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A Study of Electrocardiogram Changes in Patients with Acute Stroke in a Tertiary Care Hospital

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Abstract
Background: *Electrocardiogram (ECG) changes are observed in patients with acute stroke and may create confusion with ECG changes found in cardiac disorders. The aim of the study was to determine the frequency of ECG changes in patients with acute stroke.*
Material and Methods: *It was a prospective hospital-based observational study conducted for a period of 1 year (March 2016 to February 2017) including patients with acute stroke. Total 60 patients were enrolled and ECG changes were observed.*
Results: *The present study was conducted in 60 patients diagnosed with acute stroke in which incidence of ischemic stroke was more than hemorrhagic stroke (38>22), incidence of stroke was more in males 65.00%, most common preceding neurological event for stroke was headache 20(33.33%). ECG abnormality was seen in 73.33% patients of stroke. Most common rhythm abnormality was Atrial Fibrillation i.e., it was seen in 5 patients (8.33%). It was more in patients with ischemic stroke. AV block was seen in 3 patients. Ventricular tachycardia and LBBB were seen in 2 patients each .RBBB was seen in 1 patient. In the present study, the most common ECG abnormality was prolonged QT_c interval, overall it was 43.33% and in ischemic stroke it was seen in 36.84 % and in hemorrhagic group it was seen in 54.55%.*
Conclusions: *From above study it was concluded that, electrocardiography abnormalities in the patients with acute stroke are common and cardiac evaluation can have prognostic importance.*
Keywords: *ECG (Electrocardiogram), Acute stroke, NCCT head.*

Introduction

Cerebrovascular diseases are manifested by the abrupt onset of a neurological deficit. A stroke, or cerebrovascular accident, is defined as abrupt onset of a neurologic deficit that is due to vascular cause.[1]

Sometimes, stroke is referred to as brain attack. It can injure the brain like, heart attack injures the heart.[2]

The underlying basis is disordered repolarization process. The possible mechanism is through disturbances in autonomic regulation and massive stimulation of the sympathetic nervous system.[4,5]

Repolarization disturbances and arrhythmias occurring in acute stroke may be due to release of catecholamines into the patients general circulation , direct neuronal effects mediated from the CNS via neurons ending on the heart or coexisting ischemic heart disease. Whereas hormonal and neuronal effects on cardiac function at present are of uncertain clinical relevance, coexisting ischemic heart disease represents a major issue.

Heart attack and stroke are both caused by diseases of blood vessels. They share same risk factors and by modifying these risk factors may reduce the possibility ofstroke.[6]Stroke induced ECG changes are evanescent, resolving over a period of days to months. However, the frequency and severity of ECG changes is highest within 48 hours of the onset of stroke which explains the importance of continuous ECG monitoring for these patients.

For the clinician, it is important to know whether ECG abnormalities encountered in stroke patients are caused by a coexisting acute coronary syndrome, as this would call for cardiologic intervention. The aim of the study was to determine the frequency of ECG changes in patients with acute stroke.

Material and Methods

The present study was conducted in 60 patients diagnosed of acute stroke admitted in indoors of Neurology and the Department of Medicine, G.R Medical College and J.A. Group of Hospitals, Gwalior from March 2016 – February 2017.

The Study sample includes patients with Acute stroke presenting within 48-72 hrs of onset of symptoms irrespective of pre-existing cardiovascular disorder. Acute stroke was diagnosed according to General History and Neurological examination and confirmed by Radiological Investigations Detailed history and clinical examination was done and the result recorded on a patient proforma. Data from the patient regarding blood pressure, hyperlipidaemia, diabetes mellitus, cigarettes smoking, previous stroke and coronary heart disease were recorded.

A 12-lead ECG was recorded in all patients on admission and day 1 and day 2 and interpreted. ECG were evaluated as per following items : the Q wave, the R Wave ,the ST segment, the T wave, the AV conduction ,the ventricular conduction and the cardiac rhythm .In addition, the and QTc interval was measured according to Bazett's formula (QTc = QT in sec/square root of RR).

