

Association between Abnormal Electrocardiogram with Acute Ischemic Stroke in Patients Without Prior Ischemic Heart Disease

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ABSTRACT

Background: Around half a million people in the world suffer from acute cerebrovascular events in a year which mainly are due to infarction, intracerebral bleed and subarachnoid hemorrhage. Multiple electrocardiographic (ECG) abnormalities are frequently encountered in patients presenting with acute ischemic stroke.

Aim: To find the association between abnormal electrocardiography in patients presenting with acute ischemic stroke without any previous ischemic heart disease.

Setting and duration of study: Department of Internal Medicine, Sheikh Zayed Hospital, Lahore from January 2015 to June 2015.

Methodology: This is a Cohort study and 100 patients were enrolled in the study from the Emergency Department of Medicine, Sheikh Zayed Hospital, Lahore. Two groups were formed Group I patients with stroke, Group II normal controls. All candidates underwent ECG reporting by same Senior Cardiologist.

Results: In our study mean age was calculated as 56.72±7.20 in Group-I and 56.08±8.96 years in Group-II. 27(54%) patients in Group-I and 29(58%) in Group-II were male, while 23(46%) in Group-I 21(42%) in Group-II were female. Association between abnormal electrocardiography pattern in patients presenting with acute ischemic stroke without prior ischemic heart disease was calculated as 44(88%) in Group-I and 28(56%) in Group-II, p 0.0004 which is statistically significant.

Conclusion: There is an association between abnormal electrocardiography with acute ischemic stroke in patients without previous ischemic heart disease.

Keywords: Acute Ischemic Stroke, Abnormal Electrocardiography ECG, Association

INTRODUCTION

Ischemic stroke is one of the leading causes of mortality and morbidity in the world¹⁻². The incidence of ischemic strokes is falling in the West but a rising trend is being observed in Asia. Cerebrovascular accidents have various risk factors of which diabetes is on the forefront. In 2020 Pakistan has become the 4th country having a huge population suffering from diabetes, as burden of diabetes is continuously on the rise in Pakistan so are the patients presenting with ischemic stroke².

Abundance of both rhythm and morphologic changes in ECG are observed in patients with acute cerebrovascular accidents, moreover myocardial damage and dysfunction has also been reported. Multiple studies have documented rhythm changes to be commonly seen in patients with anterior circulation ischemia, whereas T wave inversion and ST changes are more often reported in hemorrhage and ischemia involving the posterior circulation of brain.³ Myocardial and cerebral ischemia can co-exist in patients due to similar underlying pathogenic mechanisms of atherosclerosis, thus recognizing that these ECG changes are a consequence of acute myocardial ischemia rather than a nonspecific ECG change seen in patients with acute ischemic stroke will immensely benefit stroke patients⁴.

Common ECG changes reported in patients of acute ischemic stroke include disturbances in rhythm, ST segment, T wave and QT interval⁵. Presence of Q waves and ST depression may indicate a coexisting coronary disease. There so, secondary coronary prevention should be offered in patients presenting with acute ischemic stroke and follow-up should be advised with focus on both cardiac and neurological aspects⁵.

MATERIAL AND METHODS

One hundred patients after fulfilling the inclusion criteria were enrolled in the study from the Department of Medicine, Sheikh Zayed Hospital, Lahore. Informed consent was obtained and demographics of candidates (name, age, gender) were noted. Two groups were formed Group I patients with stroke and Group II normal controls. All patients underwent ECG which was reported by the same Senior Cardiologist. If a change in normal pattern of ECG was noted, then it was labeled as abnormal. Data was entered and analyzed using SPSS 20. Quantitative data like age was described by mean±SD while qualitative data like gender and abnormal ECG was described using frequency and percentage. Relative risk was calculated to measure the association between abnormal ECG and stroke. RR >1 was taken as significant.

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RESULTS

In our study 11(22%) in Group-I and 18(36%) in Group-II patients were between 30-50 years of age while 39(78%) in Group-I and 32(64%) in Group-II were between 51-70 years of age, mean±SD was calculated as 56.72±7.20 in Group-I and 56.0±8.96 years in Group-II (Table 1). According to gender 27(54%) in Group-I and 29(58%) in Group-II were male while 23(46%) in Group-I and 21(42%) in Group-II were females (Table 2). Abnormal ECG were seen in 44(88%) in Group-I and 28(56%) in Group-II, while 6(12%) in Group-I and 22(44%) in Group-II had no ECG changes, Relative risk: 1.571, Odds ratio was 5.76 and p 0.004 (Table 3). Common ECG abnormalities detected were ST segment depression, T wave inversion and left ventricular hypertrophy in both the groups, whereas arrhythmia was seen in patients of Group I.

