

## Cardiac Function Assessment By Echocardiography In Ischemic Stroke/Non Hemorrhagic Cerebral Infarction

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### Abstract

**Background:** Every year, more than half a million people in the world suffer from acute cerebrovascular events, including ischemic stroke, intracerebral and subarachnoid hemorrhage, giving a mortality of nearly 20%. Acute strokes, especially subarachnoid hemorrhage is frequently accompanied by a variety of electrocardiographic (ECG) abnormalities. **Objective:** To find out the cardiac function assessment by echocardiography in ischemic stroke/non hemorrhagic cerebral infarction. **Material and Methods:** An observational study was conducted in Department of Medicine and Cardiology, Sher-E-Bangla Medical College Hospital, Bangladesh from July to December-2019. 51 patients of ischemic stroke were taken and 2D transthoracic echocardiography was done to find potential cardioembolic abnormalities. **Results:** 74.5% of patients had echocardiographic abnormalities and 41.1% had potential cardioembolic abnormalities, out of which most common were ventricular wall hypokinesia, calcific aortic valve, rheumatic heart disease and dilated cardiomyopathy. The prevalence was almost similar in different age groups and both the sexes. **Conclusion:** Prevalence of potential cardioembolic abnormalities is high (41.1%) in ischemic stroke patients and 2D echocardiography is therefore recommended in the management and secondary prevention of cardioembolic stroke, which has a higher mortality and more chances of recurrence than atherothrombotic type of ischemic stroke.

**Keywords:** Stroke, echocardiography, potential cardioembolic abnormalities, cardioembolic stroke.

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## INTRODUCTION

Every year, more than half a million people in the world suffer from acute cerebrovascular events, including ischemic stroke, intracerebral and subarachnoid hemorrhage, giving a mortality of nearly 20% [1]. Acute strokes, especially subarachnoid hemorrhage is frequently accompanied by a variety of electrocardiographic (ECG) abnormalities [2, 3], some of which may be indistinguishable from those seen in association with an episode of severe myocardial ischemia and/or infarction. In addition, patients often have simultaneous hypertension or coronary atherosclerosis, leading to ECG abnormalities. CNS infarction is defined as brain, spinal cord, or retinal cell

death attributable to ischemia, based on pathological, imaging, or other objective evidence of cerebral, spinal cord, or retinal focal ischemic injury in a defined vascular distribution; or clinical evidence of cerebral, spinal cord, or retinal focal ischemic injury based on symptoms persisting  $\geq 24$  hours or until death, and other etiologies excluded [4]. Strokes are a major cause of morbidity and mortality worldwide [5]. They may result from brain infarction or haemorrhage. Majority are due to ischemic cerebral infarction [6]. Ischemia may result from occlusion of blood vessels due to a disease process intrinsic to carotid and intracranial vessels or may relate to coexisting heart diseases, predisposing to embolic phenomenon [7]. About 20% of ischemic stroke and

TIAs are probably due to embolism from the heart. The most common cause being non-rheumatic atria fibrillation. Stroke is the leading cause of disability and the second most common cause of death worldwide [8, 9]. Cardio embolic cerebral infarction accounts approximately for one quarter of all cerebral infarcts [10]. In most cases, recurrence of cardio embolism can be prevented by oral anticoagulants. Therefore, for a patient with a cerebral infarct, early confirmation of a diagnosis of cardio embolic cerebral infarction is extremely important in order to initiate anticoagulation therapy for an adequate secondary prevention [11]. The present study was conducted for finding the prevalence of cardioembolic abnormalities in patients of non-hemorrhagic stroke.