Inclusion criteria

a) Age>18yrs irrespective of sex
b) Onset of neurological deficit within 72hrs irrespective of preexisting heart disease

Exclusion criteria

a) Head trauma occurred within 1 week prior to stroke
b) Patient had artificial functioning pacemaker
c) Alternate diagnosis were not excluded.

Statistical analysis

Data was analyzed using standard statistical methods and results were compared.

Results

Table No. 1 Showing distribution of cases and type of stoke

Type	Number of cases (n=60)
Ischemic	38 (63.33%)
Hemorrhagic	22 (36.66%)

Above table shows incidence of ischemic stroke is more than hemorrhagic stroke (38>22).

Table No. 2 Table showing gender wise distribution

Sr. no.	Type of stroke	Male (n=39)	Female (n=21)
1	Ischemic	26 (68.42%)	12 (31.58%)
2	Hemorrhagic	13 (59.09%)	09 (40.91%)
3	Total (n=60)	39 (65.00%)	21(35.00%)

Above table shows incidence of stroke is more in males 65.00%

Table 3: Table showing past history of neurological events

S. no.	Neurological event	Ischemic (n=38)	Hemorrhagic (n=22)	Total (n=60)
1	Headache	13 (34.21%)	07 (31.82%)	20(33.33%)
2	Convulsions	06(15.79%)	05 (22.73%)	11(18.33%)
3	TIA	04 (10.53%)	03 (13.64%)	07(11.66%)
4	Stroke	03 (07.89%)	01 (04.55%)	04(06.66%)

Above table shows most common preceding neurological event for stroke is headache 20 (3.33%). Overall incidence is 42 (70%).

Table 4 Table showing incidence of ECG abnormalities in stroke

ECG	Ischemic (n=38)	Hemorrhagic (n=22)	Total (n=60)
Normal	12 (31.58%)	04 (18.18%)	16 (26.67%)
Abnormal	26 (68.42%)	18 (81.82%)	44 (73.33%)

Above table shows ECG abnormality in 73.33% patients of stroke

Table 5 Table showing ECG rhythm findings in stroke patients on admission (n=60)

ECG rhythm	Ischemic (n=38)	Hemorrhagic (n=22)
Normal Rhythm	30(78.95%)	17(77.27%)
Abnormal Rhythm(arrhythmia)	08(21.05%)	05(22.73%)
Atrial fibrillation	03(07.89%)	02(09.09%)
Ventricular tachycardia	01(02.63%)	01(04.55%)
AV BLOCK	02(05.26%)	01(04.55%)
LBBB	01(02.63%)	01(04.55%)
RBBB	01(05.26%)	00(00.00%)

Above table shows most common rhythm abnormality is Atrial Fibrillation.

Table No. 6 Table showing ST, T, QTc and other abnormalities in stroke

ECG abnormality	Ischemic (n=38)	Hemorrhagic (n=22)
ST Segment Changes (Elevation /Depression)	05 (13.16%)	04 (18.18%)
T Wave Changes (Tall/Inverted)	05 (13.16%)	03 (13.64%)
QTc prolongation	14 (36.84%)	12 (54.55%)
Abnormal Q wave	07 (18.42%)	04 (18.18%)
LVH	04 (10.53%)	03 (13.64%)

Above table shows QTc prolongation as the most common ECG abnormality in both groups of stroke.

Discussion

Present study was done with the aim of grossly exploring ECG findings in acute stroke and its relation with the type of stroke. Thus, there is increasing interest in identifying coronary artery disease in patients with cerebrovascular disease, including those without clinical manifestation of heart diseases.

Type of stroke

Type of stroke in present study was found to be 63.33% for ischemic stroke and 36.66% for hemorrhagic stroke.

