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# Electrocardiographic Changes in Ischaemic Cerebral Infarction

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## *Abstract*

Electrocardiographic changes in 100 patients of ischaemic cerebral infarction (of which 50 were fatal cases) are reported. The main changes have been observed in ST segment and T wave. There may be elevation or depression of ST segment. T wave may be flattened, peaked or inverted. In a small percentage of patients there was prolongation of QT interval. Sinus bradycardia and sinus tachycardia were found in a significant number of patients. ECG changes were also analysed with reference to age, presence or absence of hypertension, myocardial infarction and left ventricular hypertrophy. Repeat ECG's were done in the surviving patients who came for follow up.

Key words -
**E.C.G,**
**Stroke,**
**Cerebral infarction**

Electrocardiographic abnormalities have been described in a variety of central nervous system lesions like sub-arachnoid haemorrhage, head injury, intracranial space occupying lesions and meningitis [1], [2], [3], [4]. Weisman [5] in 1939 reported pulmonary oedema following spontaneous and traumatic intracerebral haemorrhage. Burch et al. [1] in 1954 were among the first to report electrocardiographic abnormalities in patients with cerebrovascular accident. Since then, there have been other reports of ECG changes in strokes in literature [6], [7], [8], [9], [10], [11], [12], [13], [14].

The main changes have been observed in ST segment and T wave. There may be elevation or depression of ST segment. T wave may be flattened, peaked, inverted or low in amplitude [5], [6], [7], [8], [9], [10], [11], [12], [13]. There may be arrythmias or sinus bradycardia.

The electrocardiographic changes found in cerebrovascular accidents are of interest in two ways.

1. There are certain ECG abnormalities considered to be the results of the cerebrovascular accidents. These changes may mimic ischaemic heart disease.
2. There are changes in the ECG reflecting disease process in the heart. Evidence of myocardial infarction may provide a clue to the aetiology of stroke. Certain other conditions like hypertension, valvular heart disease, myocardial infarction, and left ventricular hypertrophy which are related to stroke, can also produce electrocardiographic abnormalities.

Apart from Abraham and Daniel [15], none appear to have studied this problems from our country specially in a homogeneous group like cerebral infarction. Hence an attempt was made to understand the same in our stroke population.

## Material and Methods

This report is on 100 cases of ischaemic cerebral infarction admitted to NIMHANS which included 50 fatal cases of retrospective analysis and 50 non fatal prospective stroke patients. All these patients after a detailed history, and complete neurological assessment, were investigated in detail for the risk factors of stroke and other causes of paralysis were excluded. 12 lead electrocardiogram was recorded in all the cases; the majority underwent cerebral angiographic studies. All cases with blood or xanthochromia in CSF were excluded. The majority of fatal cases were autopsied to confirm the diagnosis. Hypertension as judged by a blood pressure of 160/100 mm of Hg or above was present in 20%. Diabetes mellitus was noticed in 9% of cases. Ketonuria and significant electrolyte imbalance were not found in any case. Of the surviving 50 cases, repeat electrocardiographic recordings were done in 20 cases after six months of follow up.

## Results

Out of 100 electrocardiogram examined 62 were abnormal, 20 out of 50 in non fatal group and 32 out of 50 in the fatal group. The commonest changes were ST shift followed by T wave abnormality, the details of which are given in tables below.

***Table I - Details of ECG abnormalities in ischaemic cerebral infarction***

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***Table II - Arrythmias and conduction defects in ischaemic cerebral infarction***

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***Table III - Incidence of age and sex in ischaemic cerebral infarction***

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Cerebrovascular accidents occurring below 40 years contributed 18% of cases in our series. Associated diabetes mellitus, hypertension, LVH, myocardial infarction were more frequent in older patients as shown in the following table.

***Table IV - Incidence of associated diseases***

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Though abnormal T waves were present in larger percentage of older patients, similar changes were present in a higher proportion of younger patients especially in the non-fatal group as shown in the following table.

***Table V - ECG abnormalities in young versus old patients***

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*Table VI - ECG changes in cases with non fatal cerebral infarction (20) at 6 months interval*

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Arrythmias and conduction defects found in non fatal cases which were present during stroke were absent in repeat ECG after 6 months suggesting probable non-specific effect of stroke.

## Discussion

The incidence of electrocardiographic abnormalities in ischaemic cerebral infarction, in our series was 62%. Kreus et al. [14] reported ECG abnormalities in cerebrovascular accidents, the incidence being 71.5% in subarachnoid haemorrhage. 57.1% in intracerebral haemorrhage and 41.4% in unclassified cerebrovascular accidents.

ST shift, T wave abnormalities, sinus bradycardia and sinus tachycardia were the main changes. The incidence of ST shift and the T wave abnormalities were 28% each in our series. This was in contrast to the lower incidence of ST shift noted by Abraham and Daniel [15] i.e., 11% and a slightly higher incidence of T wave abnormality, i.e., 33.3%. The main abnormality in the Vellore series was the U wave change which was not found in any case of our series [15].

Cerebrovascular accidents occurring below the age of 40 years constituted 18% of our series. Associated diabetes mellitus, hypertension, left ventricular hypertrophy and myocardial infarction were present in older patients. Our results indicate that some of the ECG changes may be due to associated diseases. The changes were more in the older age group who also had a higher incidence of ischaemic heart disease, hypertension and diabetes mellitus. This is in consistence with the study conducted in Vellore [15]. However higher incidence of T wave abnormality found in patients of 40 years and below in whom associated abnormalities (diabetes, hypertension etc.) were absent would suggest them to be non-specific changes due to stroke itself.

Sinus bradycardia and sinus tachycardia were found in a significant number of patients in our series 11% each. In the Vellore study [15] sinus tachycardia was present in 16% of cases whereas sinus bradycardia was present in only 6% of cases.

## Conclusion

In the light of the above findings the following conclusions were arrived at:

1. The incidence of electrocardiographic abnormalities in ischaemic cerebral infarction was 62%.
2. The common set changes were ST segment shift and abnormalities in T wave the incidence being 28% each.
3. There was no significant difference in the electrocardiographic recordings of the fatal and non-fatal groups.
4. Sinus bradycardia and sinus tachycardia were present in significant number of patients.
5. Cerebrovascular accidents occurring below the age of 40 years contributed 18 percent of our series.
6. Associated diabetes mellitus, hypertension, left ventricular hypertrophy and myocardial infarction

were present in older patients.

7. Though abnormal T wave were present in higher percentage of older patients, it was also present in a higher proportion of younger patients in the nonfatal group, probably suggesting their nonspecific nature (due to stroke).
8. Repeat ECG examination after 6 months show clearly that sinus tachycardia, bradycardia and conduction defects are mainly seen transiently at the time of stroke: probably secondary to stroke itself.


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