



ELECTROCARDIOGRAPHIC AND ECHOCARDIOGRAPHIC CHANGES IN CEREBROVASCULAR ACCIDENTS

General Medicine

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ABSTRACT

Background: Cerebrovascular accidents (CVA) or strokes are the most common life-threatening disorder. It is the third leading cause of death in developed countries after cardiovascular diseases and cancer. Many studies have shown CVA association with ECG changes and wall motion abnormalities in 2D Echo. Hence, the current study was undertaken to know the ECG and 2D echo changes (wall motion abnormalities) in different types of CVA's and to know whether such changes have any prognostic significance with the diseases. **Aim:** To study the different patterns in ECG and Echocardiographic changes in the case of cerebrovascular accidents and its correlation with the outcome of the patients. **Materials and Methods:** This study is done in 100 CVA patients admitted in MICU/General wards between March 2021 to September 2022 in the Department of General Medicine in Government Medical College Kadapa. ECG and 2D ECHO were done and results were analyzed with reference to age, sex and risk factors, and clinical examination. **Results:** The percentage of normal ECGs in patients who survived Stroke is 31.5% (24 out of 76), while 25% (6 out of 24) succumbed to death, 68.4% (52 out of 76) of stroke survivors had abnormal ECG. In comparison, 75% (18 out of 24) of patients who died of Stroke had abnormal ECG ($p > 0.5$) and is statistically insignificant. Among stroke survivors, 57.8% (44 out of 76) had normal 2D echo findings. In comparison, 42.1% (32 out of 76) had abnormal 2D echo study, while among patients died due to Stroke had 91.6% (22 out of 24) abnormal 2D echo finding, wherein only 9.09% (2 out of 24) patients had normal echo findings, so the mortality in abnormal 2D Echo was observed as high and was statistically significant ($p < 0.01$). **Conclusions:** The study emphasizes that most CVA patients have abnormalities in ECG and 2D ECHO. This study revealed patients with abnormal 2DECHO are associated with poor prognosis. This study revealed no statistically significant association between ECG and prognosis in CVA patients.

KEYWORDS

Cerebrovascular Accidents, 2decho, Electrocardiographs.

INTRODUCTION

Cerebrovascular accidents (CVA) or strokes are the most common life-threatening disorder. It is the third leading cause of death in developed countries after cardiovascular diseases and cancer. Cerebral infarction is responsible for about 80% of all first-ever in lifetime strokes, accounting for Primary intra cerebral haemorrhage (PICH) for 10% and sub arachnoid haemorrhage (SAH) for 5%. The incidence of Stroke worldwide is 178 per 1,00,000 population in various parts. In Western countries, the overall prevalence rate is 792 per 1 lakh of a population. CVA is capable of causing crippling morbidity in young as well as in elderly individuals. They also have remarkable social, psychological, and economic implications. Because of its wide prevalence and high cost in economic terms and human disability, cerebrovascular accidents (CVA's) has evoked much interest in the medical fraternity. Many studies have shown CVA association with ECG changes and wall motion abnormalities in 2D Echo. The changes of ECG in strokes were reported in many studies. (Bayers et al, 1947^[2], Burch et al. ^[3], 1954; Dimant J et al. ^[4], 1987). Changes in ECG following Stroke were T-wave, U-wave, ST-segment changes, QT-interval, and various arrhythmias; these ECG changes may show resemblance to those of myocardial ischemia or sometimes a myocardial infarction. Earlier it was thought that CVAs are preceded by changes in cardiac, but Burch et al. ^[3] (1956) disproved this view and found ECG changes in young patients with CVA in whom others cause, like Ischemic heart disease for ECG changes, could not be seen. Along with the ECG changes, many studies have shown wall motion abnormalities in 2D Echo following a stroke, especially with subarachnoid hemorrhages (Davies K et al. ^[5], 1991; Sakka SH et al. ^[6], 1998). Hence, the current study was undertaken to know the ECG and 2D echo changes (wall motion abnormalities) in different types of CVA's and to know whether such changes have any prognostic significance with the diseases.

Aim

To study the different patterns in ECG and Echocardiographic changes

in the case of cerebrovascular accidents and its correlation with the outcome of the patients.

OBJECTIVES

Primary Objective: -To evaluate ECG and Echo changes in cerebrovascular accidents.

