

ORIGINAL ARTICLES

Prevalence of atrial cardiopathy in subtypes of acute ischemic stroke

Shishir Pandey, Pushpendra Nath Renjen, Dinesh Mohan Chaudhari, Priyal

Indraprastha Apollo Hospitals, New Delhi, India

Abstract

Background & Objective: Atrial cardiopathy, an abnormal and permanent structural change in atrial tissue, can occur due to inherited factors, exposure to toxins, or cardio-thoracic surgery. Histologically, it may involve myocyte hypertrophy and atrial fibrosis. Atrial electrical remodeling, a consequence of atrial cavity enlargement, leads to irreversible alterations in the density of ion channels, ion currents, and action potential duration. Our study conducted at a single center over 1.5 years examined the prevalence of atrial cardiopathy in different subtypes of acute ischemic stroke. **Methods:** We did a prospective observational single-center study over 1.5 years on 110 acute ischemic stroke patients above 18 year who presented to our hospital with first ever ischemic stroke. These patients underwent assessments for vascular risk factors, routine hematological and biochemical parameters, and neuro-radiological analysis necessary for diagnosing the stroke and determining its underlying causes. The stroke subtype of each patient was defined based on the TOAST classification, utilizing clinical data, radiological images, and investigation findings. Atrial cardiopathy was identified by the presence of any of the following criteria: PTFV1 > 5000 μ V-ms, NT-proBNP level > 250 pg/ml, or severe left atrial enlargement (≥ 5.2 cm in men or ≥ 4.7 cm in women). The distribution of atrial cardiopathy within each subgroup was analyzed, and conclusions were drawn concerning the study's aims and objectives. **Results & Conclusion:** The indicators of atrial cardiopathy, including atrial diameter, NT-pro BNP level, and PTFV1>5000, were notably higher in the groups with cardio-embolic and undetermined causes compared to the other groups.

Keywords: Atrial cardiopathy, cardio-embolic stroke, acute ischemic stroke.

INTRODUCTION

An aberrant, irreversible structural alteration in atrial tissue, or atrial cardiopathy, can be inherited, caused by toxins, or acquired during cardio-thoracic surgery. Myocyte hypertrophy and atrial fibrosis are possible histological abnormalities. They put patients at risk for atrial enlargement when they coexist with vascular risk factors, including diabetes, hypertension, and dyslipidemia. Atrial electrical remodeling is irreversible due to atrial cavity enlargement because it alters the tissue density of ion channels, ion currents, and action potential duration. There is an increase in the likelihood of sustained atrial fibrillation and blood stasis, which sets off Virchow's triad and raises the risk of thromboembolism. According to various studies, the prevalence of atrial fibrillation in people with

atrial cardiopathy ranges from about 30% to 70%. We studied the prevalence of atrial cardiopathy in various subtypes of acute ischemic stroke.

METHODS

We did a prospective observational single-center study over 1.5 years on 110 acute ischemic stroke patients above 18 who presented to our hospital with first ever ischemic stroke. We excluded patients with transient ischemia, hemorrhagic stroke, prior hemorrhagic/sinus thrombosis/ischemic stroke, and non-consenting patients. These patients underwent assessments for vascular risk factors, routine hematological and biochemical parameters, and neuro-radiological analysis necessary for diagnosing the stroke and determining its underlying causes. The stroke subtype of each patient was defined based on

Address correspondence to: Dr. P N Renjen, Indraprastha Apollo Hospitals, New Delhi, India. email: pnrenjen@hotmail.com

Date of Submission: 28 August 2023; Date of Acceptance: 2 April 2025

<https://doi.org/10.54029/2025pth>

the TOAST classification, utilizing clinical data, radiological images, and investigation findings. Atrial cardiopathy was identified by the presence of any of the following criteria: PTFV1 > 5000 μ V-ms, NT-proBNP level > 250 pg/ml, or severe left atrial enlargement (≥ 5.2 cm in men or ≥ 4.7 cm in women). The distribution of atrial cardiopathy within each subgroup was analyzed, and conclusions were drawn concerning the study's aims and objectives. The comparison of quantitative variables was done using independent t test and ANOVA test with post-hoc correction using Bonferroni. The comparison of qualitative variables was done using chi-squared test or Fischer exact. Data was collected in MS excel and analyzed using SPSS 21.0. The p value of 0.05 was considered statistically significant. The approval of study, patient information sheets, and informed consent forms in Hindi and English was obtained from the institutional ethics committee.

RESULTS

Atrial cardiopathy with LA enlargement is seen more frequently in acute ischemic stroke with cardio-embolism, other determined causes and undetermined causes compared to large artery and small artery strokes (p 0.0003) (Table 1).

The presence of atrial cardiopathy with elevated NT-pro BNP levels is more common in acute ischemic strokes attributed to cardio-embolism and other undetermined causes (p-value of 0.0001) (Figure 1).

Additionally, atrial cardiopathy manifested by PTFV values exceeding 5000 microV/sec was more prevalent in acute ischemic strokes caused by other undetermined causes and cardio-embolic strokes (Figure 2).

Overall, atrial cardiopathy is more commonly found in acute ischemic strokes resulting from cardio-embolism and strokes of other

undetermined causes when compared to strokes caused by large artery issues, small artery issues, and other determined causes (Figure 3).

