

Original Research

Significance of Abnormal T Waves in Acute Coronary Syndrome without ST Changes in ECG

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ABSTRACT:

Background: Acute coronary syndrome (ACS) refers to any group of clinical symptoms compatible with acute myocardial ischemia and includes unstable angina (UA), non—ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI). Hence; the present study was undertaken for assessing the significance of Abnormal T Waves in Acute Coronary Syndrome without ST Changes in ECG. **Materials & methods:** A total of 100 patients who reported to the department with unstable angina pectoris were enrolled in the present study. Inclusion criteria for the present study included patients without ST-segment deviation in ECG with following electrocardiographic findings of T wave abnormality. During the acute stage, continuous ECG recording was done during the first hour of the admission, followed by ECG recording for every 30 minutes for next four hours. All the ECG findings were recorded in Microsoft excel sheet and were analysed by SPSS software. **Results:** Sensitivity and specificity of abnormal T waves in detection of coronary artery stenosis was found to be 95 percent and 90 percent respectively. **Conclusion:** T-wave abnormalities are crucial ECG occurrences in subjects with non—ST-segment elevation ACS and often correlated with coronary artery obstruction.

Key words: Abnormal T wave, Acute coronary syndrome, Electrocardiographic

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INTRODUCTION

The term acute coronary syndrome (ACS) refers to any group of clinical symptoms compatible with acute myocardial ischemia and includes unstable angina (UA), non—ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI).¹ Acute myocardial infarction is typically categorized as either ST-elevation or non-ST elevation acute coronary syndrome (NSTEMI-ACS) based on the electrocardiographic (ECG) findings; importantly, NSTEMI-ACS comprises ≈70% of all acute myocardial infarctions.¹⁻³ NSTEMI-ACS presents with various ECG patterns including isolated ST-segment depression, isolated T-wave abnormality, transient ST-segment elevation, or normal/nonischemic abnormality. Although

invasive evaluation is commonly pursued, management of NSTEMI-ACS remains heterogeneous and not fully informed by myocardial substrate or ECG changes.^{4,5} The most powerful independent predictors of mortality in NSTEMI ACS (old age, elevated cardiac markers, and ST-segment depression) are commonly referred to as dichotomous variables in defining high-risk patient subsets.⁶ Hence; the present study was undertaken for assessing the significance of Abnormal T Waves in Acute Coronary Syndrome without ST Changes in ECG.

MATERIALS & METHODS

The present study was conducted in the the Department of Cardiology, Govt Medical College, Amritsar, Punjab to evaluate significance of Abnormal T Waves in Acute

Coronary Syndrome without ST Changes in ECG. A total of 100 patients who reported to the department with unstable angina pectoris were enrolled in the present study. Inclusion criteria for the present study included:

- Patients without ST-segment deviation in ECG with following electrocardiographic findings of T wave abnormality
- Patients with negative history of any other systemic illness,
- Patients with negative history of any known drug allergy

METHODOLOGY

During the acute stage, continuous ECG recording was done during the first hour of the admission, followed by ECG recording for every 30 minutes for next four hours. Assessment of cardiac enzymes was also done until the

time angiography was unavailable. All the ECG findings were recorded and were analysed by SPSS software. Univariate regression curve was used for assessment of level of significance.

RESULTS

In the present study, a total of 100 patients with unstable angina pectoris were analysed. Mean age of the patients of the present study was 54.8 years. There were 60 males and 40 females in the present study. Arterial hypertension was found to be present in 25 percent of the patients were affected with arterial hypertension. 24 percent of the patients were affected with diabetes while mean duration of angina was 4.1 years. Sensitivity and specificity of abnormal T waves in detection of coronary artery stenosis was found to be 95 percent and 90 percent respectively.

