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ECG changes in patients of stroke- what are they, and what is their significance

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Abstract

Background- Physicians have known for centuries that primary cardiac disorders can lead to stroke, but the realization that strokes may produce cardiac abnormalities is much more recent.

Aims and objectives- to study the various electrocardiographic changes during stroke and their correlation with outcome.

Material and methods- The present study was conducted, in Jayarogya group of hospitals, GRMC Gwalior M.P. A total of 306 patients of cerebrovascular stroke who have ECG changes in first 24 hours were studied from November 2013 to October 2014, in Department of neurology, Jayarogya group of hospitals, GRMC Gwalior M.P, the ECG interpretation was done by Assistant professor cardiology and results are as follows.

Results – Males are more affected by stroke than females. (65.2% V/s 34.8%), Age when first ever stroke occurred in females is higher than males. (>70 years V/s >50). The incidence of ischemic stroke is 74.8% while death is 12.76% in this group of stroke while the death rate is higher in hemorrhagic stroke (42.06%) irrespective of its lower incidence (25.2%) in comparison to ischemic stroke. In our study myocardial ischmic changes like ST segment depression and T-wave inversion, LVH, LBBB were significantly associated with the mortality. So these parameters can be use for poor prognostic factor in patients of Strokes.

Conclusion- In our study myocardial ischmic changes like ST segment depression and T-wave inversion, LVH, LBBB were significantly associated with the mortality. So these parameters can be use for poor prognostic factor in patients of Strokes.

Keywords- Stroke, Ischemic Stroke, Hemorrhagic Stroke, Electrocardiographic Changes.

Introduction

Stroke is a common worldwide health problem. It is a major cause of morbidity, mortality and disability in developed as well as developing countries [1, 6, 9]. Each year there are about one million strokes in the European Union making it by far the most common neurological disorder [4]. After coronary heart disease and all cancers, stroke is the third common cause of death in the world, causing about 4 million deaths in 1990, and three quarters of them in developing countries [4, 6].

Aims and objectives- to study the various electrocardiographic changes during stroke and their correlation with outcome.

Material and methods- This study was prospective study which was conducted strictly in compliance with good clinical practice guidelines. This study was conducted after formal approval of the study protocol by the Ethical Committee of the G.R. Medical College, Gwalior. This study was conducted in Department of neurology, G.R. Medical College & J.A. Group of Hospitals, Gwalior (M.P.) during the period of November 2013 to October 2014. In this study patients were diagnosed as stroke by WHO classification and confirmed by brain imaging as CT scan or MRI. Written informed consent was taken from each patient after informing them about the nature of the study and the investigations (like ECG) desired for the study. The study specified inclusion and exclusion criteria for the selection of the cases of stroke to avoid biasing during the study. Inclusion criteria: All patients of cerebrovascular stroke aged >14 yrs, both males & females. Exclusion criteria: All patients of cerebrovascular stroke aged <14 yrs, Sub-arachnoid hemorrhage, TIA. Patients of stroke (who fulfilled the WHO criteria for stroke) presented to Department of Neurology, G.R. Medical College & J.A. Groups of Hospitals,

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Gwalior (M.P.) were subjected to brain imaging and electrocardiography. Various lab parameters were assessed. The data was filled in a proforma that was approved by ethical committee of G.R. Medical College, Gwalior. All the data collected was tabulated and analysed through various suitable statistical methods as chi-square test for parametric and non-parametric data and T-test for Mean and Standard Deviation. The result was compared and recorded as significant or non-significant to determine the co-relation between stroke and the electrocardiographic changes.

Observations -

Table 1: ECG changes in patients of stroke within first 24 hrs.

