMI in 88(45.6%) cases. S/R wave ratio > 0.33 plus ST depression > 1 mm in lead aVL (Criterion A positive) in Right Coronary Artery (RCA) was seen in 129(92.1%) cases and in Left Circumflex Artery (LCX) was 2(1.4%) and followed by Ratio of ST elevation in lead III/elevation in lead II > 1 (Criterion B positive) was seen in 127(90.7%) in RCA and 2(1.4%) in LCX. **Conclusion:** ST segment depression in leads aVL recommends a greater risk area among the patient who has acute inferior wall myocardial infarction.

Keywords: AVL depression, Inferior MI, Sensitivity, Specificity

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INTRODUCTION

AVL depression is mainly a homogenous situation in which the extent of acute inferior wall MI mostly rely on the infarct related artery patients with inferior STEMI who also have ST depression in precordial lead.[1,2] Acute myocardial infarction (AMI) is a chief phenomenon of acute coronary syndrome (ACS) which generally happens due to the involvement of anterior and inferior wall.[3] Mortality and morbidity of AMI inferior rely on the site of coronary artery lesion. ST depression can be thought only as an ECG phenomenon for the reciprocal reflection of electrical currents in the inferior infarct area not having any anatomical or physiological consequence. Hence, this

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disease may tend to occur on the patients with inferior STEMI although the rate is still low. In medical field, the electrocardiogram (ECG) is the most useful tool which is feasible, cheap and commonly available for the primary evaluation, early risk identification, triage, and guidance of therapy in patients who are suspicious of having an acute ischemic disease.[4] To foresee the culprit artery in Inferior wall, STEMI may become a challenging issue because of the factors associated with RCA and LCX among patients. Studies had also found that patients with precordial ST depression also had a greater area of infarction, along with higher cardiac enzyme levels, heavier regional LV wall movement abnormalities, and lower Ejection Fraction (EF).[1,5-8] Some studies had claimed that inferior STEMI along with precordial ST depression has much chance of multi vessel coronary disease. This situation emphasized that precordial ST depression can also be occur due to ischemic left anterior wall of the left ventricle resulted by LAD disease.[9] Some studies had reinforced the involvement of LAD disease by using angiography criteria[2,10,11]. Although these data did not clearly claimed LAD disease as major risk factor of precordial ST depression, but they specify that some inferior IMAEST patients had high grade LAD disease [10-14]. However, ST segment changes in lead AVL are frequently ignored in ECG analysis. But all other factors in ECG analysis are measured for recognition of MI and localization of STEMI.[10] The aim of our study was to assess the sensitivity and specificity of aVL for the identification and the diagnosis of inferior wall MI and dealt with the relation of ratio of ST elevation to assess the culprit artery for the patient with inferior wall MI.

MATERIALS AND METHODOLOGY

This is a hospital based, retrospective, descriptive study which was conducted at the department of Oncology in Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. The study was conducted during the period of March 2021-February 2022 (One Year). The total sample size for this study was 193.

Inclusion criteria: The patients with complete patient information and investigation reports in the medical records were included in the study. The patients having chest pain (lasting for more than 30 minutes) before hospital admission, Elevation of troponin I (>0.01 ng/ml), Creatinine kinase (CK-MB) greater than twice the upper limit of normal range (Normal: 0 - 3.5 ng/ml). The ECG showing ST segment elevation >0.1 mV (1 mm) in at least 2 of 3 the inferior leads.

Exclusion criteria: Patients with incomplete medical records were excluded. Patients having previous history of acute myocardial infarction. Who had the history of coronary artery bypass surgery or percutaneous coronary intervention prior to current hospitalization, Having evidence of recent left bundle branch block or left ventricular hypertrophy in ECG. Significant stenosis in both LCX and RCA or triple vessel disease so that a single infarct related artery could not be defined.

In this study, the patients were selected by reviewing the hospital's AVL nominal register. The quantitative variable for this study was clinical profile and outcome pattern of the study patients. The data required for the purpose of this study (gender, age, address, a provisional and final diagnosis of the patient, date of admission, the average length of the AVL stay, and duration of medical histories were carefully reviewed. The course in the hospital and treatment given were recorded properly. The statistical analysis was done using the statistical tool SPSS version 21. Representative tracing obtained within the first 24 h after the onset of MI, was used for analysis. The first 12-lead ECG taken in the emergency room.

