



EVALUATION OF ELECTROCARDIOGRAPHY AND ECHOCARDIOGRAPHIC FINDING IN CEREBROVASCULAR ACCIDENTS

General Medicine

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ABSTRACT

Background: Stroke is common life threatening disorder. Many studies have shown CVA associated with ECG changes and wall motion abnormalities on 2D echo.

Material and method: Present cross sectional study comprised of 100 Patient admitted in a Medical College & Hospital Aurangabad, from March 2016 to February 2018.

Objectives: To study the different changes in ECG and Echocardiographic patterns in the cases of cerebrovascular accidents & to assess the different changes have got any prognostic significance in these cases.

Results: T inversion was the most common ECG change in stroke patients, occurred in 50% Haemorrhagic stroke patients & 20% Ischemic stroke patients. Reduced ejection fraction (17.14%) was the most common abnormality noted in Ischemic group whereas Diastolic Dysfunction (26.67%) was the most common abnormality noted in haemorrhagic group.

Conclusion: ECG abnormalities in stroke patients do not have any prognostic significance; also 2D Echo had no prognostic significance in predicting stroke.

KEYWORDS

Electrocardiography, Echocardiography, Cerebrovascular Accidents.

INTRODUCTION:

Stroke is commonest cause of mortality after coronary artery disease. Also it is the commonest cause of chronic adult disability. CVA or strokes are capable of causing crippling morbidity in young as well as elderly individuals. They also have marked social, psychological and economic implications. Due to its wide prevalence and its high cost in economic terms as well as human disability, cerebrovascular accidents have evoked much interest in medical fraternity.¹

Identification of the specific cause is crucial in order to choose the most optimal preventive strategy and these vary for the different subtypes of stroke. Searching for cardiac sources of stroke is a crucial part of the urgent ischemic stroke evaluation as it will change treatment decisions. There is a considerable disagreement among experts regarding the extent of cardiac testing in stroke patients. There is insufficient data to support the optimal cost effective approach.²

Even after a complete diagnostic workup up to 30% of all strokes remain classified as undetermined or cryptogenic. Most of these have embolic features and an occult cardiac source is suspected in most cases.³

Many studies have shown CVA associated with ECG changes and wall motion abnormalities on 2D echo.⁴⁻⁶ Changes occurring in ECG following stroke were T-wave, U-wave, ST-segment, QT-interval and various arrhythmias. These ECG changes may resemble those of myocardial ischemia or sometime myocardial infarction. Along with ECG changes many studies have shown wall motion abnormalities on 2D echo following stroke, especially with subarachnoid hemorrhage.⁷⁻⁸ hence, this study was undertaken to determine ECG and 2D echocardiographic changes in different types of strokes and to know whether such changes have any prognostic significance.

MATERIALS AND METHODS

The present hospital based cross sectional study was carried out in Department of General Medicine of Government Medical College and teaching Hospital, Aurangabad (Tertiary Health Care Centre) city in Maharashtra during period March 2016 to February 2018. Cases of CVA (CT scan proved) admitted within 72 hours after the onset of stroke were selected for the study, patients admitted beyond 72 hours after onset of stroke were excluded as the incidence of ECG changes

beyond this period were infrequent. Traumatic cases producing neurological deficits, infection, neoplastic cases producing CVA also excluded from the study. Permission from the Institutional Ethical Committee was taken before the start of the study.

Total 100 samples were selected by non-probability convenient sampling method. After admission a detailed history regarding the temporal profile of the stroke including history of risk factors like hypertension, diabetes mellitus, smoking, history of IHD and rheumatic heart disease were obtained. Detailed neurological examination including fundoscopy, cardiovascular examination were carried out in all the cases.

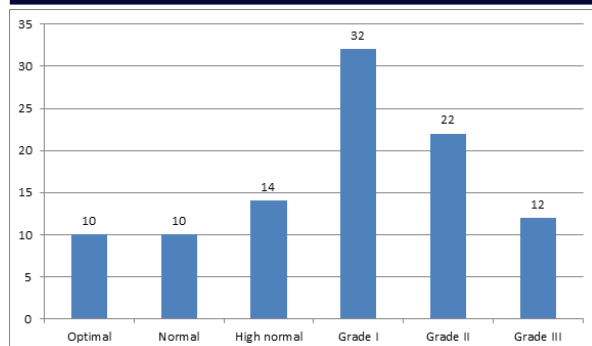
The diagnosis of CVA was made on the basis of temporal profile of clinical syndrome, Clinical examination and NCCT scan of brain. A 12 lead ECG and 2D echocardiography was done within 24 hours of admission. Data was collected using predesigned, pre-tested, semi-structured questionnaire. Data analysis was done using SPSS trial version 20.0.