## MATERIAL AND METHODS

An observational study was conducted in Department of Medicine and Cardiology, Sher-E-Bangla Medical College Hospital, Bangladesh from July to December-2019. 51 patients diagnosed as cerebrovascular accident, confirmed to be of non haemorrhagic nature on CT scan/MRI were taken. All patients were subjected to detailed history after taking consent and detailed systemic examination and investigations were performed. Patients diagnosed as cerebrovascular accident, confirmed to be of non haemorrhagic on CT scan/MRI were included in the study and those having intracranial hemorrhage and venous infarctions were excluded. This was a cross sectional single centre type of echocardiographic study of 51 patients with ischemic stroke undertaken to investigate the potential cardiac abnormalities as cause for ischemic stroke. A Trans Thoracic Echocardiography (TTE) examination was performed in all subjects using available portable Colour Doppler Echocardiography (Samsung S-40) machine with an adult transducer of 2.5M Hz (Sonosite USA). Parasternal long-and short-axis, apical 4 chamber and two chamber views were obtained. All the measurements were done according to the American Society of Echocardiography guidelines and all the abnormalities were diagnosed according to the standard guidelines. All the significant cardiac findings on

echocardiography were noted. Following are the potential cardioembolic abnormalities considered:

- Rheumatic heart disease
- Atrial fibrillation: Absence of 'A' wave on colour doppler.
- Infective/non infective endocarditis:
- Patent foramen ovale:
- Hypokinesia/akinesia of ventricular wall:
- Calcific aortic valve: An echo-dense lesion.
- LA/LV thrombus:
- Cardiac myxoma
- Prosthetic valve
- Atrial septal aneurysm
- Paradoxical embolism and congenital heart disease

The data was collected and analysed Chi square test was used.

## RESULTS

This is a Cross sectional single centre type of echocardiographic study of 51 patients with non-hemorrhagic cerebral infarction undertaken to investigate the potential cardiac abnormalities as cause for ischemic stroke. 51 patients diagnosed as cerebrovascular accident, confirmed to be of non haemorrhagic nature on CT scan/MRI were taken. Following observations were made the youngest patient was 32 years old and oldest 80 year old. The mean age of the patients was 56.42 with SD of 12.32. Maximum incidence was in 45-65 year age group. Both males and females were almost equally represented in the study. Stroke incidence rates are generally relatively higher in males than females. In this study females constituted 54.9% of cases and males 44.1% of cases, the difference may be due to small sample size. Atrial fibrillation was found in 3.9% of cases in that study compared to 4% in our study. Bundle branch blocks i.e. LBBB and RBBB were found to be in 6% cases each as compared to 2 and 7 in that same study. In this study most common abnormalities found were left ventricular hypertrophy (33.3%), followed by diastolic dysfunction (31.3%), hypokinesia/akinesia of ventricles in 19.6% cases, valvular findings in 19.6% cases and systolic dysfunction in 15.6% of cases.

**Table 1: ECG finding (N=51)**

Findings	Number	percentage
Atrial Fibrillation	2	3.9
Ischemic Heart Diseases	7	13.7
LBBB	3	5.8
RBBB	3	5.8
LVH	9	17.6

**Table 2: Echocardiographic findings (N=51)**

Findings	Number	percentage
Left Ventricular Hypertrophy	17	33.3
Diastolic Dysfunction	16	31.3
Hypokinesia/Akinesia Of Ventricles	10	19.6
Valvular	10	19.6
Systolic Dysfunction	8	15.6
Ventricular Wall Hypokinesia,	1	1.9
Calcific Aortic Valve	6	11.7
Rheumatic Heart Disease	4	7.8
Dilated Cardiomyopathy	4	7.8
Normal Echocardiographic	12	23.5

