



A STUDY OF ELECTROCARDIOGRAPHIC FINDINGS IN PATIENTS WITH ACUTE CVA

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ABSTRACT

Background - Electrocardiographic abnormalities are common in patients with acute CVA, the possible mechanism of which is the disturbances in autonomic regulation and excessive stimulation of sympathetic nervous system resulting in disordered repolarization process. Physicians are often confronted due to ECG abnormalities in acute CVA since it often mimick that of myocardial ischemia. The present study was undertaken with the objective to describe the frequency and pattern of common ECG abnormalities in CVA.

Methodology - This is a retrospective case series study conducted among patients with acute stroke admitted to HSK hospital bagalkot during February 2020 - August 2020. A 12 lead ECG of cases fulfilling the inclusion and exclusion criteria of our study were evaluated for characters like P wave, PR segment, QRS, ST segment, Q wave etc. Sample size estimation was done using open epi Software version 2.3.1

Results - Among the 90 cases, 70% had abnormal ECG. Among cerebral infarction 61(67.7%) cases, ST segment depression was found in 21(34.4%), Qtc prolongation in 16(26.2%), T wave inversion in 13(21.3%) and wide QRS in 14(22.9%). Among cerebral hemorrhage 24(26.6%), prolonged QTc was found in 10(41.6%), T wave inversion in 9(37.5%), ST segment elevation in 6(25%) and tall T wave in 4(16.6%) patients. In SAH patients, ST segment elevation was found in 2(40%), tall T wave in 2(40%), and T wave inversion in 2(40%).

Conclusion - Abnormal electrocardiographic findings are common in patients with acute cerebrovascular accidents even in the absence of electrolyte imbalance or known organic heart disease. ECG abnormalities like ST segment elevation, tall T wave, T wave inversion, and prolonged QTc were commoner in cerebral infarction than in cerebral hemorrhage whereas ST segment depression was predominantly found in patients with cerebral hemorrhage. Understanding that these abnormalities are associated with acute CVA is important to avoid erroneous judgment of assigning these patients as having cardiac dysfunction.

KEYWORDS : ECG, Acute CVA, ST segment.

INTRODUCTION

Stroke or cerebrovascular accident is defined as an abrupt onset of a neurological deficit that is attributable to a focal vascular cause(1). Globally more than half a million people suffer from cerebrovascular events including ischemic stroke, intracerebral and subarachnoid hemorrhage. In acute stroke the death rate has been estimated to be around 20% of the total cases(2). The anatomical and physiological pathways involved in brain-heart interaction have been demonstrated in both animal and human studies. The ability to reproduce the arrhythmia by activation of the sympathetic nervous system suggested a neurogenic mechanism(3). The medulla has been described as the principal site of vagal parasympathetic and sympathetic areas involved in cardiac control(4). The actual mechanism by which cerebrovascular accidents cause ECG abnormalities remain unclear(5).

The possible mechanism is by disturbances in autonomic regulation and excessive stimulation of symapthetic nervous system resulting in disordered repolarization process(6,7). ECG abnormalities are present in 60-90% of patients with intra-parenchymal or subarachnoid bleed and in 5 -20% of patients with acute ischemic stroke(8). Many of the ECG changes resemble those of myocardial ischemia/infarction and can lead to misinterpretation and delay in management especially surgical management of subarachnoid haemorrhage(9). ECG abnormalities commonly observed are T wave abnormalities, p wave changes ,ST segment abnormalities and rhythm disturbances like Sinus bradycardia, sinus tachycardia, premature ventricular beats, premature atrial beats etc. (10).

Physicians are often confronted due to ECG abnormalities in acute CVA since it often mimick that of myocardial infarction/ischemia. The present study was undertaken to describe the frequency and common pattern of ECG

abnormalities observed in patients of acute CVA.

METHODOLOGY:

Study Design: Retrospective case series study.

Case Definition

Patient with stroke presented within 24 hours of episode of having acute infarct or bleed on CT/MRI brain.

Inclusion Criteria:

1. Patients presenting with stroke within 24hrs of onset.
2. CT/MRI brain suggesting cerebral infarct/bleed

Exclusion Criteria:

1. Patients with pre-existing congenital heart disease/ischemic heart disease/valvular heart disease.
2. Patients who presented 24hours or more after the onset of stroke.
3. Patients with head injury.

This is a retrospective case series study among patients with acute cerebrovascular accidents attending the OPD/IPD of SNMC and HSK hospital bagalkot during January 2020 to August 2020. ECG taken at the time of admission of patients fulfilling the inclusion and exclusion criteria of our study was evaluated. Since its retrospective study informed consent was not taken. Admission case sheets were traced from the medical records section of our hospital and were evaluated for the paramaeters of the study. A 12 lead ECG which was taken within 24 hours of admission of cases with acute cerebrovascular accidents were evaluated. ECG parameters like rate, rhythm, ST segment, T wave, QRS, PR interval etc were studied.

Stastical Analysis

Sample size estimation was done using open epi software version 2.3.1

At 95% confidence level and 10% absolute precision

According to the study conducted by 'Rambabu M. V., Viswajothi Rao P'(11) on 'Study of ECG changes in patients with acute stroke: a hospital based cross sectional study' Proportion of t wave inversion on ECG : 33% Sample size : 90. Formula used $4pq/L^2$

RESULTS

Study results of 90 patients with acute CVA are as follows

Incidence Of Abnormal ECG In The Study Group

Study Group	No of cases	Cases with abnormal ECG	Percentage with abnormal ECG(%)
Cerebral Infarction	61	41	67.2
Cerebral Hemorrhage	24	18	75
Subarachnoid Hemorrhage	5	4	80
Total	90	63	70

70% of all stroke patients had some form of ECG changes

75% of patients with hemorrhages, 67.2 % of patients with infarct and 80 % of patients with SAH had abnormalities in their ECG.

