



ORIGINAL RESEARCH PAPER

General Medicine

A STUDY OF ELECTROCARDIOGRAPHIC CHANGES IN PATIENTS OF ACUTE CEREBROVASCULAR ACCIDENTS

KEY WORDS: Acute Cerebrovascular Accident, Ecg, St-t Changes.

Dr. Mukesh Kumar Meena

Post Graduate Student, Dept. Of General Medicine, Jhalawar Medical Collage, Jhalawar, Rajasthan

Dr. Bhalachandra S Patwardhan*

Post Graduate Student, Dept. Of General Medicine, Jhalawar Medical Collage, Jhalawar, Rajasthan *Corresponding Author

ABSTRACT

INTRODUCTION: Physicians are confronted on having ECG in patients with acute stroke as it can mimic that of myocardial infarction/ischemia. They should be aware of these changes taking place in patients with acute stroke and not due to myocardial infarction/ischemia. The objective of the present study was to study ECG changes in patients with acute stroke.

MATERIAL AND METHODS: A hospital based prospective study was carried out for a period of one year at medicine department (SRG Hospital, JMC Jhalawar). A total of 100 patients were included who were eligible for the presents study as per the inclusion and exclusion criteria. Detailed clinical examination, history, lipid profile, cardiac profile, RFT, LFT, Serum electrolytes, Trop. T, blood pressure, addictions, RBS and ECG were done for all selected patients. The data obtained was analysed using appropriate statistical methods.

RESULT: Out of 100 cases, 60 were ischemic and 40 were haemorrhagic. The ECG changes were noted in 78 patients. Among ischemic group, T wave inversion (38.3%), and sinus tachycardia (31.7%) were the most common abnormalities, followed by QTc prolongation and ST depression (30%) and presence of U waves (25%). In case of haemorrhagic group, T wave inversion (32.5%) and U waves (27.5%) were most common followed by ST segment depression and QTc prolongation (25%). The mortality was high in patients with abnormal ECG (15.4%) in contrast to those who had normal ECG (9.09%).

CONCLUSION: ECG changes occur very commonly in acute cerebrovascular accidents. The major ECG abnormalities were ST-T changes, QTc prolongation and positive U waves. The incidence of mortality is higher in stroke patients with ECG abnormalities.

INTRODUCTION:-

ECG abnormalities are common occurring, in 92 percent of patients with acute stroke¹. In 1947, Byer and colleagues first described marked QT prolongation with large T and U waves on the ECG of four patients with stroke². Subsequently Burch and colleagues described an ECG pattern after stroke consisting of large inverted T waves, prolonged QT intervals and large septal U waves that has become distinctive of cerebral vascular injury³.

Cardiac abnormalities occur in 60 to 70 percent of patients after stroke⁴. The most common disturbance include ECG abnormalities, cardiac arrhythmias and myocardial injury and dysfunction distinguishing cardiac abnormalities directly caused by stroke. It however remains difficult because the prevalence of preexisting cardiac disease is high particularly among patients with ischemic stroke⁵. More importantly, cardiac disturbances are most common cause of death stroke accounting for up to 6 percent of unexpected death during the first month⁶.

Beattie and colleagues first described cardiac arrhythmias after hypothalamic stimulation⁷. Arrhythmias from hypo thalamic stimulation were subsequently confirmed in other animal models⁸. Areas of cerebral cortex with connection to autonomic nervous can also elicit cardiac response. The autonomic – emotional interaction with cardiovascular function have been linked to central nucleus of amygdale⁹.

The insular cortex has widespread connectivity with other areas of brain that are involved in autonomic control¹⁰. Oppenheimer and colleagues first identified the insular cortex in rats as a site from which lethal cardiac arrhythmias and myocardial damage could be produced, resembling changes seen in patients after stroke and sudden death in patients with epilepsy. These micro stimulation experiments in the rat posterior insular cortex produced stereotyped ECG changes from progressive atrioventricular block leading to complete heart block interventricular block, QT interval

prolongation's, ST segment depression, ventricular ectopy and finally death in asystole.

AIMS OF THE STUDY:-

- To study risk factors and the occurrence of symptoms in stroke.
- To study the incidence of ECG changes in patients with acute stroke
- To study the nature and types of ECG changes in different types of strokes
- To find out whether there is any prognostic significance for these abnormal ECG findings in patients with acute stroke.