RESULT

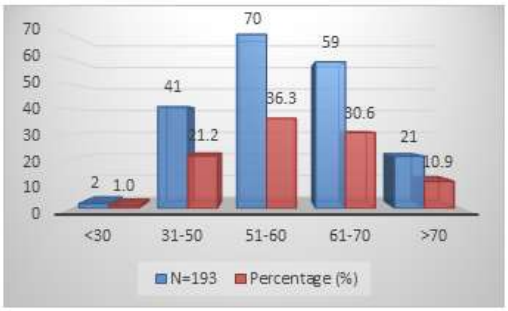

Figure 1: Age Distribution of the Study People

Figure 1 shows the age distribution of the study people. The most 70(36.3%) were aged between 51-60 years and followed by 2(1%) were <30 years, 41(21.2%) were 31-40 years, 59(30.6%) were 61-70 years and 21(10.9%) were >70 years.

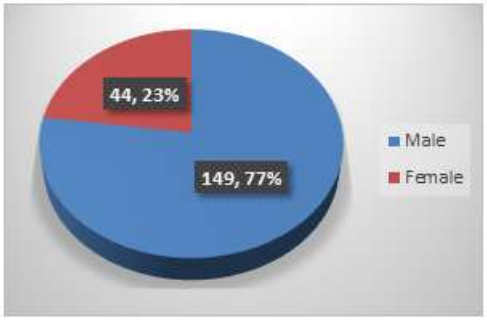

Figure 2: Gender Distribution of the Study People

Figure 2 shows the gender distribution of the study people. Most of the respondents 149(77%) were male and 44(23%) were female.

Table 1: Co-morbidities and risk factors among the Study Patients

Co-morbidities and risk factors	N	Percentage (%)
Diabetes	88	45.6
Hypertension	70	36.3
Smoking habit	77	39.9
Alcohol intake	28	14.5
Chronic kidney disease	3	1.6
History of exertional angina	70	36.3
AWMI	104	53.9
IWMI	88	45.6

Table 1: Co-morbidities and risk factors among the Study Patients. Diabetes was found in 88(45.6%) cases and followed by Hypertension in 70(36.3%), Smoking habit in 77(39.9%), Alcohol intake in 28(14.5%), Chronic kidney disease in 3(1.6%), History of exertional angina in 70(36.3%), AWMI in 104(53.9%) and IWMI in 88(45.6%) cases.

Table 2: Correlation of electrocardiogram (ECG) changes with angiographic findings.

ECG findings	Right Coronary Artery (RCA)		Left Circumflex Artery (LCX)	
	N=140	Percentage (%)	N=53	Percentage (%)
S/R wave ratio > 0.33 plus ST depression > 1 mm in lead aVL. (Criterion A positive)	129	92.1	2	1.4
Ratio of ST elevation in lead III/elevation in lead II > 1. (Criterion B positive)	127	90.7	2	1.4
Criterion A + criterion B positive	116	82.9	0	0.0
Criterion A + criterion B negative	0	0.0	49	35.0

Table 2 shows the correlation of electrocardiogram (ECG) changes with angiographic findings. S/R wave ratio > 0.33 plus ST depression > 1 mm in lead aVL (Criterion A positive) in Right Coronary Artery (RCA) was seen in 129(92.1%) cases and in Left Circumflex Artery (LCX) was 2(1.4%) and followed by Ratio of ST elevation in lead III/elevation in lead II > 1 (Criterion B positive) was seen in 127(90.7%) in RCA and 2(1.4%) in LCX. Both criterion A and criterion B was positive in 116(82.9%) cases in RCA. Both criterion A + criterion B was negative in 49(35%) cases of LCX.

Table 3: Sensitivity and specificity of AVL Depression in the electrocardiogram (ECG) criteria, alone and in combination

ECG findings	Culprit artery	Sensitivity (%)	Specificity (%)
S/R wave ratio > 0.33 plus ST depression > 1 mm in lead aVL. (Criterion A positive)	RCA	92	95
Ratio of ST elevation in lead III/elevation in lead II > 1. (Criterion B positive)	RCA	91	95
Criterion A + criterion B positive	RCA	83	100
Criterion A + criterion B negative	RCA	0	18
	LCX	89	100

Table-3 represents the sensitivity and specificity of AVL Depression in the electrocardiogram (ECG) criteria, alone and in combination. S/R wave ratio > 0.33 plus ST depression > 1 mm in lead aVL (Criterion A positive) showed the sensitivity rate 92% and specificity rate 95% where the culprit artery was RCA and followed by ratio of ST elevation in lead III/elevation in lead II > 1 (Criterion B positive) showed these rate 91% and 95%. Criterion A + criterion B was both positive with 83% and 100%. Criterion A + criterion B was both negative with the specificity rate 18% in RCA and the sensitivity rate 89% and specificity rate 100% in LCX.

