Original Article

Echocardiographic evaluation of left ventricular function in patients with acute onset stroke and its prognostic significance

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Abstract
Introduction: *Research was conducted to determine if 2D echocardiography changes in various types of cerebrovascular accidents had any prognostic significance. With this a study was conducted to evaluate left ventricular function in acute onset stroke using 2D-Echocardiography.*
Methods: *It was a cross-sectional study conducted in the department of General medicine of GSL Medical College. Study was conducted between October 2019 and March 2021.The study protocol was approved by the institutional ethics committee. Informed written consent was obtained from all the study participants. Those <20 years, traumatic patients with neurological defects, those with abnormal 2D echo findings, neoplastic patients, unwilling individuals were excluded from the research. Detailed neurological examination, including fundoscopy and cardiovascular examination, were carried. Necessary relevant investigations such as hematological parameters, 2D Echo, ECG were carried as per the institutional protocol. Results were analyzed regarding age, sex, and other risk factors and in relation to Echocardiographic evaluation of left ventricular function. P <0.05 was considered statistically significant.*
Results: *Majority were in 50 – 59 (30.4%) years group; the mean age was 56.13 ± 14.07 years. Male female ratio was 1.7. Hypertension was the leading (51%; 47) risk factor. CT findings reveal that 68.48% (63) had ischemic stroke (IS) Among the IS, normal ECG was detected in 20.6% and it was 6.6% in HS group. Those showed abnormal ECG changes, 48.9% were survived and 23.9% were dead. In the normal ECG findings, it was 22.8% and 4.35%, respectively.*
Conclusions: *IS was the leading risk factor. With ECHO, statistically there was significant in the dead criteria. Small sample size and short duration are the limitations of this research.*
Keywords: *Stoke, hypertension, patients.*

Introduction

Cardiac disease is the leading cause of stroke next to age and hypertension.[1] Demographic changes, urbanization and increased exposure to the risk factors are the reported factors for the high stroke burden especially in the South Asian countries.[2]

Stroke is a devastating and disabling clinical condition leads to a significant economic loss. For the last 2 decades, as per the data, there is 68% rise in the stroke. Moreover, report says that the burden of stroke is 31% those <20 years.[3]

In India, 20% of stroke patients require hospitalization and the mean age was <40 years.[4] As per one of the reports by government of India, there will be 1.67 million stroke cases; high prevalence of hypertension, diabetes, dyslipidemia, the fast changing lifestyles were reported to be the causes for this huge number. [5]

There is a correlation between cerebrovascular accidents to regional wall motion abnormalities. These changes can be detected by 2D echocardiography. Davies KR et al.[6] and Sakka SG et al.[7] reported regional wall motion abnormalities. As a result, research was conducted to determine if 2D echocardiography changes in various types of cerebrovascular accidents had any prognostic significance. With this a study was conducted to evaluate left ventricular function in acute onset stroke using 2D-Echocardiography.

Methods

It was a cross-sectional study conducted in the department of General medicine of GSL Medical College. Study was conducted between October 2019 and March 2021.The study protocol was approved by the institutional ethics committee. Informed written consent was obtained from all the study participants and those willing to sign were included.

The risks and benefits involved in the study and the voluntary nature of participation were explained before obtaining consent. The confidentiality of the study was assured. Individuals aged > 20 years, CT scan proved cases of stroke admitted within 72hours after the onset were included in this research. Those <20 years, traumatic patients with neurological defects, those with abnormal 2D echo findings, neoplastic patients, unwilling individuals were excluded from the research.

After admission, detailed history regarding the onset and progression of the stroke was collected. The risk factors such as diabetes mellitus, hypertension, smoking, history of IHD, and rheumatic heart disease and so on were recorded. Detailed neurological examination, including fundoscopy and cardiovascular examination, were carried out. Necessary relevant investigations such as hematological parameters, 2D Echo, ECG were carried as per the institutional protocol. In hospital follow up was done until discharge, and after that, the patient was followed up at monthly intervals for one year. Results were analyzed regarding age, sex, and other risk factors and in relation to Echocardiographic evaluation of left ventricular function.

Statistical Analysis

Statistical analysis was carried using SPSS version 16.0. Descriptive statistics such as mean and standard deviation for quantitative variables, frequency and proportion for categorical variables was included. All Quantitative variables were checked for normal distribution within each category of an explanatory variable by using visual inspection of histograms and normality Q-Q plots. $P < 0.05$ was considered statistically significant.

Results

Majority were in $50 - 59$ (30.4%) years group; the mean age was 56.13 ± 14.07 years. Gender wise, 63% (58) were male and male female ratio was 1.7 (Table 1) .Hypertension was the leading (51%; 47) risk factor followed by smoking (32%; 29) and diabetes (15%; 14).

CT findings reveal that 68.48% (63) had ischemic stroke (IS) and 31.52% (29) had hemorrhagic stroke (HS). ECG findings showed abnormal findings in 73% (67) and it was 55% (51) with ECHO. Among them IS individuals, normal ECG was detected in 20.6% and it was 6.6% in HS group; statistically there was no significant difference. Whereas, with ECHO, 31.5% were

abnormal in IS and 23.9% in HS group and the difference was statistically significant (Table 2). Those showed abnormal ECG changes, 48.9% were survived and 23.9% were dead. In the normal ECG findings, it was 22.8% and 4.35%, respectively. Statistically the difference was not significant. Whereas, with normal ECHO changes participants, 26% were survived and 18.5% were dead; statistically the difference was significant (Table 3).