RESULTS

The incidence of stroke in the present study was more common in 4th and 5th decade and there was slight male (66%) preponderance compared to females (34%) making male-female ratio of 1.9:1. (Table 1). Out of 100 samples, 32% were having grade I hypertensive, 22% were grade II, and 12% were grade III. Among others 14% were having high normal blood pressure. (Bar diag.1)

Table No.1: Age and gender wise distribution of study subject (n=100)

Age group (In years)	Gender		Total
	Male	female	
21-30	3	2	5
31-40	6	3	9
41-50	15	7	22
51-60	14	9	23
61-70	19	9	28
71-80	8	4	12
81-90	1	0	1
Total	66	34	100



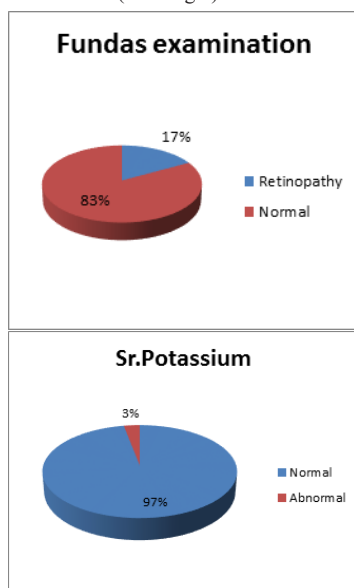
Bar diag.1: Classification of hypertensive samples in stroke patients (n=100)

Hypertension was the most common risk factor and was present in 41% of the cases, followed by smoking in 20%, history of stroke in 13%, diabetes mellitus in 12% of patients and Ischemic heart disease in 5% stroke patients. Also 14% of samples were having habit of tobacco chewing and alcoholism. (Table 2)

Table-2: Incidence of risk factors in stroke patients

Sr. No	variable	No. of cases	Percentage
1	Diabetes Mellitus		
	Yes	12	12
	No	88	88
2	Habits		
	Tobacco	14	14
	Alcohol	14	14
	Smoking	20	20
3	Past History Of		
	DM	12	12
	Hypertension	41	41
	Old CVA	13	13
	IHD	05	05

In most of study subjects sr. potassium level was normal (97%) & only 03% were having abnormal sr. potassium level. Also fundus examination reveals only 17 % samples having retinopathy whereas 83% samples were normal. (Bar diag.2)



Bar diag.2: Clinical findings in study group

ECG finding in stroke patient reveals 29% samples have t inversion on ECG, 13% has ST depression whereas 8% has arrhythmias. Findings related to 2 D Echo shows that 52 % samples had normal ejection whereas 18% had Diastolic dysfunction , 17% had reduced ejection fraction and 9% were having vulvular heart disease. NCCT brain shows that most of samples i.e. 70% had Ischemic stroke and 30% were having Haemorrhagic stroke. (Table 3)

Table-3: ECG, 2D Echo & NCCT brain findings in study group

Sr. No	variable	No. of cases	Percentage
1	ECG		
	T Inversion	29	29
	ST depression	13	13
	Arrhythmias	08	08
	QTc Prolongation	02	02
2	2 D Echo		
	Reduced ejection fraction	17	17
	Normal ejection	52	52
	Diastolic dysfunction	18	18
	Vulvular Heart Disease	09	09
3	NCCT Brain		
	Ischemic	70	70
	Haemorrhagic	30	30

The incidence of infarct was (70%) more common compared to haemorrhagic stroke (30%) and the incidence of stroke was little more common among males 58.57% , it was found statistically significant ($p < 0.05$). Also risk factors such as Smoking/Alcohol, history of diabetes/hypertension/old CVA, level of sr. potassium were statistically not significant when correlated with both type of stroke ($p > 0.05$). But the fundus examination i.e. retinopathy was found in 17 patient (10% in ischemic and 33.33% in haemorrhagic stroke) was found to be statistically significant ($p < 0.05$). (Table 4)

Table 4: Correlation of Infarct & Haemorrhage stroke with variables

Variable	Ischemia n=70		Haemorrhage n=30		Chi-Square value	p Value
	No	%	No.	%		
Male	41	58.57	24	80	4.2386	P= 0.039
Female	29	41.43	06	20		
Tobacco	07	10.00	07	23.33	1.0667	P=0.5866
Alcohol	07	10.00	07	23.33		
Smoking	13	18.57	07	23.33		
DM	09	12.86	02	6.66	4.1486	P=0.2489
Hypertension	27	38.57	14	46.67		
Old CVA	12	17.14	01	3.33		
Normal K	68	97.14	29	96.67	0.0164	P=0.8982
Abnormal K	02	02.86	01	03.33		
No retinopathy	63	90.00	20	66.67	8.103	P=0.0044
retinopathy	07	10.00	10	33.33		

It is evident that ECG abnormalities among ischemic group, T-wave (20%), ST depression (14.29%), arrhythmias (10%) and QTc prolongation (1.43%) were the most common abnormalities. In cases of hemorrhage group T-wave inversion (50%), ST segment depression (10%) and arrhythmias & QTc prolongation (3.33%) were the most common abnormalities.