DISCUSSION

The most 36.3% were aged between 51-60 years and followed by 1% were <30 years, 21.2% were 31-40 years, 30.6% were 61-70 years and 10.9% were >70 years [figure I] Joseph and Menon in their study showed the most 36.4% were aged between 51-60 years and followed by 1% were <30 years, 21% were 31-40 years, 35.5% were 61-70 years and 11% were >70 years.[15] Most of the respondents 77% were male and 23% were female [figure II] Laila N *et al.* also showed most of the respondents 96.2% were male and 3.8% were female.[16] But in contrast, T. Lindow *et al.* found most of the respondents 50.5% were female and 49.5% were male.[17] Diabetes was found in 45.6% cases and followed by hypertension in 36.3%, smoking habit in 39.9%, alcohol intake in 14.5%, chronic kidney disease in 1.6%, history of exertional angina in 36.3%, AWMI in 53.9% and IWMI in 45.6% cases [table I] In the study of Joseph and Menon, diabetes was found in 46% cases and followed by hypertension in 36%, smoking habit in 40%, alcohol intake in 14%, chronic kidney disease in 1.7%, history of exertional angina in 36.4%, AWMI in 54% and IWMI in 46% cases.[15] S/R wave ratio > 0.33 plus ST depression > 1 mm in lead aVL (Criterion A positive) in right coronary artery (RCA) was seen in 92.1% cases and in left circumflex artery (LCX) was 1.4% and followed by ratio of ST elevation in lead III/elevation in lead II > 1 (Criterion B positive) was seen in 90.7% in RCA and 1.4% in LCX. Both criterion A and criterion B was positive in 82.9% cases in RCA. Both criterion A + criterion B was negative in 35% cases of LCX [table II] E Bayram and C

Atalay in their study found the S/R wave ratio > 0.33 plus ST depression > 1 mm in lead aVL (Criterion A positive) in right coronary artery (RCA) was seen in 92% cases and in left circumflex artery (LCX) was 5% and followed by ratio of ST elevation in lead III/elevation in lead II > 1 (Criterion B positive) was seen in 91% in RCA and 5% in LCX. Both criterion A and criterion B was positive in 83% cases in RCA. Both criterion A + criterion B was negative in 90% cases of LCX.[18] S/R wave ratio > 0.33 plus ST depression >1 mm in lead aVL (Criterion A positive) showed the sensitivity rate 92% and specificity rate 95% where the culprit artery was RCA and followed by ratio of ST elevation in lead III/elevation in lead II >1 (Criterion B positive) showed these rate 91% and 95%. Criterion A + criterion B was both positive with 83% and 100%. Criterion A + criterion B was both negative with the specificity rate 18% in RCA and the sensitivity rate 89% and specificity rate 100% in LCX [table III] In the study of E Bayram and C Atalay, the S/R wave ratio > 0.33 plus ST depression >1 mm in lead aVL (Criterion A positive) showed the sensitivity rate 92% and specificity rate 94% where the culprit artery was RCA and followed by ratio of ST elevation in lead III/elevation in lead II >1 (Criterion B positive) showed these rate 86% and 94%. Criterion A + criterion B was both positive with 83% and 100%. Criterion A + criterion B was both negative with the specificity rate 12% in RCA and the sensitivity rate 87% and specificity rate 100% in LCX.[18]

CONCLUSION

From the above study, it can be said that ST segment depression in leads aVL indicates a greater risk area among the patient who has acute inferior wall myocardial infarction. The result from this present study suggest that a ratio of ST elevation in lead III/elevation in lead II > 1, and an S/R wave ratio > 0.33 plus ST depression > 1 mm in lead aVL, are specific and sensitive markers of RCA occlusion. While evaluating the risk in an acute inferior wall myocardial infarction, it is also recommended to look for ST depression in leads aVL, as it implies a greater perfusion territory and stresses for more antagonistic reperfusion therapy.

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