Secondary Objective: -To correlate the ECG and Echo changes with the type of strokes and outcome.

Study design: A prospective cross sectional observation study.

Study setting: The study material comprised 100 patients admitted to Government Hospital, Kadapa

Study subjects: Patients admitted to General Medicine Department, Government General Hospital, Kadapa

Sample size: 100

Study period: March 2021 to September 2022

Inclusion criteria:

Cases of CVA (CT scan proved) who were admitted within 72 hours after the stroke onset were selected for the present study. Patients who were admitted beyond 72 hours after onset of Stroke were excluded as the incidence of ECG changes beyond this period was found to be infrequent.

Exclusion Criteria:

Any Traumatic cases producing neurological deficits

Infectious cause producing a stroke.

Neoplastic cases producing a stroke.

CVA cases with known underlying heart diseases, which may produce ECG and echocardiographic changes

Criteria for diagnosis:

- A Temporal profile of clinical syndrome
- Clinical examination
- CT scan imaging of the brain
- A 12 lead ECG and 2D Echo were done within 24 hrs of admission.

All the patients were subjected to investigations : Complete blood

picture Erythrocyte sedimentation rate(ESR) Renal function tes(RFT) Serum electrolytes Lipid profile

Follow-up was done to know their prognosis under two categories: Live Dead

The Results were analyzed with reference to age, sex and risk factors, and clinical examination.

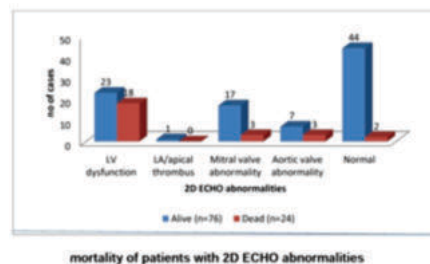
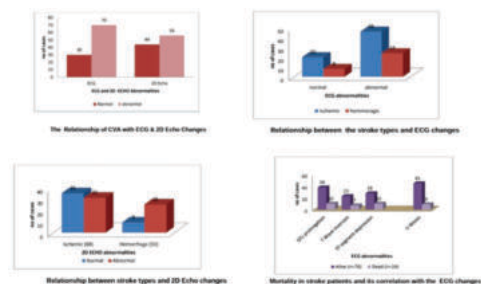
Ethical clearance: Before collection of data, all subjects were briefed about the purpose of the study and written informed consent was obtained. All investigations were done free of cost and no financial burden imposed on the patient. Ethical clearance was obtained from the institutional ethics committee.

Statistical analysis: All the data was initially entered into Microsoft Excel , and later these spreadsheets were used for analysis. Statistical analysis was done by using S.P.S.S. version 20.0.

Descriptive statistics were calculated as frequency, percentage, mean and standard deviation. Descriptive data were represented using various tables, graphs, diagrams.

For all the statistical tests of significance, a p-value of <0.05 was considered to reject the null hypothesis. For categorical nominal variables, the Chi-square test was done to test the association between the variables.

RESULTS:



DISCUSSION :

In the present study, the most common stroke-associated ECG abnormalities were U-wave abnormalities, ST depression, prolonged QTc interval, and T waves inversion found respectively in 50%, 38%, 38% and 30% of the stroke patients.

It was also observed that other ECG changes comprising pathologic Q-wave and ST-segment elevation might also occur in stroke patients, thereby mimicking an acute myocardial injury. The high frequency of ECG abnormalities in our study population is comparable to the frequency reported in the literature. According to the results of these studies, the ischemia-like ECG abnormalities and QT interval prolongation can occur in more than 90% of the patients with ischemic or hemorrhagic Stroke, and this rate will decrease by 8–40% if patients with a history of known cardiac disease and treatment by cardiac drugs are excluded. In an early study of 150 patients with acute Stroke, Goldstein^[7] detected QT prolongation in about 45%, ischemic changes in 39%, arrhythmias in 27%, and U-waves in 28% of their patients. In a study on patients with ischemic Stroke but without a history of primary heart disease, Dogan^[8] et al. found ischemia-like ECG changes in about 65% of patients, QTc interval prolongation in 26%, and arrhythmias in 44% of them. In the study of Lindgren^[9] et al., transient ST-T changes were found in 54% of patients with ischemic Stroke with no primary cardiac disease. Prominent U-wave, QT interval prolongation, and arrhythmia were observed in 17%, 13%, and 4% of them, respectively. On the other hand, in the study of McDermott^[10] et al., ST-segment depression was noted in only 8% of the selected patients without any prior history of coronary heart disease, whereas it was observed in 60% of the patients. However, the number of study patients was also limited to 51 cases.