There were some 2D echo abnormalities among the infarct group; reduced ejection fraction (17.14%) was most common, followed by diastolic dysfunction (15.72%) and vulvular heart disease (10%). Abnormality in cases of hemorrhagic strokes diastolic dysfunction (26.67%) was most common abnormality followed by reduced ejection fraction (16.66%) and vulvular heart disease (6.67%). Normal echo was seen in 57.14% of ischemia and 50 % in hemorrhagic stroke. (Table 5)

Table-5: ECG & 2D echo changes in stroke patients

	Ischemia (n=70)		Haemorrhage (n= 30)	
ECG Changes	No.	%	No.	%
T Inversion	14	20	15	50.00
ST depression	10	14.29	3	10.00
Arrhythmias	07	10.00	01	03.33
QTc Prolongation	01	01.43	01	03.33
2D Echo changes				
Reduced ejection fraction	12	17.14	05	16.66
Normal ejection	40	57.14	15	50.00
Diastolic dysfunction	11	15.72	08	26.67
Vulvular Heart Disease	07	10.00	02	06.67

ECG abnormalities were more common in patients of stroke. ECG abnormalities were more in hemorrhagic stroke (66.67%) compared to infarct (45.71%), which was statistically not significant ($p>0.05$).

2D Echo abnormalities were more common in patients of stroke. 2D Echo abnormalities were more in hemorrhagic stroke (50%) compared to infarct (42.86%), which was statistically not significant ($p>0.05$). (Table 6)

Table 6: Correlation between stroke types and ECG changes & 2D echo changes(n=100)

Type of stroke	No. of sample	ECG changes				Chi square value	P value
		Normal		Abnormal			
		No.	%	No.	%		
Ischemia	70	38	54.29	32	45.71	3.6935	P=0.054
haemorrhage	30	10	33.33	20	66.67		
		2D echo changes					
Ischemia	70	40	57.14	30	42.86	0.4329	P=0.5105
haemorrhage	30	15	50.00	15	50.00		

DISCUSSION:

Among the 100 patients 66 were males and 34 were females (sex ratio was M:F – 1.9:1), age ranged from 21-90 years and the mean age of patients of alive 58.73. The cases of stroke were more common in the 4th and 5th decade, making 64%, which is comparable to Venkataramana et. al.⁹ study in which the percentage of stroke cases above the age of 51 years was 41% and in the Carlo study¹⁰ was 71.8%.

In present study hypertension was the most common risk factor and was present in 41% of the cases, followed by smoking in 20%, history of stroke in 13%, diabetes mellitus in 12% of patients and Ischemic heart disease in 5% stroke patients. Also 14% of samples were having habit of tobacco chewing and alcoholism. Reports from different countries have implicated different factors associated with high risk of stroke. To evaluate the risk factors, a prospective survey of a given population of the years as done in the Framingham Study¹¹ was essential. The only epidemiological study of Abraham et al.¹² who found hypertension, diabetes mellitus, hypercholesterimea and syphilis to be the risk factors associated in hemiplegia patients. Shaper et al¹³ concluded that, hypertension, cigarette smoking and pre-existing IHD was found to be the major risk factors.

In this study, 70% of the patients has ischemic stroke, which was comparable with that found in the studies of Daniele et al.¹⁴, Roy et al.¹⁵ i.e., 78.20%, 71.00% respectively. 30% had haemorrhagic stroke in the present study comparable with 21.80%, 29% in the Danieleco et al¹⁴, Roy et al¹⁵ study group.

T-wave inversion was seen in 15% by Goldstein et al.¹⁶ while in our study it is 50%. ST-segment depression was seen in 13% in Goldstein while in the present study it was 10%. Increased QTc was seen in 32% of cases in Goldstein et al¹⁶, while in our study it is 3.33%.

In the present study, Reduced ejection fraction in ischemic stroke was present in 17.14% of cases, which is comparable to the series of Gagliardi et al.¹⁷ and Uma et al.¹⁸ who reported 22% and 26% respectively. Vulvular heart disease was present in 10% comparable to Gagliardi et. al¹⁷. who present 18.50 %. In infarct group 2D echo was normal in 57.14% comparable to Gagliardi et. al¹⁷. who present 59.50 %. Present study concludes that ECG abnormalities in stroke patients do not have any prognostic significance, similar finding were found in study by A. P. S. Tomar et al¹⁹

CONCLUSION:

T inversion was the most common ECG change in stroke patients, occurred in 50% Haemorrhagic stroke patients & 20% Ischemic stroke patients. Reduced ejection fraction (17.14%) was the most common abnormality noted in Ischemic group whereas Diastolic Dysfunction (26.67%) was the most common abnormality noted in haemorrhagic group. Hypertension was the most common risk factors comprising 41% followed by smoking 20%. Gender and fundus examination shows significant relationship with stroke. ECG abnormalities in stroke patients do not have any prognostic significance; also 2D Echo had no prognostic significance in predicting stroke.

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