

Prediction of an Infarct Related Artery on Electrocardiogram and its Correlation With Coronary Angiography in an Anterior Wall Acute Myocardial Infarction.



MEDICAL SCIENCE

KEYWORDS : ANTERIOR AMI, ELECTROCARDIOGRAM, CORONARY ANGIOGRAPHY

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ABSTRACT

Objective: To study the Prediction of an infarct related artery on Electrocardiogram and its correlation with Coronary angiography in an Anterior Wall Acute Myocardial Infarction.

Methodology: This study was done on 50 patients presented to Noble hospital with acute onset chest pain radiating to left arm with ECG changes suggestive of acute anterior wall myocardial infarction.

Results: ST-elevation in lead aVR, complete RBBB, ST-depression in V5 and ST-TVI >2.5 mm strongly predicted proximal LAD occlusion, whereas abnormal Q-waves in V5, ST segment isoelectric or minimally elevated in inferior leads and ST depression in aVL were associated with distal LAD occlusion. All patients revealed that the sensitivity of these ECG criteria in identification of site of occlusion in LAD was 100%, specificity was 79.16%.

Conclusion: In anterior AMI, the ECG is useful to predict the LAD occlusion site in relation to its major side branches.

INTRODUCTION

The electrocardiogram remains the most accessible and inexpensive diagnostic and prognostic tool to evaluate a patient with complaints suggestive of acute myocardial ischemia.

The ECG may be used to identify patients to be posted for invasive diagnostic procedures. The ECG may help in assessing the size of myocardial ischemic area at risk may help in differentiation between subendocardial and transmural ischemia, and may assist in identifying the presence of previous infarctions

It plays a crucial role in the decision making about the aggressiveness of therapy especially in relation to reperfusion therapy, which has led to a considerable reduction in mortality in acute myocardial ischemia.

The decision to offer reperfusion therapy, whether pharmacological using thrombolytic agents or mechanical depends on several variables including ECG on presentation, the time of onset of symptoms, site and size of jeopardized myocardium, the presence or absence of contraindications to fibrinolytic agents and the availability of a PCI capable cardiac catheterization laboratory and PCI team etc.

The mechanical revascularization strategy, although superior in outcome as compared to the pharmacological approach, can be offered only in specialized centers.

The ECG is reliable, inexpensive, noninvasive instrument to obtain this information. Recently it has become clear that in both anterior as well as in inferior wall the ECG permits identification of not only the 2 infarct related artery (culprit artery), but also the site of occlusion in the artery.

The prognosis of a patient of myocardial infarction depends upon the site and severity of occlusion in the coronary artery. Hence it is of paramount importance that Left main stenosis, severe triple vessel disease and proximal left anterior descending branch occlusion is promptly be identified and offered aggressive therapy.

plan the appropriate therapeutic intervention. This ability can be crucial during anterior wall acute myocardial infarction (AMI) as documented by detrimental outcome of proximal left anterior descending coronary artery (LAD) occlusion.

The electrocardiogram is reliable tool for detecting anterior wall AMI(3,4,5) or infarction caused by obstruction of LAD(4, 6, 7, 8, 9). During the acute phase of anterior AMI, the ECG may

show ST elevation in leads facing the anterior wall, lateral wall and inferior wall and also in leads facing right ventricle.(3) On the basis of the ECG, several subtypes of anterior AMI have been recognized (anteroseptal, anterolateral, apical and extensive anterior

GRADES OF ISCHEMIA IN MYOCARDIAL INFARCTION

Shortly after occlusion of a coronary artery, serial ECG changes are detected by leads facing the ischemic zone(1)

1. the T waves become tall, symmetrical, and peaked (grade I ischemia)
2. there is ST elevation (grade II ischemia), without distortion of the terminal portion of the QRS
3. Changes in the terminal portion of the QRS complex appear (grade III ischemia)(1, 2)

The ability to predict noninvasively the occlusion site of the infarct related coronary artery as well as the size and location of its vascular bed shortly after the hospital admission may help the clinician to estimate the extent of the myocardial area at risk and to gender, age, Killips class on admission, risk factors, duration from onset of symptoms, proximal and distal LAD disease on ECG. The primary aim of the study was to know the correlation of predicted infarct related (culprit) artery on ECG in Acute Anterior Wall Myocardial Infarction with coronary angiography.

Data Analysis: At the end of study data had been evaluated and positive predictive value related to ECG lead changes with prediction of infarct(10) related artery and culprit artery on angiographic analysis had been calculated. Also the sensitivity and specificity had been calculated.

Inclusion criteria:

All patients with chest pain radiating to left arm and shoulder with ECG showing fresh anterior wall myocardial infarction.

Electrocardiography studies:-

All the patients with anterior AMI underwent a conventional 12-lead ECG upon admission to Medicine intensive care unit and this had been repeated daily for first 3 days and subsequently any time patient developed an episode of angina during their stay. ST segment deviation is measured at 40 ms from J point. Of the various ECGs performed during the first 3 days, the one that showed greatest changes had been used for study (usually ECG performed on admission).

