

A Study of Correlation of Left Atrial Size with Acute Ischemic Stroke

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Abstract:-

➤ Introduction:

Left atrial enlargement has been reported to be associated with ischemic stroke. Limited data are available on the relationship of Left atrial size and Cardiogenic embolic stroke. Our aim is to access the association of left atrial size and the occurrence of acute ischemic stroke.

➤ Methods:

A cross sectional, comparative, analytical, hospital based study was carried out from 2018 to 2019 in Bir Hospital. A total of 93 patients of ischemic stroke were enrolled and 93 patients without stroke were taken as control. Transthoracic Echocardiography was done in every patients and Left atrial diameter was measured according to American echocardiography guidelines. The data were recorded in Excel a sheet and analyzed by SPSS 20.

➤ Results:

Among patients with stroke, the mean left atrial size was found to be 3.92 ± 0.73 cm. while the mean left atrial size in patients without stroke was found to be 2.98 ± 0.54 . The left atrial size has statistically significant association with presence of stroke with P value of 0.000. Two out of 135 patients with LA size <4cm had clots. Similarly One out of 36 patients with LA size 4-5cm had clot. While 2 out of 15 patients with LA size >5 cm had clot. The P value was found to be 0.027, which shows that LA size is significantly associated with presence of LA clot. Two out of 135 patients with LA size <4cm had atrial fibrillation. One out of 36 Patients with LA size 4-5cm had atrial fibrillation. 12 patients of 15 with LA size >5 cm had atrial fibrillation, and 6 of them didn't have atrial fibrillation.. The P value was found to be 0.001, which shows that LA size is significantly associated with atrial fibrillation.

➤ Conclusion:

This study shows that with increasing age, there is significant increasing risk of developing ischemic stroke. Other risk factor to develop acute ischaemic stroke are hypertension, diabetes mellitus and smoking. This study also shows that there is significant association between left atrial size and ischaemic stroke. The Left atrial size was also related to atrial fibrillation and left atrial clot.

Keywords:- Ischemic stroke; Left atrial enlargement; risk factors.

I. INTRODUCTION

Stroke is one of the most devastating of all neurological diseases, often causing death or gross physical impairment or disability.¹ It has been predicted that there will be almost 12 million stroke deaths and 70 million stroke survivors by 2030.² Pathologically, stroke can be classified into ischaemic stroke (around 80%) and haemorrhage stroke (around 20%).³

Left atrial (LA) dilation, the hallmark of LA remodelling, has been noted to be of clinical value for predicting the likelihood of cardiovascular events and all-cause mortality beyond potential risk factors.^{4,5}

Well-known definite risk factors for ischemic stroke include dyslipidemia, hypertension, diabetes mellitus, ischemic heart disease, atrial fibrillation, valvular heart disease, carotid stenosis, cigarette smoking, and obesity. We have frequently seen ischemic stroke patients with left atrial enlargement (LAE) in clinical practice. This condition indicates increased left ventricle (LV) filling pressure and the subsequent remodeling process in hypertensive heart disease.⁶

In studies performed in general populations, some authors reported association between LA size and risk of stroke, whereas others did not, and some found an association only in men or only in women.⁷ The data is scarce in our set up. Thus we decided to study about the relation between Left Atrial size and acute ischemic stroke.

II. METHODS

A cross sectional, comparative, analytical, hospital based study was carried out from 2018 to 2019 in Bir Hospital. The Ethical clearance for the research was taken from the Institutional Review Board (IRB) of the National Academy of Medical Sciences (NAMS), Bir Hospital. A total of 93 patients of ischemic stroke were enrolled and 93 patients without stroke were taken as control. Patients admitted in hospital with clinical symptomatology of stroke and positive radiological (Neuroimaging) evidences of ischemic stroke were enrolled in the study. Hemorrhagic lesion confirmed by CT scan and patients with valvular heart disease were excluded from the study. Convenient sampling technique was

applied. Transthoracic Echocardiography was done in every patients and Left atrial diameter was measured according to American echocardiography guidelines.

