



## Electrocardiographic abnormalities in patients with acute stroke attending a rural hospital

Authors

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### Abstract

**Objectives:** *To study the incidence of electrocardiographic changes seen in acute stroke, to know the nature of electrocardiographic changes seen in different types of stroke and the prevalence of electrocardiographic changes in acute stroke.*

**Method:** *100 patients of acute stroke were taken and ECG was recorded in these patients at the time of admission. Follow up of admitted patients were done by serial ECG monitoring to look out for any fresh ECG changes and development of any arrhythmias for a period of 7 days.*

**Result:** *Among 100 patients (male: female- 55:45), cerebral thrombosis was the most common cause seen in 56 patients and least common cause is cerebral venous thrombosis seen in 2 patients. Abnormal ECG changes were seen in 80 patients in which ST segment depression being the most common (29% of patients).*

**Conclusion:** *Patients with cerebrovascular accidents often have abnormal electrocardiogram in the absence of known organic heart disease or electrolyte imbalance. These ECG changes are more common in cerebral thrombosis and cerebral haemorrhage. The ECG changes are presumed to be due to brainstem interference and excessive sympathetic activity. This study will provide insight in prognosis and management of acute patients.*

**Keywords:** *stroke, cerebrovascular accident, ECG.*

### Introduction

Most cerebrovascular diseases are manifested by sudden onset of focal neurological deficits and is defined by abrupt onset of focal neurologic deficit that is attributable to a focal vascular cause<sup>1</sup>.

Approximately 200000 deaths in United States are due to neurologic disability. A comparative study of stroke between India and other countries showed that Indians are more susceptible<sup>2</sup>.

Many studies have shown close relationship between cerebrovascular accident and cardiovascular disease. Physicians have known for centuries that primary cardiac disorder can lead to stroke, but the realization that stroke can produce cardiac abnormalities is much more recent<sup>3</sup>. Cerebrovascular accident can cause abnormal ECG even in patients without heart disease<sup>4</sup>. In view of above speculations, the objectives of

present study is to identify the electrocardiographic changes produced primarily due to cerebrovascular accidents.

### Materials and Methods

The study was conducted in Adichunchanagiri Institute of Medical Sciences B G Nagara, among 100 patients (>18 years) with cerebrovascular accidents in whom ECG was taken during the arrival of the patient in the emergency ward. Follow up ECG was done at 7 days for further changes.

Cases of head injury, primary cardiac illness, patients presenting after 72 hours of focal neurologic deficit and those with hepatic/renal disorders were excluded from the study. The study conducted was observational and analytical type analysed by descriptive statistic by means of percentage and proportions.

Patients were included in the study after confirming the diagnosis of acute stroke by NCCT Brain (with diffusion weighted imaging).

### Results

Of the 100 patients 55 were male (55%) and 45 were female (45%). Incidence of stroke was found to be more between 61-70 years of age group (31%) (table-1). Most common cause was found to be cerebral thrombosis (56%) followed by cerebral haemorrhage (28%) and least common was cerebral venous thrombosis (2%) (table-2). Hypertension was the most common risk factor associated (63%) followed by diabetes (19%) and history of recurrent stroke was present in 21% of individuals (table-3). Most common ECG abnormality was found to be ST segment depression in 29 patients (29%) followed by T wave inversion in 26 patients (26%), QTc prolongation in 25 patients (25%), U wave prominence seen in 22 patients (22%), tachycardia seen in 20 patients (20%), P wave abnormalities and PR interval abnormalities seen in 11 patients each(11% each), ST segment elevations seen in 7 patients (7%) and tall T waves being the least common finding seen in 6 patients (6%) (table-4).