- Most common risk factor in study group was DM (Diabetes Mellitus).

- All the patients had SVD. There were 23 patients with hypertension and 19 patients had dyslipidemia. Hyperhomocysteinemia was documented in 5 patients and there were 11 smokers.
- Most of the patients n=23 were in Killips class I on presentation. There were 7 patients with Killips class IV anterior wall myocardial infarction. 5 patients had Killips class III AML. There were 15 patients in Killips class II. There were no deaths reported in these groups, because >95% of the patients underwent primary angiographic myocardial intervention.
- Amongst the 50 patients studied 26 had Proximal LAD disease and 24 had Distal LAD disease. 46% of patients having Proximal LAD Disease 67 had Killips I acute anterior wall MI and 35% of these patients had Killips II myocardial infarction, 1(3%) patient had Killips III and 4 (15%) patients had Killips IV myocardial infarction.
- Among the 24 patients with Distal LAD Disease, 11 (45.83%) had Killips I and 6 (25%) had Killips II infarction and 4 (16%) patients had Killips III and 3 (12.5%) patients had Killips IV infarction. Thus the patients with DISTAL LAD Disease had worst clinical outcome as compared to patients having PROXIMAL LAD Disease.

MATERIALS AND METHODS

Study design: Prospective Observational study.

Study area: This study was conducted in the Department of Medicine, Noble Hospital, Pune, which is Tertiary care teaching hospital.

Study Population: In the present study, 50 patients with Acute Anterior wall Myocardial Infarction were studied. All the patients fulfilling the inclusion criteria were included in the study.

Data Collection Techniques and Tools: Present study included 50 patients. These patients were divided in different groups according By definition had been included in study those patients with ST segment elevation = 2 mm in leads V2 and V3. In the rest of the leads, an elevation or depression will be considered significant if it is >5 mm.

The presence of Q-wave with an amplitude=30 ms (amplified duration) will be considered abnormal.

Coronary Angiography:-

The patients were subjected to coronary angiography in the cardiac catheterization laboratory. The culprit artery was identified. 50 patients meeting both the angiogram criteria and the ECG criteria had been chosen for the study after a written and informed consent.

DISCUSSION

The study population contains 38(76%) males and 12(24%) females. Obvious difference in no. of males and females probably due to lesser attention towards the ill health by women and much lesser no. of females willing for coronary angiogram because of financial and social reasons.

- Most of the patients (n=20) were in age group of 51-60 followed by age group of 41-50.
- The comparison between the prediction of the site of occlusion on ECG and the findings on coronary angiography studied. All patients in this study revealed that the cumulative sensitivity of these ECG criteria in identification of site of occlusion in Left Anterior Descending Artery was 100%, the specificity of these criteria was 79.16%, positive predictive value was 83.87% and negative predictive value was 100% However the patients presenting within 6 hours were studied (n=41), the sensitivity was 100%, specificity was 90%,

positive predictive value was 91.30% and negative predictive value was 100%.

Table 1: Showing comparison between the prediction of the site of occlusion on ECG and the findings on coronary angiogram inclusive of all cases

	ECG Px	ECG Dx
AngioPx	26	0
AngioDx	5	19

Sensitivity	Specificity	PPV	NPV
100%	79.16%	83.87%	100%

The value of ECG in predicting the site of occlusion was significantly higher (specificity, PPV, NPV) in patients presenting within first 6 hours of symptoms of myocardial infarction. This may be explained by the fact that ECG in myocardial infarction is changing over 68 the time the MI is evolving. So, if patient presents late, the ECG showing most predominant changes is often missed. So specificity of these criteria suffers.

Table 2: showing the comparison between the occlusion on ECG and the findings on coronary angiogram in patients coming within 6 hours of symptoms

	ECG Px	ECG Dx
AngioPx	21	0
AngioDx	2	18

Sensitivity	Specificity	PPV	NPV
100	90	93.30	100

SUMMARY AND CONCLUSIONS

At the end of the study the conclusions reached are:

- The ECG can, with reasonable accuracy identify the culprit Coronary artery in acute anterior wall myocardial infarction.
- The ECG criteria for the prediction of the site of the occlusion in the left anterior descending coronary artery are very specific and have good positive predictive value.
- The specificity increases if the ECG is recorded within 6 hours of the symptoms of myocardial infarction.
- Complete Right Bundle Branch Block and ST ↓ in lead V5 have highest specificity (95.83%) followed by ST ↑ in aVR (87.5%) for the proximal LAD disease, while ST ↓ in aVL (100%) was the most specific marker of the Distal LAD disease.
- ST ↑ in V1 was the most sensitive marker of the Proximal LAD Disease (88.46%) and ST segment isoelectric or minimally elevated in inferior leads was the most sensitive (75%) marker of the Distal LAD Disease.
- However this study has significant male/female bias as the females have less attention to their ill-health and less no of females undergoing coronary angiography for social, financial and other reasons.

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