Graph 1: Patients characteristics

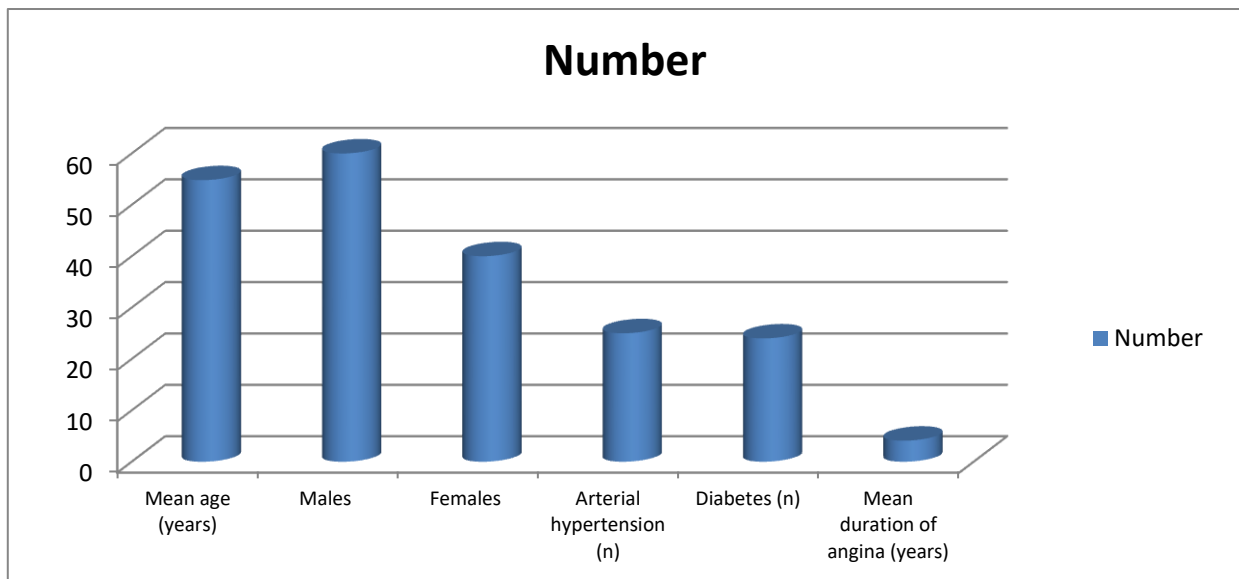


Table 1: Correlation of abnormal T waves with coronary artery stenosis

Parameter		Number of patients	Patients with associated coronary artery stenosis
Patients with T wave abnormality	Inverted symmetrical T waves	65	60
	Biphasic T waves	15	11
Patients without T wave abnormality		20	1

Table 2: Sensitivity and specificity

Parameter	Value
Sensitivity	95%
Specificity	90%
p- value	0.00 (Significant)

DISCUSSION

The electrocardiogram (ECG) is a mainstay in the diagnosis of acute and chronic syndromes due to coronary artery disease. The findings depend upon several key factors including the duration (hyperacute/acute versus evolving/chronic), extent (Q wave versus non-Q wave), and localization (anterior versus inferior-posterior and the size of the ischemic or infarcted region) of ischemia or infarction, as well as the presence of other underlying abnormalities.⁵⁻⁷ Recently, an association between T wave abnormalities and myocardial edema evaluated with T2W imaging has been reported in patients with conditions other than ACS, namely myocarditis and takotsubo cardiomyopathy. The pathophysiological links between myocardial edema and T wave abnormality remain to be fully elucidated, although we could speculate that edematous myocardium is marked by dispersion of repolarization potentials to produce this specific ECG finding.⁷⁻⁹ Hence; the present study was undertaken for assessing the significance of Abnormal T Waves in Acute Coronary Syndrome without ST Changes in ECG.

In the present study, a total of 100 patients with unstable angina pectoris were analysed. Mean age of the patients of the present study was 54.8 years. There were 60 males and 40 females in the present study. Arterial hypertension was found to be present in 25 percent of the patients were affected with arterial hypertension. The ECG is a powerful clinical tool in the evaluation of such patients and assists the physician in the selection of the proper treatment, in particular the application of treatment aimed at coronary reperfusion. Considerable electrocardiographic discussion has focused on the interpretation of ST segment elevation; comparatively little emphasis has been placed on the differential diagnosis of ST segment depression (STD). In many instances, STD is associated with acute coronary syndromes (ACS)—both acute ischaemia and acute infarction; this electrocardiographic pattern, however, may also be found in patients with non-ischaemic events, such as left bundle branch block (LBBB), left ventricular hypertrophy (LVH), and those with therapeutic digitalis levels.¹⁰⁻¹²

In the present study, 24 percent of the patients were affected with diabetes while mean duration of angina was 4.1 years. Sensitivity and specificity of abnormal T waves in detection of coronary artery stenosis was found to be 95 percent and 90 percent respectively. Rogério T et al assessed the impact of the admission ECG on prognosis over non-ST ACS. Patients were divided in 2 groups: A (n=538) - Abnormal ECG and B (n=264) - Normal ECG. Normal ECG was synonymous of sinus rhythm and no acute ischemic changes. A one-year clinical follow up was performed targeting all causes of mortality and the MACE rate. Group A patients were older (68.7±11.7 vs. 63.4±12.7Y, p<0.001), had higher Killip classes and peak myocardial necrosis biomarkers. Furthermore, they had lower left ventricular ejection fraction (LVEF) (52.01±10.55 vs. 55.34± 9.51%, p<0.001), glomerular filtration rate, initial hemoglobin, and total cholesterol levels. Group B patients were more frequently submitted

to invasive strategy (63.6 vs. 46.5%, p<0.001) and treated with aspirin, clopidogrel, beta blockers and statins. They also more often presented normal coronary anatomy. There were no differences regarding the MACE rate. In their non-ST elevation ACS population, a normal ECG was an early marker for good prognosis.¹³

Acute subendocardial ischemia also affects the Twave morphology. STD with tall peaked positive T waves is now being recognized as a sign of regional subendocardial ischemia. The European STEMI guidelines recommend repeat ECGs or STE monitoring in patients with (prominent) hyperacute T waves, which may precede STE. On the other hand, it seems that STD in the anterolateral leads (V4–V6) along with negative T waves is associated with worse prognosis than STD with positive T waves in these leads. The cumulative amount of ST-segment depression should be considered in future multivariate analyses of the incremental prognostic value of novel biomarkers.¹⁴⁻¹⁶

CONCLUSION

From the above results, the author concluded that T-wave abnormalities are crucial ECG occurrences in subjects with non-ST-segment elevation ACS and often correlated with coronary artery obstruction. However; further studies are recommended.

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