Left atrial diameter were measured using M-mode or two-dimensional echocardiography, from the posterior aortic wall to the posterior left atrial wall, in the parasternal long-axis view at the end-ventricular systole (i.e., just before the mitral valve opening).⁷ Any valvular lesions, presence of the chamber clots in left atrium or left ventricle and ejection fraction were also noted and echocardiographic diagnosis will be made. The data were recorded in Excel a sheet and analyzed by SPSS 20.

III. RESULTS

A total of 93 stroke patients were enrolled along with 93 patients with out stroke were taken as control. The mean age of ischemic stroke patients was 63.28 ±15.52 with a range from 30 to 94 years. Mean age of the patient with stroke thus was higher than that without stroke. The age was found to be statistically significantly associated with presence or absence of stroke (P = 0.000). Table 1.

	Patients with Stroke	Patient without stroke
No of patients	93	93
Mean Age	63.28	51.80
Standard Deviation	15.521	10.09
Maximum Age	94	70
Minimum Age	30	31
P value	0.000	

Table 1:- Age Distribution of The Study Population

Hemiplegia was the most common presentation of the patients and was present in all the cases. Other common presentations were dysarthria due to facial deviation in 68 (73.11%), aphasia in 6 (6.45%), headache in 5 (5.4%) and altered sensorium / loss of consciousness in 1.07 % patients. Stroke was found to be more predominant % in age group 70-80 followed by % in 60-70 age group. Table 2.

Age group	Patients with stroke	Patients without stroke	Total
20-30	1	0	1
30-40	5	11	16
40-50	16	29	45
50-60	15	29	44
60-70	19	23	42
70-80	21	1	22
80-90	14	0	14
>90	2	0	2
Total	93	93	186

Table 2:- Age Wise Distribution of The Study Population

The stroke was predominant in male with 52(55.91 %). The relation between stroke and age was not statistically significant. Table 3.

SEX		STROKE		Total	P value
		YES	NO		
	Female	41	51	92	0.142
	Male	52	42	94	
Total		93	93	186	

Table 3:- Sex Distribution of The Study Population

The most common risk factor in stroke patient was hypertension 58.1%, followed by smoking 51.6%, LVH 48.4%, hypercholesterolemia 28% ,diabetes mellitus 11.8%, atrial fibrillation 3.2% and coronary artery disease 1.1%. Table 4.

Risk factors	Patients with stroke n (%)	Patients without stroke
Hypertension	54 (58.1)	48 (51.6)
Hypercholesterolemia	26 (28)	14 (15.05)
Diabetes	11 (11.8)	11 (11.8)
LVH	45 (48.4)	19 (20.43)
Smoking	48 (51.6)	47 (50.53)
Atrial fibrillation	3 (3.2)	2 (2.15)
Coronary artery disease	1 (1.1)	0

Table 4:- Risk Factors of Study Population

The mean left atrial size was found to be 3.92± 0.73 in patients with stroke. The relation of ischemic stroke with left atrial size was found to be statistically significant (p= 0.000). Table 5.

Stroke	Left atrial size				P- Value
	Minimum	Maximum	Mean	Standard deviation	
Yes	2	5.2	3.9194	0.73857	0.000
No	2	4.7	2.9849	0.54233	

Table 5:- Left Atrial Size Distribution with Stroke

Two out of 135 patients with LA size <4cm had clots. Similarly One out of 36 patients with LA size 4-5cm had clot. While 2 out of 15 patients with LA size >5 cm had clot. The P value was found to be 0.027, which shows that LA size was significantly associated with presence of LA clot. Table 6.

		LA SIZE			Total	P value
		<4	4-5	>5		
LA CLOT	No	133	35	13	181	0.027 (Chi square 7.25, df 2)
	Yes	2	1	2	5	
Total		135	36	15	186	

Table 6:- Left Atrial Size Distribution With La Clots

Two out of 135 patients with LA size <4cm had atrial fibrillation. One out of 36 Patients with LA size 4-5cm had atrial fibrillation. 12 patients of 15 with LA size >5 cm had atrial fibrillation, and 6 of them didn't have atrial fibrillation. The P value was found to be 0.001, which shows that LA size is significantly associated with atrial fibrillation. Table 7.