**Table 1:** Age and sex distribution

Sl. no	Age group (years)	Male	Female	Percentage (%)
01	18 - 20	00	01	01
02	21 - 30	02	01	03
03	31 - 40	06	03	09
04	41 - 50	11	05	16
05	51 - 60	13	09	22
06	61 - 70	15	16	31
07	71 - 80	04	06	10
08	81 - 90	03	03	06
09	91 - 100	01	01	02
<b>Total</b>		<b>55</b>	<b>45</b>	<b>100%</b>

**Table 2:** Aetiology of Stroke

Type of Stroke	No of patients	Percentage (%)
Cerebral Thrombosis	56	56
Cerebral Haemorrhage	28	28
Subarachnoid Haemorrhage	06	06
Cerebral embolism	08	08
Cerebral Venous Thrombosis	02	02

**Table 3:** Risk factors in Stroke

Risk Factors	No of patients	Percentage(%)
Hypertension	63	63
Diabetes	19	19
Hyperlipidaemia	10	10
Smoking	32	32
Alcohol	20	20
Previous stroke	21	21

**Table 4:** Nature of ECG changes observed

ECG changes	No of patients	Percentage(%)
P wave abnormalities	11	11
PR interval abnormalities	11	11
QTc prolongation	25	25
ST segment elevations	07	07
ST segment depression	29	29
Tall T waves	06	06
T wave inversion	26	26
U wave prominence	22	22
Tachycardia	20	20
Bradycardia	10	10
Arrhythmias	10	10
Normal ECG	20	20

**Table 5:** Specific ECG changes in different types of Stroke

ECG changes	Cerebral Thrombosis	Cerebral Haemorrhage	Subarachnoid Haemorrhage	Cerebral embolism	Cerebral Venous Thrombosis	Total
P wave abnormalities	05	04	00	01	01	11
PR interval abnormalities	07	03	11	00	00	11
QTc prolongation	23	01	01	00	00	25
ST segment elevations	03	03	01	00	00	07
ST segment depression	18	07	02	02	00	29
Tall T waves	04	02	00	00	00	06
T wave inversion	16	06	01	02	01	26
U wave prominence	18	04	00	00	00	22
Tachycardia	13	04	00	02	01	20
Bradycardia	09	01	00	00	00	10
Arrhythmias	06	03	00	01	00	10
Normal ECG	06	09	01	03	01	20

## Discussion

Stroke is one of the leading cause of mortality. Although there was a lack of unanimity, several factors have been reported to increase risk of stroke. Shaper et al<sup>5</sup> concluded that hypertension, cigarette smoking and pre-existing IHD was found to be major risk factors.

In present study among 100 patients of 18-94 years age group male to female sex ratio was 1.2:1 which is comparable to other studies done by Anand et al<sup>6</sup> (1.7:1) and Nagaraja et al<sup>7</sup> (2:1). Most common age group being 5<sup>th</sup> and 6<sup>th</sup> decade (71%) which is comparable to Carlo<sup>8</sup> study (71.8%).

Hypertension was present in majority of cases (63%) which is comparable to studies done by Pundiyan U et al<sup>9</sup> (88%), Smith<sup>10</sup> (87%) and Carlos<sup>8</sup> (48%).

In this study, 66% patients had ischemic stroke which is comparable with Kuruvilla et al<sup>11</sup> (57.3%) and Roy et al<sup>12</sup> (71%).

Vast majority of stroke patients demonstrated ECG changes in current study which is comparable with studies of Goldstein<sup>13</sup> and Bozluolclay<sup>14</sup>. Increased QTc in our study seen in 25% of cases is comparable with study of Goldstein<sup>13</sup> (32%). T wave inversion was seen in 26% in the present study, whereas 15% was seen in study by Goldstein et al<sup>13</sup>. ST segment depression was seen in 29% in present study whereas 13% was seen in study by Goldstein et al<sup>13</sup>. U waves were seen in 22% which was comparable to study done by Goldstein et al<sup>13</sup>

(28%). Sinus Tachycardia seen in 20% of cases in present study whereas 2% seen in Goldstein et al<sup>13</sup> study.

Sinus Bradycardia was seen in 10% in present study whereas 8% was seen in Goldstein et al<sup>13</sup> study. Arrhythmia was seen in 10% in present study whereas 25% was seen in Goldstein et al<sup>13</sup> study.

## Conclusion

Cerebrovascular accident is a major cause of morbidity and mortality and the incidence increases with advancement of age. Patients with cerebrovascular accidents often have abnormal electrocardiogram in the absence of known organic heart disease or electrolyte abnormalities. In clinical practice ECG changes in stroke can be misinterpreted as myocardial ischemia / infarction and thereby knowledge of these changes are necessary for efficient management.

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