MATERIAL AND METHODS:-

It is a prospective hospital based study conducting at medicine department (SRG Hospital, JMC Jhalawar) during period from July 2018 to July 2019. For the purpose of study following inclusion and exclusion criteria was used to select the study patients,

- **Inclusion Criteria:** Cases of cerebrovascular accident and admitted within 72 hours.
- **Exclusion Criteria:** Stroke cases which came after 72 hours, the individuals with head injury and known cardiac, hepatic and renal diseases.

Thus total 100 cases of cerebrovasculare accident were enrolled in the study by using the above mentioned inclusion and exclusion criteria. The diagnosis of CVA was confirmed by using following criteria

- Temporal profile of the clinical syndrome
- Evidence of focal brain damage/disease
- Clinical setting

A 12 Lead Electrocardiogram was taken for all the cases within 24 hours of admission and subsequently repeated on 3rd day, 5th day and 30th day for follow up. CT scan brain was taken and all patients were subjected to following inves ti

gation - CBC, Urine examination, ECG, Blood Urea, Serum Creatinine, Serum Electrolytes, Lipid Profile, Cardiac profile and Trop.T.

DATA ANALYSIS AND INTERPRETATION:

Data was entered into Microsoft Excel (Windows 7; Version 2007) and analyses were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 22.0; SPSS Inc, Chicago). Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical Variables were determined. Association between Variables was analyzed by using Chi-Square test for categorical Variables. Bar charts and Pie charts were used for visual representation of the analyzed data. Level of significance was set at 0.05.

RESULTS:-

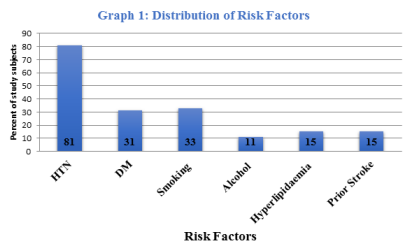
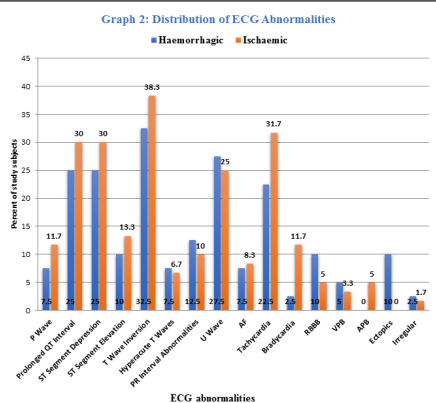


Table 1: Distribution of Study Subjects according to the Clinical Features (N=100)

| Clinical Features | Total | Haemorrhagic (n=40) | Ischaemic (n=60) | P Value |
|-----------------------|-------|---------------------|------------------|---------|
| Hemiplegia | 79 | 26 (65.0) | 53 (88.3) | 0.024* |
| Headache | 21 | 17 (42.5) | 4 (6.7) | <0.001* |
| Vomiting | 11 | 8 (20.0) | 3 (5.0) | 0.019* |
| Seizures | 6 | 3 (7.5) | 3 (5.0) | 0.606 |
| Loss of Consciousness | 23 | 15 (37.5) | 8 (13.3) | 0.005* |
| Drowsy | 19 | 8 (20.0) | 11 (18.3) | 0.835 |
| Neck Stiffness | 7 | 7 (17.5) | 0 | 0.001* |

Chi-Square Test, P Value * Significant



- The mean age was 62.09±12.40 years. The incidence of stroke in the present study was more common in the age group 61-70yrs (32%), followed by 51-60yrs (31%).
- Out of 100 patients in the study group, 72 were male and 28 were females. There was male preponderance compared to females making male-female ratio of 2.6:1.
- The incidence of ischemia (60%) was more common when compared to haemorrhage (40%).
- In case of ischemia out of 60 patients, 36 patients (60%) were male and 24(40%) patients were female, and in case of haemorrhage 36 patients (90%) were male and 4 patients (10%) were females out 40 patients. This results was highly significant (p value=0.001).
- The abnormalities of ECG were common in stroke patients.

nts. ECG changes were seen in 78/100 patients. In the ischemic group, ECG changes were seen in 47/60 patients (78.3%). Among haemorrhagic group, 31/40 patients (77.5%) had ECG changes. The abnormalities were more common in ischemic group (78.3%) compared to haemorrhagic group(77.5%).