Kumar S et al 2016[7] performed neuroimaging in 122 cases. Imaging revealed cerebral infarct in 54.10% and cerebral hemorrhage in 45.90% cases. The finding is consistent with the present study

Gender distribution

In present study, incidence of stroke was more in males 65.5 % than females 34.5%.

Kumar S et al 2016[7] reported out of 122 patients in his study, female contributes to 44.3% and male to 55.7%.

Hasan et al 2018[8] reported out of 97 patients in his study, female contributes to 32.99% and male to 67.01%.

Neurological events in the past

In the present study of 60 patients, 42 (70%) patients had neurological event in various form of headache, convulsion, TIA and stroke.

Headache was reported in 33.33% patients followed by 18.33% patient of convulsions, Prior TIA was seen in 11.66% patients and stroke in 6.66%.

Nagaraja et al 2009[10] studied 1174 patients found 154 (13.1%) of prior stroke.

Abnormal ECG

In the present study overall ECG was normal in 26.67% patients and abnormal in 73.33% patients. Goldstein 1979[9] studied 150 patients of stroke and reported ECG abnormality in 92% patients.

Kumar S et al 2016[7] reported out of 122 patients in his study, reported ECG abnormality in 56.60% cases.

ECG changes

Rhythm

In the present study most common rhythm abnormality was atrial fibrillation 5 patients (8.33%). It was more in ischemic group than hemorrhagic. Rhythm was normal in 47 (78.33%). AV block was seen in 3 patients. Ventricular tachycardia and LBBB were seen in 2 patients each. RBBB was seen in 1 patient.

Goldstein 1979[9] reported arrhythmias of any type occurred in 27% of patients. In same study AF reported in 21(14%) patient. In the same study LBBB reported in 2% patient, RBBB in 7% patient and AV block in 9% patient slightly higher from our study.

Kumar S et al 2016[7] reported arrhythmias of any type occurred in 56.6 %(69) of patients. In same study AF reported in 12(9.8%) patient. AV blocks in 6(4.9%) patient slightly higher from our study.

ST, T, QTc and other abnormalities in stroke

In the present study the most common ECG abnormality was prolonged QTc interval 43.33% in both ischemic 36.84 % and hemorrhagic group 54.55%.

In the present study ST segment changes was present in 13.16% ischemic patient and 18.18% hemorrhagic patients.

In the present study T Wave changes was present in 13.16% ischemic patient and 13.64% hemorrhagic patients.

In the present study LVH was present in 11.66% patients .Hemorrhagic group was having more incidence 13.64% when compared to ischemic group 10.53% suggesting long standing hypertension in hemorrhagic group.

In present study Q waves which indicating old MI was present in 18.42% of ischemic patients and 18.18 % of hemorrhagic patients. Overall it was present in 18.33 % patients.

Goldstein 1979[9] studied 150 patients of stroke and reported ECG abnormality in 92% patients overall most common ECG abnormality reported was prolonged QTc interval in 45% of patients which very well correlates with our present study .In the same study he reported ST elevation in 6% patients and ST depression in 27% of patients which is little higher than present study. In the same study he reported T wave inversion in 29% of patients which again was higher than present study. Also Goldstein reported LVH in 26% patients with more incidence in hemorrhagic group than ischemic group as seen in present study also. He reported Q waves in 20% of patients which was similar to present study.

Kumar S et al 2016[7] reported LVH in 19 patients (15.6%), prolonged QTc interval in 53 patients (43.4%), p wave abnormalities in 30 patients (24.6%), pathological q wave in 11 patients (9.6%), ST segment elevation in 14 patients (11.4%), ST segment depression in 20 patients (16.4%), T wave inversion in 44 patients (36.1%) and presence of U wave in 9 patients (7.1%).

Conclusion

The observations of this study suggest that electrocardiography abnormalities in the patients with acute stroke are common and cardiac evaluation could have prognostic importance.

So, the continuous ECG monitoring should be advisable to patients with acute stroke for detection of these changes and urgently management of life threatening arrhythmia if occur, may improve the survival outcomes of such patients.

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