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ORIGINAL ARTICLE

STUDY OF ECG AND ECHOCARDIOGRAPHIC ABNORMALITIES IN STROKE PATIENTS AND ITS PROGNOSTIC SIGNIFICANCE

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ABSTRACT: BACKGROUND: Stroke is common life threatening disorder. It is the third leading cause of death in developed countries after cardiovascular disease and cancer. **OBJECTIVE:** 1.To study ECG and 2D echocardiographic changes in different types of strokes. 2. To know whether such changes have any prognostic significance. **MATERIAL AND METHOD:** The material of study comprised of 100 Patient admitted in a Medical College & associated Hospital of central India, from May 2009 to Sept. 2011. **RESULTS:** Abnormal ECG changes were more common among hemorrhagic patients (78.12%) compared to infarct patients (67.64%). 2D echo abnormalities were more common among hemorrhage group (75%) than in infarct (44.12%). None of the ECG changes had much significance on mortality and was statistically insignificant ($p>0.05$) while LV dysfunction showed significant mortality in stroke patients and was statistically significant ($p<0.001$). **CONCLUSION:** ECG abnormalities in stroke patients do not have any prognostic significance, while LV dysfunction had prognostic significance in predicting mortality.

KEYWORDS: CVA, stroke, ECG abnormalities, Echocardiographic abnormalities.

INTRODUCION: Stroke is common life threatening disorder. It is the third leading cause of death in developed countries after cardiovascular disease and cancer.[1] Cerebral infarction is responsible for about 80% of all first ever in a lifetime strokes. For India, community surveys have shown a prevalence rate in range of 200 per 100, 000 persons, nearly 1.5 of all urban hospital admissions, 4.5 of all medical and around 20% of neurological cases.[2]The changes of ECG in CVA were reported in many studies.[3-5] 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.[6-7] 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.

MATERIAL AND METHOD: The material of the study comprised of 100 Patient admitted in a Medical College & Associated Hospital of central India, from May 2009 to Sept. 2011. INCLUSION CRITERIA: Cases of CVA 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. EXCLUSION CRITERIA: Traumatic cases producing neurological deficits, infections, neoplastic cases producing CVA. CVA cases with known underlying cardiac diseases, which produce ECG and echocardiographic changes.

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

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heart disease were obtained. Detailed neurological examination including fundoscopy and cardiovascular examination was carried out in all the cases. The diagnosis of CVA was made on the basis of following criteria:

Temporal profile of clinical syndrome, clinical examination, CT scan of brain.

RESULTS: were analyzed with reference to age, sex and risk factors and clinical examination.

	Normal		Abnormal	
	Total	%	Total	%
ECG	29	29.00	71	71.00
2D Echo	46	46.00	54	54.00

Table 1: Relationship of CVA with ECG & 2D Echo Changes

Type of Stroke	ECG Changes			
	Normal		Abnormal	
	No	%	No	%
Ischemic (n-68)	22	32.35	46	67.64
Hemorrhage (n-32)	7	21.8	25	78.12

Table 2: Relationship between stroke types and ECG changes

$p > 0.05$

Type of Stroke	ECHO Changes			
	Normal		Abnormal	
	No	%	No	%
Ischemic (n-68)	38	55.88	30	44.12
Hemorrhage (n-32)	8	25.00	24	75.00

Table 3: Relationship between stroke types and 2D Echo changes

ECG changes	Ischemic (n-68)				Hemorrhage (n-32)			
	Normal		Abnormal		Normal		Abnormal	
	No	%	No	%	No	%	No	%
QTc prolongation	43	63.23	25	36.76	16	50.0	16	50.00
T-wave inversion	47	69.11	21	30.88	23	71.87	9	28.13
ST Segment depression	47	69.11	21	30.88	14	43.75	18	56.26
U waves	33	48.52	35	51.47	14	43.75	18	56.26
Sinus tachycardia	44	64.70	24	35.29	16	50.0	16	50.0
Sinus bradycardia	68	100.0	0	0	30	93.75	2	6.25

Table 4: ECG changes in stroke patients

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ECHO changes	Ischemic (n-68)				Hemorrhage (n-32)			
	Normal		Abnormal		Normal		Abnormal	
	No	%	No	%	No	%	No	%
LV dysfunction	52	76.47	16	23.53	14	43.75	18	56.26
LA thrombus	68	100.0	-	-	32	100.0		-
Mitral valve abnormality	54	79.41	14	20.59	32	100.0	-	-
Aortic valve abnormality	65	95.58	3	4.41	32	100.0	-	-
Normal	30	44.11	38	55.88	24	75.0	8	25.00

Table 5: 2D Echo changes in stroke patients

Type of ECG changes	Ischemic (n-68)				Hemorrhage (n-32)			
	Alive (n-59)		Dead (n-9)		Alive (n-19)		Dead (n-13)	
	No	%	No	%	No	%	No	%
QTc prolongation	21	35.50	4	44.4	10	52.63	6	46.15
T-wave inversion	17	28.80	4	44.4	6	31.50	3	23.00
ST Segment depression	19	32.20	2	22.2	10	52.60	8	61.50
U Wave	31	52.54	4	44.44	13	68.42	5	38.46

Table 6: Mortality in stroke types and its co-relation with ECG changes

Type of ECG Changes	Stroke patients				P Value	Chi-square
	Alive (n=78)		Dead (n=22)			
	No	%	No	%		
QTc prolongation	31	39.74	10	45.45	p>0.05	0.23
T Wave inversion	23	29.48	7	31.8	p>0.05	0.044
ST segment impression	29	37.17	10	45.45	p>0.05	0.49
U Waves	44	56.41	9	40.90	p>0.05	1.65

Table 7: Mortality in stroke patients and its correlation with ECG changes

*The above table shows, mortality was higher in patients of stroke with QTc prolonged (45.45) and ST segment depression (45.45%) followed by U waves (40.90) and least was with T-wave inversion (31.8%), but none of them were statistically significant.