## DISCUSSION

In this study, an echocardiographic evaluation was done for all 51 patients included in the study. 13 (25.4%) patients had normal echocardiographic data, while 38 (74.6%) patients had some abnormal finding on echocardiography. Potential cardioembolic abnormality, identified by transthoracic echocardiography was found in 41.1% of the cases. Stroke incidence rates are generally relatively higher in males than females. In this study females constituted 54.9% of cases and males 44.1% of cases, the difference may be due to small sample size. In our study ECG was found to be abnormal in 41.1% cases. LVH was found to be the most common abnormality in 17.6% cases on ECG which is quite comparable to a study by Goldstein *et al.*, [12] in which LVH was found in 21.5% cases. Atrial fibrillation was found in 3.9% of cases in that study compared to 4% in our study. Bundle branch blocks i.e. LBBB and RBBB were found to be in 6% cases each as compared to 2 and 7 in that same study. In this study most common abnormalities found were left ventricular hypertrophy (33.3%), followed by diastolic dysfunction (31.3%), hypokinesia/akinesia of ventricles in 19.6% cases, valvular findings in 19.6% cases and systolic dysfunction in 15.6% of cases. Potential cardioembolic abnormalities were present in 42% cases as compared to a study done by N. Uma *et al.*, [13] at Lady Hardinge Medical College and Associated Smt. Sucheta Kriplani and Dr. Ram Manohar Lohia Hospitals, New Delhi where potential cardioembolic source was found in 27 (54%) patients. Most common abnormalities found were left ventricular wall hypokinesia in 13 (26%) followed by mitral regurgitation in 9(18%) and aortic valve calcification in (14%) patients. This difference may be due to small sample size (51 cases) in both the studies. Zenkers *et al.*, [14] also reported a similar result and found a potential cardioembolic source in 50% patients evaluated by transthoracic echocardiography. Infarction secondary to cerebral embolism was diagnosed in 127 (23.5%) of 540 patients in the Michael Reese Stroke Registry [15]. Coronary artery disease, atrial fibrillation, valvular heart disease, mitral annulus calcification, and cardiomyopathy were the commonest etiologies. Echocardiography documented a potential

embolic source in 7 patients without previously known heart disease and clarified the cardiac pathology in many of the patients with known heart disease. In a study by Sandercock P *et al.*, [16] 244 patients of cerebral infarction were studied. Potential cardioembolic sources were found in 31% of patients. Gagliardi *et al.*, [17] studied frequency of echocardiographic abnormalities in patients with ischemia of the carotid territory. Only 5 (18.5%) of the 27 patients with abnormal angiograms had a potential cardiac source of emboli while 24 (47%) out of the remaining 51 patients had a potential cardiac source demonstrated at echocardiography. In our study the Left ventricular ejection fraction was compared in patients with a potential cardioembolic abnormality and those without a potential cardio embolic abnormality. Ejection fraction was found to be significantly lower ( $p < 0.05$ ) in the group with potential cardio embolic abnormalities (56.06%) than the group without potential cardio embolic abnormalities (41.14%). Low EF was a risk factor for stroke in the multiethnic North Manhattan (NOMASS) population cohort, independently of age, sex and ethnicity; however, risk of stroke was not related to severity of EF reduction [18]. Our major finding was an increased number of patients with abnormal T-wave, posterior fossa bleedings, and more rhythm disturbances for ischemic lesions, localized in the anterior fossa. Thus, from these various observations, it has not been possible to establish a clear correlation between the location of the intracranial disorder and a specific ECG abnormality. Since we did not routinely perform thoracic echocardiography and other investigations such as stress echocardiography, myocardial scintigraphy, and scanning techniques for coronary artery territory, asymptomatic coronary heart disease may have remained undetectable.

## CONCLUSION

Strokes are a major cause of morbidity and mortality. More than 39.2% of ischemic stroke patients have potential cardioembolic abnormalities. Cardioembolic stroke has higher mortality and recurrence rates. 2D echocardiography is the main stay in diagnosing cardiac source of embolus. Many patients

with no apparent clinical or ECG evidence of cardiac disease can be identified with echocardiography. 2D ECHO is recommended in every ischemic stroke patient to find potential cardioembolic abnormalities which will guide in the management of stroke, use of anticoagulants and secondary prevention of stroke.

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