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The Relationship between Left Atrial Dysfunction and Ischemic Stroke Etiology 2D Speckle Tracking Echocardiography Study

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ABSTRACT

Background: Adult stroke, particularly cardioembolic stroke, is a prominent consequence of mortality and illness, but the cause is frequently unknown.

Aim of the work: To study role of left atrial dysfunction as an etiological factor in ischemic stroke using 2D speckle tracking echocardiography.

Patients and Methods: The Al-Hussein Hospital Al-Azhar University hosted this prospective cohort study. The TOAST classification was used in this study, which included 40 patients with ischemic stroke.

Result: The ECHO- LAD in the study population ranged from 2.1 to 5.3 with mean ± SD = 3.11 ± 0.86. The ECHO- AO in the study population ranged from 2 to 5.1 with mean ± SD = 3.41 ± 0.71. The ECHO- LVEDd in the study population ranged from 4 to 5.9 with mean ± SD = 4.89 ± 0.51. The ECHO- LVESd in the study population ranged from 2 to 5.2 with mean ± SD = 3.46 ± 0.71. The ECHO- EF in the study population ranged from 37 to 77 with mean ± SD = 56.15 ± 9.96. The ECHO- FS in the study population ranged from 18 to 44 with mean ± SD = 32.2 ± 8.45.

Conclusion: 2D-STE is a quick and dependable approach for assessing dynamic LA functions in patients with ischemic stroke. Hypertension , diabetes, carotid artery stenosis and atrial Fibrillation were potential risk factors for ischemic stroke.

Keywords: *2D speckle; Echocardiography; Ischemic stroke etiology; Left atrial dysfunction.*

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INTRODUCTION

Stroke is a prominent consequence of death and sickness in grownups, particularly cardioembolic stroke, yet the reason is often unknown.[1]

Cryptogenic strokes occur for 25–40% of ischemic strokes, with thromboembolic strokes accounting for the bulk of cryptogenic strokes.

The thrombus is assumed to have formed as a result of a number of well-known potential embolic sources, such as minor-risk or hidden cardiac sources, paradoxical embolization in veins, and non-occlusive atherosclerosis lesions in the aortic arch, vertebral, or cerebral arteries.[2]

Approximately 10% of individuals hospitalized for an incident ischemic stroke or temporary ischemic attack were recently indicated with AF.[3]

According to previous research, unexplained AF may be present in 20% to 28% of individuals with uncertain aetiology stroke.[4]

Paroxysmal atrial fibrillation is the greatest prevalent occult reason, with severe disease and expense if left untreated. On the other hand, detecting paroxysmal atrial fibrillation is challenging. During normal stroke workup, 24-hour monitoring is now often employed as the recommended way of detecting pAF.[5]

Echocardiography may be used to measure atrial size and function. A new technique called speckle tracking echocardiography can be utilized to evaluate left atrial size and activity.[6]

Furthermore, even in individuals with a low risk of stroke, LAS was a prediction of stroke in those with chronic AF.[7]

The goal of the research was to study role of left atrial dysfunction as an etiological factor in ischemic stroke using 2D speckle tracking echocardiography.

PATIENTS AND METHODS

This was Prospective cohort research will perform in Al-Hussein Hospital Al-Azhar University. 40 patients enrolled with ischemic stroke depending on the TOAST moniker (The aetiology of stroke was classified as cardioembolic, large-artery atherosclerosis, small-vessel occlusion, undetermined, or additional etiological factors.)

Inclusion criteria: Patients between the ages of 18 and 80, those who have had an ischemic stroke, and those who have had a large-vessel infarction but no evidence of extracranial or intracranial stenosis (50 percent)

Exclusion criteria: Incarceration, gestation, bleeding stroke, significant left ventricular ejection fraction (35%) decline, extreme valvular heart condition, existence of prosthetic heart valves, and persistent endocarditis are all hazard factors.

Methods:

All subjects will be subjected to the following: Full medical history, physical exam, routine labs, basic ECG, carotid Doppler, Ct brain and Echocardiography: Current guidelines were used to determine the dimensions of the chambers of the left atrium and the chambers of the left ventricle

Left atrial volume was assessed at the end of LA diastole and systole using apical 4-chamber views. [(LA diastole – LA systole)/(LA diastole – LA systole) 100] was used to determine the LAEF. Off-line study of left atrial longitudinal deformation was performed using speckle tracking derived strain and strain rate from the apical 4-chamber image. The endocardial boundary was manually delineated at three spots in the LA using a point-and-click approach (2 in the mitral annulus and 1 in the LA roof). The program separated the LA wall into six parts, and the median was utilized for evaluation. Early ventricular filling, late diastole/atrial contraction, and ventricular systole, LASR was measured (LASRa). The strain analysis reference point was selected as the commencement of the QRS complex on the surface electrocardiogram. Because LASRa has a stronger relationship with AF onset than LASR during ventricular systole in the general population, it was chosen as the strain reference value.