		LA size variation			Total	P VALUE
		<4cm	4-5cm	>5cm		
Atrial Fibrillation	no	133	35	12	180	0.001 Chi square 14.85 Df 2
	yes	2	1	3	6	
Total		135	36	15	186	

Table 7:- Atrial Fibrillation and La Size

IV. DISCUSSION

This was a cross sectional descriptive, comparative study consisting of 93 patients with acute ischemic stroke and 93 patients without stroke. The age distribution of patients with stroke varied from 30 to 94 years. Maximum patients with stroke were in age group 70-80 years with mean age being 63.28 ± 15.52 . The age was significantly associated with the presence or absence of stroke. These results were similar to the study conducted by Maskey A. et al. in Manipal Teaching Hospital, Pokhara in 2010, where the mean age was 65.98 years \pm 10.69.⁹ Among patients with stroke, 44 % were female and 56 % were male. This gender distribution was not significantly associated with stroke. Study conducted by Devkota et al. in a Medical College from Kathmandu showed mean age of presentation was 61.65 years and 58.3% were male and 41.7 % were female.¹⁰ This study was comparable with our study.

The most common risks factor of stroke patient were hypertension 58.1% followed by smoking 51.6%, LVH 48.4%, hypercholesterolemia 28% ,diabetes mellitus 11.8%, atrial fibrillation 3.2% and coronary artery disease 3.2%.. These risk factors were comparable with the community based cross-sectional study done in Colombo, Sri Lanka in 2313 adults of age ≥ 18 years. Hypertension was the most common risk factor (62.5%) followed by smoking (50%), excess alcohol (45.8%), diabetes (33.3%), TIA (29.2%) and family history (20.8%).¹¹ Stroke study in Qatar showed hypertension in 63% of its population.¹²

Our study showed that LA size was significantly associated with stroke. This finding was in accordance with the finding reported by Barnes et al. 2004. In the study conducted by Emella J. Benjamin et al., through Framingham heart study left atrial enlargement was found to be the predictor of ischemic stroke in men.¹³ Similarly Alberto Bouzas et al. conducted the study in which the association of left atrial diameter with ischemic stroke was significant among women but not among men.¹⁴ In study conducted by Marco R. Di Telli et., Left atrial index was associated with ischemic stroke in the overall group .The association was present in men but not in women , and in patients aged 60 years.¹⁵ In a study conducted by Yasuhiro Hamatani et al., LAE was associated with increased risk of stroke.¹⁶ Similarly study conducted by Toshiyasu Ogata et al., showed that an increased indexed-left atrial diameter was significantly associated with elevated risk of stroke.¹⁷

Our study showed that left atrial size was significantly associated with atrial fibrillation. In the study conducted by Sanfilippo, AJ ,et al. the left atrial size was associated with atrial fibrillation.¹⁸ Similarly the study conducted by Walter P. Abhayaratna et al. showed that left atrial size was associated with atrial fibrillation.¹⁹ In the study of Tsang et al., left atrial size was found to be risk factor of atrial fibrillation.²⁰

Our study showed that Left atrial size was significantly related to left atrial clot formation. In the study conducted by NMAI-Saady,O A Obel, A J Camm, et al. noted that left atrial enlargement was associated with left atrial thrombus formation.²¹

Several reasons could be proposed to explain the association of LA enlargement with ischemic stroke. One potential mechanism is blood stasis, and thrombus formation might occur more frequently as left atrial size increase.²² It has been shown that with an increase in left atrial volume, reduced flow velocity in the left atrial appendages results in an increased risk for thrombus formation and potential for embolic stroke.^{15,22} The thrombogenicity of LA enlargement has been supported by trans-esophageal echocardiographic studies, suggesting an association between LA dilatation and spontaneous echocardiographic contrast, LA thrombus, and embolic events.²² Another proposed mechanism is that LA enlargement serves as a strong risk factor for the development of atrial fibrillation, a well established condition that increases the risk of stroke.^{15,22}

V. CONCLUSION

This study shows that with increasing age, there is a significant increasing risk of development of acute ischemic stroke. Hypertension, diabetes mellitus, hypercholesterolemia and smoking are common risk factors for acute ischemic stroke. This study shows there is significant association between left atrial size and ischaemic stroke. Left atrial size was also related to atrial fibrillation and left atrial clot. Echocardiographic evaluation of high risk groups is recommended.

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