Pattern Of ECG Abnormalities Found In Acute Cerebrovascular Accidents

ECG abnormality	Cerebral infarction (n=61)	Cerebral hemorrhage (n=24)	Subarachnoid hemorrhage (n=5)
ST segment elevation	4	6	2
ST segment depression	21	4	0
T wave inversion	13	9	2
Tall T wave	4	4	2
Prolonged PR interval	4	2	0
Prolonged QTc	16	10	0
Prolonged QRS	14	6	0
Abnormal P wave	9	4	0
Pathological Q wave	6	1	1

Among patients with cerebral infarction(61) ST segment depression was found in 21(34.4%) patients, Qtc prolongation was found in 16(26.2%), wide QRS in 14(22.9%), T wave inversion in 13(21.3%), P wave abnormalities in 9(14.7%), pathological q wave in 6(9.8%) and tall T wave, prolonged PR interval, ST segment elevation each found in 4(6.5%).

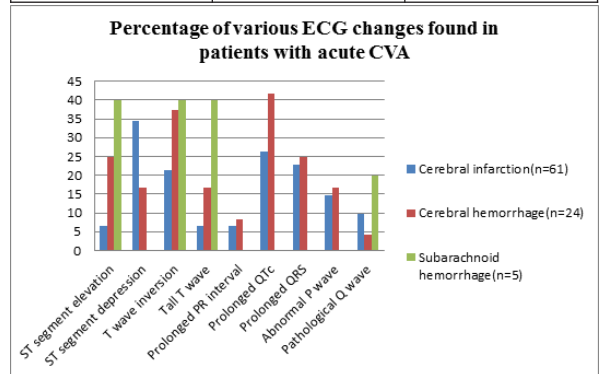
Among patients with cerebral hemorrhage(24), prolonged QTc was found in 10(41.6%), T wave inversion in 9(37.5%), ST segment elevation in 6(25%), wide QRS in 6(25%), ST segment depression in 4(16.6%), tall T wave in 4(16.6%), abnormal P wave in 4(16.6%), prolonged PR interval in 2(8.3%) and pathological q wave in 1(4.1%).

Among patients with SAH ST segment elevation was found in 2(40%), tall T wave in 2(40%), T wave inversion in 2(40%) and pathological Q wave in 1(20%) patients.

Incidence Of Rhythm Disturbances In ECG In CVA

Type of CVA	Sinus tachycardia	Sinus bradycardia
Cerebral infarction(n=61)	11(18%)	4(6.5%)

Cerebral hemorrhage(n=24)	7(29.1%)	6(25%)
Subarachnoid hemorrhage(n=5)	4(80%)	0
Total(N=90)	22(24.4%)	10(11.1%)



DISCUSSION

The patient with stroke and with an abnormal ECG represents a common diagnostic challenge to the clinician, because ECG changes in stroke mimic the finding those of myocardial ischemia, rhythm disorders and other cardiac disorders. ECG changes in acute stroke in our study are thoroughly studied as following:

Among 90 patients with acute cerebrovascular accident ischemic CVA(67.7%) was more common than hemorrhagic CVA(32.2%) in our study. This finding was similar to study conducted by Abhijit Kanrar et.al (12). Majority(70%) had changes in their initial ECG which was recorded within 24 hours of the episode of stroke. Patients with SAH had maximum incidence of ECG abnormality(80%) in our study.

Analysing ECG abnormalities in patients with cerebral infarction, ST segment depression(34.4%) was most common finding followed by prolonged QTc(26.2%). This finding was similar to study conducted by Vinod Kumar Kandalal et.al (13). Other common ECG abnormalities includes prolonged QRS(22.9%), T wave inversion(21.3%) and abnormal P wave(14.7%).

Analysing ECG abnormalities in patients with cerebral hemorrhage, prolonged QTc(41.6%) followed by T wave inversion(37.5%) were most common. This pattern was similar to study conducted by Gural Singh Sachdeva et.al(14). Other common ECG abnormalities in cerebral hemorrhage includes ST segment elevation(25%), prolonged QRS(25%), ST segment depression(16.6%), tall T wave (16.6%) and abnormal P wave(16.6%). Among the five cases of SAH enrolled in our study ST segment elevation, T wave inversion and tall T wave were most common and each was found in 40% of patients.

Among the five patients with SAH common ECG abnormalities were ST segment elevation, T wave inversion and tall T wave each found in two(40%) patients. Notably four(80%) had sinus tachycardia.

Analysing the incidence of ECG rhythm disturbances in CVA, sinus tachycardia was most common(24.4%). Among rhythm disturbances, maximum incidence of sinus tachycardia was found in subarachnoid hemorrhage(80%) followed by cerebral hemorrhage(29.1%) and cerebral infarction(18%). In our study, sinus bradycardia was most commonly seen in cerebral hemorrhage(25%) followed by cerebral infarction(6.5%).

CONCLUSION

Abnormal electrocardiogram findings are common in patients with acute cerebrovascular accidents even in the absence of

electrolyte imbalance or known organic heart disease. Seventy percentage of cases in our study had an abnormal ECG finding. ECG abnormalities like ST segment elevation, tall T wave, T wave inversion, prolonged QTc were more commonly found in cerebral infarction than in cerebral hemorrhage whereas ST segment depression was predominantly found in patients with cerebral hemorrhage. Understanding that these abnormalities are associated with acute CVA is important to avoid erroneous judgment of assigning these patients as having cardiac dysfunction. At the same time the possibility of co-existing undiagnosed cardiac abnormalities cannot be underestimated.

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