Table 1: Age wise distribution of the study patients; n (%)

Age	Male	Female	Total
20 – 29	1 (1.09)	1 (1.09)	2 (2.2)
30 – 39	7 (7.6)	3 (3.2)	10 (10.9)
40 – 49	8 (8.7)	6 (6.5)	14 (15.2)
50 – 59	19 (20.6)	9 (9.8)	28 (30.4)
60 – 69	15 (16.3)	8 (8.7)	23 (25)
70 – 79	6 (6.5)	4 (4.3)	10 (10.9)
80 – 89	3 (3.2)	2 (2.2)	4 (4.4)
90 – 99	0	1 (1.1)	1 (1.1)
Total	58 (63)	34 (36.9)	92 (100)

Table 2: Correlation between the type of stroke and changes in ECG, ECHO among the study participants; n (%)

Stroke	ECG		ECHO	
	Normal	**Abnormal**	**Normal**	**Abnormal**
IS	19 (20.6)	44 (47.9)	34 (36.9)	29 (31.5)
HS	6 (6.6)	23 (25)	7 (7.6)	22 (23.9)
Total	25 (27.1)	67 (72.9)	41 (44.5)	51 (55.4)
	92 (100)		92 (100)	
Statistical analysis	$\Psi^2 = 0.89$; P = 0.342.		$\Psi^2 = 7.15$; P = 0.005	

Table 3: Correlation between mortality rates with ECG, ECHO changes among study participants; n (%)

Outcome	ECG		ECHO	
	Normal	**Abnormal**	**Normal**	**Abnormal**
Survived	21 (22.8)	45 (48.9)	24 (26)	45 (48.9)
Death	4 (4.35)	22 (23.9)	17 (18.5)	6 (6.6)
Total	25 (27.1)	67 (72.9)	41 (44.5)	51 (55.4)
	92 (100)		92 (100)	
Statistical analysis	$\Psi^2 = 2.5454$; P = 0.1106.		$\Psi^2 = 10.69$; P = 0.001076	

Discussion

Stroke is one of the most common causes of death and disability in India. The prevalence of stroke was 84 to 262 per 1 lakh in rural and 334 to 424 per 1 lakh urban population.[8] The incidence rate is 119 to 145 per 1 lakh which is based on recent population-based studies. In the current study, the incidence of stroke was detected in 66 (71.7%) study population. In another Indian study it was reported to be 41%.[9] whereas as per Carlo et al.[10] study findings, stroke incidence was 72% (3230/4499).

As per the study findings, majority (30.4%; 28) were in 50 – 59 age group followed by 60 – 69 (25%; 23). From the other Indian studies the mean age for prevalence of stroke was reported to be 66 years[4] and 55 years.[11] Gender wise, 63% were male and 37% were female; these findings reveal that male population are at risk of developing stroke compared to the female. Around 3 decades ago, in India, male is responsible for outdoor

household work which includes earnings. Whereas the current scenario is not like that. In addition, female population is more responsible and they are more conscious towards health. Literature also revealed the quality lifestyle related to stoke is better among the female. [12] This could be the reason for low stoke prevalence among the female.

In this study, hypertension was the leading (51%; 47) risk factor followed by smoking (32%; 29) and diabetes (15%; 14). In the literature also hypertension was reported to be the leading. [13] Due to the abnormality in heart function those with hypertension are at high risk to develop stroke. In addition, life style is also one of the important contributory factors for developing stroke. But the data is not presented in this.

In current study, 68.8% (63) had IS and 31.5% (29), HS; statistically the difference was significant in ECHO study (Table 2). Almost similar findings were reported in the literature.[14 – 16] IS was reported to be 78.2%, 71% and 93.3%, respectively in the study's reported by Daniele et al. [14], Roy et al. [15] and Mikolich et al.[16] Whereas, HS was reported to be 31.5%, 29% and 6.6%, respectively in the studies reported by Daniele et al. [14], Roy et al. [15] and Mikolich et al.[16] But the statistical analysis was not reported in these studies.

In this research, the mortality rate was 28.26%; it was 4.35% among the individuals with normal ECG study and 23.9% with abnormal ECG study and statistically there was no significant difference. However, it was 18.5% and 6.6%, respectively in those with normal and abnormal ECHO study's and the difference was statistically significant (Table 3). As per the research published by Purushothaman S et al. [17] the mortality rate were 5.2% and 27% respectively in normal and abnormal ECG findings. It was 21% and 8% respectively in normal and abnormal ECHO study.

In the current study, among the dead IS patients, 6.35% were found with LV dysfunction, 4.7% with LV hypertrophy showed mitral valve abnormalities. Whereas, it was 41.3% and 37.9%, respectively among the dead IH patients. Statistically, the difference significant in LV hypertrophy with normal ECHO and no significant correlation in mitral and aortic valve abnormalities with normal ECHO. As per the study by Togha M et al.[18] significant correlation was reported in in mitral and aortic valve abnormalities with normal ECHO.

Conclusions

Hypertension was the leading risk factor for stroke and male around 55 years group are at risk. IS was the leading. With ECHO, statistically there was significant in the dead criteria. Small sample size and short duration are the limitations of this research.

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