2D Echo Changes	Ischemic				Hemorrhage			
	Alive		Dead		Alive		Dead	
	No	%	No	%	No	%	No	%
LV dysfunction	12	20.33	4	44.40	6	66.66	12	92
LA thrombus	-	-	-	-	-	-	-	-

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Mitral value abnormality	12	20.33	2	22.22	-	-	-	-
Aortic valve Abnormality	3	5.00	0	0.00	-	-	-	-
Normal	38	64.40	-	-	6	66.20	2	15.38

Table 8: Mortality in stroke types and its co-relation with 2D Echo changes

2D Echo changes	Stroke patients				P Value
	Alive (n-78)		Dead (n-22)		
	No	%	No	%	
LV dysfunction	18	23.00	16	72.72	p>0.001
LA thrombus	-	-	-	-	--
Mitral valve abnormality	12	15.38	2	9.09	p>0.05
Aortic valve abnormality	3	3.84	-		--
Normal	44	56.41	2	9.09	p<0.01

Table 9: Mortality in stroke patients and its co-relation with Echo changes

†Above table shows mortality in patients of stroke was higher with LV dysfunction (72.72%) (p<0.001) and was statistically significant followed by mitral valve abnormality (9.09) (p>0.05).

DISCUSSION: A hospital based prospective study was done to know whether the ECG and 2D echo changes had any prognostic significance in stroke patients. Increased QTc was seen in 32% of cases in a study Goldstein et al, while in our study it was 41%. T-wave inversion was seen in 15% by Goldstein et al while in this study it was 30%. ST-segment depression was seen in 13% in Goldstein while in the present study it was 20%. U-wave was seen in 28% in Goldstein et al, while in this study it was seen in 53%. Tachycardia was seen in 2% in Goldstein et al while in this study it was 40%. Bradycardia was seen in 8% in Goldstein et al[8], while in the present study it was 2%.

In the present study, LV dysfunction in ischemic stroke was present in 23.53% of cases, which is comparable to the series of Gagliardi et al (1985) and Uma et al (1999) who reported 22% and 26% respectively. Mitral valve abnormality was present in 14% which is comparable to the study by Uma et al (1999) who reported 30% incidence. Aortic wall abnormality in present study was 3% compared to the other studies it varied, Gagliardi et al (1985) and Uma et al (1999) who reported 18.5% and 20% respectively.[9-10]

In infarct group 2D echo was normal in 55.88% (38 out of 68 patients) while LV dysfunction was seen in 23.53% (16 out of 68 patients) and mitral valve abnormality in 20.59% (14 out of 68 patients) and aortic wall abnormality in 4.41% (3 out of 68 patients) and no patients had LA thrombus.

In the hemorrhage group a high number of patients 18 out of 22 i.e., 56.26% had LV dysfunction. None had LA thrombus, mitral valve or aortic valve abnormality and in 25% 2 D echo was normal (8 out of 22).In the either group LV dysfunction was the most common abnormality noticed.

The percentage of normal ECG in patients who survived stroke was 35% (24 out of 78), while

22.72% (5 out of 22) succumbed to stroke, 79% (54 out of 78) of stroke survivors had abnormal ECG, while 77.27% (17 out of 22) of patients who died of stroke had abnormal ECG ($p>0.5$) and was statistically insignificant.

Among stroke survivors 56.41% (44 out of 78) had normal 2D echo findings while 43.59% (34 out of 78) had abnormal 2D echo study, while among patient who died due to stroke, 90.91% (20 out of 22) had abnormal 2D echo finding, and only 9.09% (2 out of 22) patients had normal echo findings, which was statistically significant ($p<0.001$).

SUMMARY:

(1) Abnormal ECG changes were more common among hemorrhagic patients (78.12%) compared to infarct patients (67.64%).

(2) ST segment depression (56.26%) and prominent U-waves (56.26%) followed by QTc prolongation were the most common abnormalities in hemorrhage group.

(3) Prominent U-wave was the most common ECG finding (51.47%) among infarct group, followed by QTc prolongation (36.76%) and T-wave inversion (30.88%).

(4) 2D echo abnormalities were more common among hemorrhage group (75%) than in infarct group (44.12%).

(5) LV dysfunction was the most common abnormality noted in both groups i.e., infarct (23.53%) and hemorrhage (56.26%) followed by mitral wall and aortic wall abnormality i.e., 20.59% and 4.41% respectively among infarct group.

(6) None of the ECG changes had much significance on mortality and was statistically insignificant ($p>0.05$).

(7) LV dysfunction showed significant mortality in stroke patients and was statistically significant ($p<0.001$).

CONCLUSION: ST segment depression, QTc prolongation and prominent U were the common ECG abnormalities in hemorrhagic strokes while QTc prolongation and prominent U-waves were the common ECG abnormality in ischemic stroke. LV dysfunction was most common 2D echocardiographic abnormality in stroke patients. ECG abnormalities in stroke patients do not have any prognostic significance. While LV dysfunction had prognostic significance in predicting mortality in CVA**.**

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