Table 1: Age Distribution (n=100)

Age (years)	Group-I (n=50)		Group-II (n=50)	
	No.	%	No.	%
30-50	11	22	18	36
51-70	39	78	32	64
Mean±SD	56.72±7.20		56.08±8.96	

Table 2: Gender Distribution

Gender	Group-I		Group-II	
	No.	%	No.	%
Male	27	54	29	58
Female	23	46	21	42

Table 3: Association between abnormal electrocardiography in patients presenting with acute ischemic stroke without previous ischemic heart disease

ECG	Group-I		Group-II	
	No.	%	No.	%
Normal	6	12	22	44
Abnormal	44	88	28	56

P value 0.004 statically significant

DISCUSSION

Our study reported an association between abnormal ECG changes in patients with acute ischemic stroke without any prior ischemic heart disease, as 88% of patients in our study had concomitant ECG abnormalities without prior ischemic heart disease. A Swedish study supports our findings, they reported 90% of their patients with acute ischemic stroke and intracerebral hemorrhage as having simultaneous ECG changes similar to those of ischemic heart disease hinting towards the presence of an underlying occult coronary artery disease in them⁶.

The findings of Goldstein and Ebrahim are in agreement with our findings. Goldstein has reported 92% of their patients with stroke as having abnormal ECG which were significantly higher than control (65%) of his study.⁷ Similarly Ebrahim reported that 68.3% patients with stroke had abnormal ECG when compared with the control group 29.4%⁸. Findings of Hussain et al from Karachi endorse our findings, the main difference being that they included patients presenting with acute stroke due to ischemia, hemorrhage and subarachnoid hemorrhage in their study in contrast to our study which included patients only with ischemic strokes⁹.

ECG findings of our study in the patients with stroke included mainly ST segment and T wave changes which were very similar to a Norwegian study who reported T wave inversion, ST depression and prolonged QT interval followed by atrial fibrillation to be the commonest rhythm abnormality encountered in their study group. Furthermore they also measured Trop T levels in the same patients which were reported to be raised. Thus pointing towards an underlying undiagnosed occult coronary artery disease⁵.

Number of international and national studies have similarly reported 80%-92% of their patients with acute stroke as having various ECG changes which endorse our findings as 88% our stroke patients had ECG changes.¹⁰⁻¹² Atrial fibrillation, left ventricular hypertrophy, left bundle branch block and ischemic changes were mostly commonly identified changes seen in patients with ischemic stroke¹³. Lazzaro et al by utilizing Holter monitor similarly confirmed atrial fibrillation to be the most prevalent ECG rhythm abnormality in patients with acute ischemic stroke¹⁴.

A Turkish study reported ECG abnormalities in their control group just like as in our study we found ECG changes in 56% of our control patients which mainly included ischemic changes and left ventricular hypertrophy¹⁵. The abnormal ECG findings in control group may just be non-specific changes without any significance, or may just be a representation of pre-existing undiagnosed coronary disease. Doungporn Ruthirago further elaborated another mechanism to be responsible for ECG changes in patients with stroke, they proposed that stimulation of specific areas of central nervous system which are responsible for regulating the autonomic control of heart results in myocardial injury and the ECG changes¹⁶. Findings of Xu et al are in contrast to our findings as they have reported autonomic dysfunction to be sole cause of ECG changes and unfavorable outcomes rather than underlying occult ischemic heart disease¹⁷. The findings of both these studies oppose our findings of an association between acute ischemic stroke and ECG changes in patients without prior ischemic heart disease.

A direct relationship between the severity of stroke and degree of autonomic dysregulation, increased risk of cardiovascular complications and poor outcome has been observed.¹⁸ Furthermore it is being observed that various risk factors like age, severity of stroke, diabetes and hemodynamic changes associated with acute stroke are the reason for development of ECG changes and arrhythmias rather than an underlying ischemic cardiovascular disease¹⁹. Moreover suggestions that ECG changes are neurally-induced is supported by the fact that inverted T waves normalize if brain death occur in these patients^{20,21}.

CONCLUSION

We conclude that there is an association between abnormal electrocardiography with acute ischemic stroke in patients without prior ischemic heart disease.

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