Ethics, Consent and Permissions

All patients or their surrogates will write consent prior to study involvement.

Statistical Analysis: SPSS 26.0 for Windows was used to collect, tabulate, and statistically analyse all data (SPSS Inc., Chicago, IL, USA). Numbers and percentages were used to describe qualitative data. Range (minimum and maximum), mean, standard deviation, and median were used to describe quantitative data. . All statistical comparisons were statistically relevant and two-tailed. A substantial change is known as a P-value of 0.05, a very substantial variation as p 0.001, and a non-substantial variation as P> 0.05.

RESULTS

	Study population (n = 40)	
	N	%
Sex		
- Male		
n (%)	29	72.50%
- Female		
n (%)	11	27.50%
Age (years)		
Mean ± SD.	55.6 ± 11.65	
Median (IQR)	54 (49 - 58.25)	
Range (Min-Max)	53 (30 - 83)	

SD: standard deviation

IQR: interquartile range

Table 1: The research population's demographic characteristics

Number of male patients in the research population was 29 (72.50%). Number of female patients in the research population was 11 (27.50%). The Age in the study population ranged from 30 to 83 with mean ± SD = 55.6 ± 11.65.

	Study population (n = 40)
ECHO- LAD	
Mean ± SD.	3.11 ± 0.86
Median (IQR)	2.95 (2.4 - 3.5)
Range (Min-Max)	3.2 (2.1 - 5.3)
ECHO- AO	
Mean ± SD.	3.41 ± 0.71
Median (IQR)	3.55 (2.78 - 3.9)
Range (Min-Max)	3.1 (2 - 5.1)
ECHO- LVEDd	
Mean ± SD.	4.89 ± 0.51
Median (IQR)	4.8 (4.5 - 5.22)
Range (Min-Max)	1.9 (4 - 5.9)
ECHO- LVESd	

Mean ± SD.	3.46 ± 0.71
Median (IQR)	3.45 (3.05 - 3.82)
Range (Min-Max)	3.2 (2 - 5.2)
ECHO- EF	
Mean ± SD.	56.15 ± 9.96
Median (IQR)	57.5 (49 - 63)
Range (Min-Max)	40 (37 - 77)
ECHO- FS	
Mean ± SD.	32.2 ± 8.45
Median (IQR)	34.5 (25.75 - 39)
Range (Min-Max)	26 (18 - 44)

Table 2: The research population's echocardiographic parameters

The ECHO- LAD in the study population ranged from 2.1 to 5.3 with mean ± SD = 3.11 ± 0.86. The ECHO- AO in the study population ranged from 2 to 5.1 with mean ± SD = 3.41 ± 0.71. The ECHO- LVEDd in the study population ranged from 4 to 5.9 with mean ± SD = 4.89 ± 0.51. The ECHO- LVESd in the study population ranged from 2 to 5.2 with mean ± SD = 3.46 ± 0.71. The ECHO- EF in the study population ranged from 37 to 77 with mean ± SD = 56.15 ± 9.96. The ECHO- FS in the study population ranged from 18 to 44 with mean ± SD = 32.2 ± 8.45.

	Study population (n = 40)	
	n	%
AF		
n (%)	6	15%
Carotid stenosis		
Mean ± SD.	38.92 ± 6.24	
Median (IQR)	39 (35 - 45)	
Range (Min-Max)	23 (25 - 48)	

Table 3: Stroke risk parameters in the study subjects

Number of patients with AF in the study population was 6 (15%). The Carotid stenosis in the study population ranged from 25 to 48 with mean ± SD = 38.92 ± 6.24.

DISCUSSION

Strokes account for 10% of all deaths worldwide[8], with ischemic strokes accounting for two-thirds of all cases.A significant and growing proportion of ischemic strokes are caused by cardiac embolism.[9]

Two-dimensional echocardiography and Doppler echocardiogram are both types of echocardiography that may be used to monitor left atrial (LA) performance noninvasively. These approaches' indicators of LA performance have been proven to estimate unfavorable cardiovascular outcomes. [10]

The current study revealed demographic characteristics of the study population. that there were 29 male patients in the study population (72.50 percent). Number of female patients in the study population was 11 (27.50%). The Age in the study population ranged from 30 to 83 with mean ± SD was 55.6 ± 11.65. Also, in similar to the present research Leong et al., [11] sought to see whether LA reservoir strain, used as an assess of LA compliance by speckle-tracking echocardiography, is compromised in patients with cryptogenic stroke (CS) with no history of atrial fibrillation. There were 742 patients in the trial (median age, 59 6 13 years; 54 percent men; 371 with CS and 371 control participants).