- From the graph-2, it is evident that among ischemic group, T wave inversion (38.3%), and sinus tachycardia (31.7%) were the most common abnormalities, followed by QTc prolongation and ST depression (30%) and presence of U waves (25%). In case of haemorrhagic group, T wave inversion (32.5%) and U waves (27.5%) were most common followed by ST segment depression and QTc prolongation (25%).
- There were a total of 14 deaths. Most of the deaths occurred in the haemorrhagic group that is 10 out of 40 patients had mortality. The number of deaths in the ischemic group was 4 out of 60 patients. Mortality was higher in cases of haemorrhagic (25%) when compared to ischemic group (6.7%) and this difference was statistically significant (p=0.010).
- The mortality was high in patients with abnormal ECG (15.4%) in contrast to those who had normal ECG (9.09%).

DISCUSSION:-

Out of 100 patients, 72 were males and 22 were females. The male: female ratio was 2.6:1 which is comparable to other studies done by Anand et al¹¹ (1.7:1) and Nagaraja et al¹² (2:1). The lower incidence of stroke in women may be attributed to genetic factors, positive effects of estrogen on the cerebral circulation or to lower blood pressure values compared to men. Moreover ischemic heart disease, peripheral artery disease and cigarette smoking are more prevalent among men.¹³

The mean age in the study group was 62.09 ±12.40 years. It is comparable to other studies done by Truelsen et al¹⁴ (64.2 years), Sridharan et al¹⁵ (67 years) and Kim et al¹⁶ (65.2 years). In the present study, hypertension was present in majority of the cases i.e., 81%, which is comparable with that found in the studies of Pandiyan et al¹⁷ (71.9%) and Watila et al¹⁸ (80.33%). Next commonest risk factors were smoking (33%) and diabetes mellitus (31%), which are comparable with that found in Pandiyan et al being, 23.6% and 49.8%. Hyperlipidemia followed which was present in 15% of the cases. This can be compared with the study of Watila et al which was 10%. Prospective studies in Framingham has shown that hypertension is the most common risk factor for stroke. The risk increases with elevated systolic and diastolic values, the relationship being almost linear and independent of age and sex. Control of hypertension with anti-hypertensive drugs reduces the risk of stroke.¹⁹

In this study, 60% of the patients had ischemic stroke, which is comparable with that found in the studies of Kuruvilla et al²⁰ and Kumar et al²¹ i.e., 57.3% and 56% respectively. The most common cause for ischemic stroke is atherosclerosis of the arteries, large and small that supply the brain. 40% had haemorrhagic stroke in the present study that is comparable with 37.9% and 44% in the Kuruvilla et al²⁰ and Kumar et al²¹ study group respectively.

A vast majority of stroke patients demonstrated ECG changes in the current study (78%). This conforms to the previous studies of Goldstein²² and Bozulolclay²³ where ECG changes were demonstrated in 92% and 62.1% of patients respectively.

Increased QTc in our study was seen in 28% of cases. This is similar to observation in a large scale study done by Goldstein where it was seen in 32% of cases. T-wave inversion was seen in 15% by Goldstein et al where as in this study it is

36%. ST-segment depression was seen in 13% in Goldstein while in the present study it is 28%. U-wave was seen in 28% in Goldstein et al, while in our study it is seen in 26%. Tachycardia was seen in 2% in Goldstein et al while in this study it is 28%. Bradycardia was seen in 8% in Goldstein et al, while in the present study it is 8%.

A similar study was done by Familoni et al²⁴ in 2006 where QTc prolongation was seen in 28% of the cases, T wave inversion in 21.8%, ST segment depression in 29.7%, U wave in 9.3% and arrhythmia in 34.4% of the cases in study group. Various other studies showed highly variable values and this may be due to the fact that ECG changes occurring in stroke are highly variable over time and cannot be standardized unless continuous ECG monitoring is done.

CONCLUSION:-

- Cerebrovascular accident is a major cause of morbidity and mortality.
- Incidence of cerebrovascular accident or stroke increases with the advancement of age
- Demographic variables like age, gender; modifiable factors like hypertension, Diabetes mellitus, smoking, alcohol and hyperlipidemia are risk factors for the development of stroke.
- ECG changes occur very commonly in acute cerebro vascular accidents.
- The ECG changes occur independent of the nature of stroke i.e they are equally seen in ischemic and haemorrhagic group.
- The major ECG abnormalities were ST-T changes, QTc prolongation and positive U waves.
- The incidence of mortality is higher in stroke patients with ECG abnormalities.
- Hence to increase the survival period and reduce the morbidity and mortality in patients of cerebrovascular accidents, the prognostic factors should be identified and attempts should be done to control diabetes mellitus, hypertension.
- ECG abnormalities should be identified and specific pathology like Ischemia and Haemorrhage should be treated.
- 24 hours Holter monitoring should be done to all patients admitted with stroke to look for any ECG abnormalities.

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