ECG Changes	Ischemic stroke n=234	Hemorrhagic stroke n=72	p value
Normal	21(8.97)	07(9.72)	0.847
Myocardial ischemia	91(38.88)	44(61.11)	0.001*
Myocardial infarction	24(10.25)	6(8.33)	0.631
LBBB	29(12.39)	17(23.61)	0.020*
LVH	66(28.20)	34(47.22)	0.003*
QTc prolongation	86(36.75)	42(58.33)	0.001*
Arrythmias	31(13.24)	8(10.81)	0.634
Other	12(5.12)	2(2.77)	0.404

* = Significant

Table 2: Patients who died during hospitalization have following ECG changes total (n=51)

ECG changes	Ischemic n=37	Hemorrhagic n=14	p value
Normal	2(5.40)	1(7.14)	0.814
Myocardial ischemia	12(32.43)	9(64.28)	0.039*
Myocardial infarction	7(18.91)	5(35.71)	0.207
LBBB	6 (16.21%)	6 (42.85%)	0.045*
LVH	14 (37.83%)	12 (85.71%)	0.002*
QTc prolongation	14 (37.83%)	6 (42.85%)	0.743
Arrythmias	3(8.10)	0(0)	0.272
Other	1(2.70)	0(0)	0.534

* = Significant

(Table no 1) As Atherosclerosis and Hypertension both predisposes the patients for the CAD and stroke, findings of Heart involvement in patients of stroke is common. Most common ECG findings in stroke patients as per our study are myocardial ischemic changes like ST-depression and T wave inversion, changes suggestive of myocardial infarction like pathological Q-wave and ST-segment elevations, LVH, LBBB and various types of arrythmias. QTc prolongation is also a common findings in patients of stroke. So all kinds of ECG changes are possible in patients of stroke.

(Table no 2) Cerebrovascular stroke causes various cardiac abnormalities, although previous cardiac diseases are also present during onset of stroke. So it is very difficult to say that mortality in patients of stroke is a direct consequences of stroke itself or it is due to cardiac disease. In our study a very small number (8) of patients presented with previous ECG, so it was very difficult for us to identify new and old cardiac events in patients of stroke. In our study myocardial ischmic changes like ST segment depression and T-wave inversion, LVH, LBBB were significantly associated with the mortality.

Discussion- Stroke is the second cause of death worldwide and all projection indicate that this will remain in the year 2020 [78-79]. Study [80] shows that Male have higher frequency of stroke in comparison to female. The age of first ever stroke is high in females as suggestive by this study as suggestive by

two population studies [81, 82]. In Our study, ischemic stroke have incidence of 74.8%, while hemorrhagic stroke have incidence of 25.2% this finding is comparable with the other study [94]. The death rate in our study in ischemic stroke is 12.76% during day 1 to death of patients while study done by Bath *et al* (2000) [95] also suggests that 30 days mortality in ischemic stroke is 10%, The death incidence is more in hemorrhagic stroke in our study that is about 42.06%, This is also comparable with study done by Bath *et al* (2000) [95] according to them mortality rate in hemorrhagic stroke is about 52%. Physicians have known for centuries that primary cardiac disorders can lead to stroke, [111] but the realization that strokes may produce cardiac abnormalities is much more recent. In 1947, Byer, Ashman, and Toth [112]
 described a patient with intracerebral hemorrhage whose electrocardiogram (ECG) showed marked QT prolongation with large T and U waves. Most common ECG findings in stroke patients as per our study are myocardial ischemic changes like ST-depression and T wave inversion, changes suggestive of myocardial infarction like pathological Q-wave and ST-segment elevations, LVH, LBBB and various types of arrythmias. QTc prolongation is also a common findings in patients of stroke. So all kinds of ECG changes are possible in patients of stroke **[113].** In our study myocardial ischmic changes like ST segment depression and T-wave inversion, LVH, LBBB were significantly associated with the mortality.

Conclusion- In our study myocardial ischmic changes like ST segment depression and T-wave inversion, LVH, LBBB were significantly associated with the mortality. So these parameters can be use for poor prognostic factor in patients of Strokes.

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