Regarding echocardiographic parameters of the study population, the current study showed that the ECHO- LAD in the study population ranged from 2.1 to 5.3 with mean ± SD = 3.11 ± 0.86. The ECHO- AO in the study population ranged from 2 to 5.1 with mean ± SD = 3.41 ± 0.71. The ECHO- LVEDd in the study population ranged from 4 to 5.9 with mean ± SD = 4.89 ± 0.51. The ECHO- LVESd in the study population ranged from 2 to 5.2 with mean ± SD = 3.46 ± 0.71. The ECHO- EF in the study population ranged from 37 to 77 with mean ± SD = 56.15 ± 9.96. The ECHO- FS in the study population ranged from 18 to 44 with mean ± SD = 32.2 ± 8.45.

While, the study by Sasaki et al., [12] reported that the mean LAD in patients with LA dysfunction was 4.9 ± 0.7 cm which was much greater than those who did not have LA dysfunction. Also, in patients with LA dysfunction the mean value of LVDD 4.9 ± 0.7 and LVEF was 60 ± 13 which was comparable with control group. In addition, the study showed that there mean LAEF was 19.5 ± 9.4 which was significantly lower than the patients without LA dysfunction.

In agreement with our results Bhat et al., [13] wanted to investigate LA function in order to learn more about the etiology of cryptogenic stroke. Reported that the mean LVEDD in patients with stroke was 4.9 [range: 4.4-5.3], LVESD was 2.9 [2.7-3.2] and LVEF was 63 [58-66]. The researchers also found no statistically significant differences in LV parameters, including measures of LV size and activity, between controls and young patients with cryptogenic stroke. Although there were no significant variations in measures of LA volume (p = 0.779), stroke patients had lowered LA function than healthy controls, as evidenced by a lower LA emptying fraction (p = 0.009), LA expansion index (p = 0.009), and LA GLS (p = 0.008).

Also, the study by Ble et al., [14] The goal of this investigation was to utilize speckle tracking

echocardiography to assess atrial anatomy and response in patients with cryptogenic strokes (CrS) and to use an implantable cardiac monitor to identify silent AF. AF patients exhibited increased atrial volume and lower atrial function, according to the research: peak atrial longitudinal strain (PALs) 19.6 ± 5.7 percent vs. 29.5 ± 7.2 percent, peak atrial contraction strain (PACs) 8.9 ± 3.9% vs. 16.5 ± 6%, LAEF 46.8 ± 11.5% vs. 60.6 ± 5.2 percent; p < 0.001.

Morris et al., [15] combining LA strain throughout LV systole to LA volume in LVDD assessment enhanced the incidence of LVDD diagnosis, according to current LV diastolic function evaluation standards (from 13.5 to 23.4 percent) 16. In patients with intact ejection fraction and regular LA volume, aberrant LA strain at the reservoir phase (23%) was found to be substantially linked with a poorer New York Heart Association class and a greater probability of HF hospitalization at 2 years. [16]

Potter et al., [17] shown that replacing LA strain for LA volume is effective Throughout the reservoir stage, The proportion of patients with intermediate LV diastolic function reduced (from 18.6% to 4.7%), the bulk of patients were categorized as having normal LV diastolic activity, and the relationships between LV diastolic activity and outcome in asymptomatic persons with HF complications remained unchanged. These results imply that future LV diastolic function assessments should take LA strain into consideration during the reservoir stage.

Regarding the Stroke risk parameters in the study population, the current study showed that Number of patients with AF in the study population was 6 (15%). The Carotid stenosis in the study population ranged from 25 to 48 with mean ± SD = 38.92 ± 6.24.

While, according to Sasaki et al. 12, the incidence of AF in patients with acute ischemic stroke was 62%. And they revealed that AF was significantly linked with LA dysfunction. Furthermore, the investigation by Ble et al., [14] revealed that the incidence of strokes in patients with AF was 18.9% and in cases without AF was 15.8%. Furthermore, the study by Dharmasaroja & Intharakham, [18] reported that severe carotid stenosis (CS) The common carotid artery and the extracranial internal carotid artery were discovered in 10.9 percent of the individuals (50 of 458 patients). The researchers discovered that age (65 years) is an important hazard factor for CS (OR 4.0, P.0001). Patients with CS had a greater rate of coronary artery condition (12 percent vs. 8 percent, P =.32), previous ischemic stroke (18 percent vs. 11 percent, P =.17), atrial fibrillation (10 percent vs. 5 percent, P =.19), and smoking (28 percent vs. 24 percent, P =.18).

CONCLUSION

2D-STE is a quick and dependable approach for assessing dynamic LA functions in patients with ischemic stroke. Hypertension, diabetes, carotid artery stenosis and atrial Fibrillation were potential risk factors for ischemic stroke. Future research is required to validate our preliminary findings.

Conflict of interest : none

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