Comparison of ECG findings in various studies						
ECG findings	Goldstein al	chan- drababu [11] et al. (2018)	Tomar [12]et al. (2014)	Present study		
				Ischemic (n=66)	Hemorrhage (n=34)	Total (n=100)
QTc	17 (32.%)	50%	41%	24(36.3%)	14(41.1%)	38%
T Wave Inversion	8(15%)	32%	30%	20 (30.3%)	10 (30.3%)	30%
ST Segment Depression	7 (13%)	36%	39%	20(30.3%)	18 (52.9%)	38%
U wave	42 (28%)	31%	53%	34 (51.5%)	18 (47%)	50%
Tachycardia	1 (2%)		41%	21 (32%)	14 (41%)	35%
Bradycardia	4(8%)		2%	3(4.5)	4(11.0%)	7%

Comparison of mortality related to ECG changes in various studies					
Type of ECG changes	chan- drababu [11] et al. (2018)	Tomar [12]et al. (2014)	Present study		
		Is- chemic(68)	Haemorrhagic(32)	Ischemic (66)	Haemorrhagic(44)
QTcprolongation	13(72.2%)	4(44.4%)	6(46.15%)	6(60%)	4(28.5%)
T wave inversion	6(33.3%)	4(44.4%)	3(23.0%)	4(40%)	3(21.4%)
ST changes	8(44.4%)	2(22.2%)	3(23.0%)	2(20%)	8(57.1%)
U waves	5(27.7%)	4(44.4%)	5(38.6%)	4 (40%)	5(35.7%)

The percentage of normal ECGs in patients who survived Stroke is 31.5% (24 out of 76), while 25% (6 out of 24) succumbed to death, 68.4% (52 out of 76) of stroke survivors had abnormal ECG. In comparison, 75% (18 out of 24) of patients who died of Stroke had abnormal ECG (p>0.5) and is statistically insignificant.

Comparison of 2D ECHO findings in various studies				
2D Echo Findings	Gagliardi et al.(%)	Uma [14] et al. (%)	Tomar et al	present study (%)
LV dysfunction	22.00	26.00	23.5	30.3
LA thrombus	--	--		1.5
Mitral valve abnormality	--	30.00	20.5	21.20
Aortic valve abnormality	18.50	20.00	4.4	9.09

Comparison of 2D echo changes in hemorrhagic Stroke		
2D ECHO changes	Tomar [12]et al. (2014)	Present study
LV dysfunction	56.25%	61.17%
LA /Apica thrombus	0.00%	0.00%
Mitral valve abnormality	0.00%	17.6%
Aortic valve abnormality	0.00%	11.76%

Comparison of mortality related to 2D ECHO changes			
2D ECHO changes	chan-drababu [11] et al. (2018)	Tomar [12] et al. (2014)	Present study%
LV Dysfunction	80%	72%	75%
LA/apical thrombus	0.0%	0.00%	0.00%
Mitral valve abnormality	15%	9.09%	12.5%
Aortic valve abnormality	10%	0.00%	12.5%

Among stroke survivors, 57.8% (44 out of 76) had normal 2D echo findings. In comparison, 42.1% (32 out of 76) had abnormal 2D echo study, while among patients died due to Stroke had 91.6% (22 out of 24) abnormal 2D echo finding, wherein only 9.09% (2 out of 24) patients had normal echo findings, so the mortality in abnormal 2D Echo was observed as high and was statistically significant ($p < 0.01$)

CONCLUSION:

ST-segment depression, QTc prolongation, and U waves are the common ECG abnormalities in patients with hemorrhagic strokes. QTc prolongation and U-waves are the common ECG abnormality in patients with ischemic Stroke.

Left ventricular dysfunction is the most common 2D echocardiographic abnormality observed in these stroke patients.

ECG abnormalities in stroke patients do not have any prognostic significance.

Left ventricular dysfunction has prognostic significance in predicting mortality in CVA.

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