DISCUSSION

Atrial cardiopathy with LA enlargement is seen more frequently in acute ischemic stroke with cardio-embolism, other determined causes, and undetermined causes compared to a large artery and small artery strokes (p 0.0003) (Figure 1). Atrial cardiopathy with elevated NT-pro BNP levels is more common in acute ischemic strokes attributed to cardio-embolism and other undetermined causes (p-value of 0.0001) (see Figure 2). Additionally, atrial cardiopathy manifested by PTFV values exceeding 5000 microV/sec was more prevalent in acute ischemic strokes caused by other undetermined causes and cardio-embolic strokes (Figure 3). Overall, atrial cardiopathy is more commonly found in acute ischemic strokes resulting from cardio-embolism and strokes of other undetermined causes than strokes caused by large arteries, small arteries, and other determined causes (Figure 4).

Our study showed that a notably higher proportion of patients with cardio-embolic and other undetermined causes had atrial cardiopathy, as determined by NT pro-BNP criteria, compared to patients with large artery, small artery, and other determined causes. Specifically, the percentages were 48.78% and 24.39% for cardio-embolic and undetermined causes, respectively, while they were 19.51%, 7.32%, and 0.00% for large arteries, small arteries, and other determined causes, respectively. These findings should be viewed along with the association of LA enlargement aligns with a previous study by Rodríguez-Yáñez *et al.*¹, which explained the association between increased NT pro-BNP levels and enlarged LA diameter in our study population.

Table 1: Atrial cardiopathy by LA diameter using Fischer exact

Atrial cardiopathy by LA diameter criteria	Large artery (n=34)	Small artery (n=23)	Cardioembolic (n=21)	Other determined cause (n=7)	Other undetermined causes (n=25)	Total	P value
No	31 (36.90%)	22 (26.19%)	11 (13.10%)	5 (5.95%)	15 (17.86%)	84 (100%)	0.0003*
Yes	3 (11.54%)	1 (3.85%)	10 (38.46%)	2 (7.69%)	10 (38.46%)	26 (100%)	
Total	34 (30.91%)	23 (20.91%)	21 (19.09%)	7 (6.36%)	25 (22.73%)	110 (100%)	

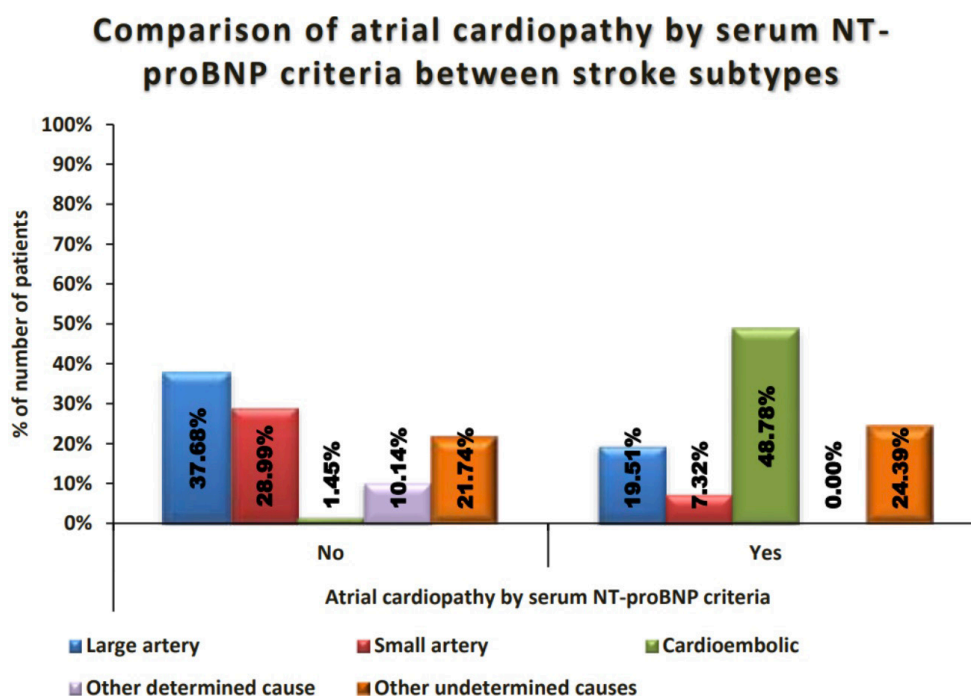


Figure 1. Comparison of atrial cardiopathy by serum NT-proBNP criteria between stroke subtypes using Fischer exact.

Regarding the identification of atrial cardiopathy using ECG criteria (PTFV1>5000 microvolt-millisecond), our study revealed a significantly higher proportion in the group with other undetermined causes (44.12%) compared to the groups with cardioembolic, large artery, small artery, and other determined causes

(23.53%, 20.59%, 11.76%, 0.00%, respectively) (p-value=0.002). This finding is supported by studies by Kamel *et al.*², which demonstrated a connection between ECG-defined left atrial abnormality (PTFV1) and stroke, independent of atrial fibrillation (AF). Another study by Kamel *et al.*³ indicated that ECG left atrial abnormality is

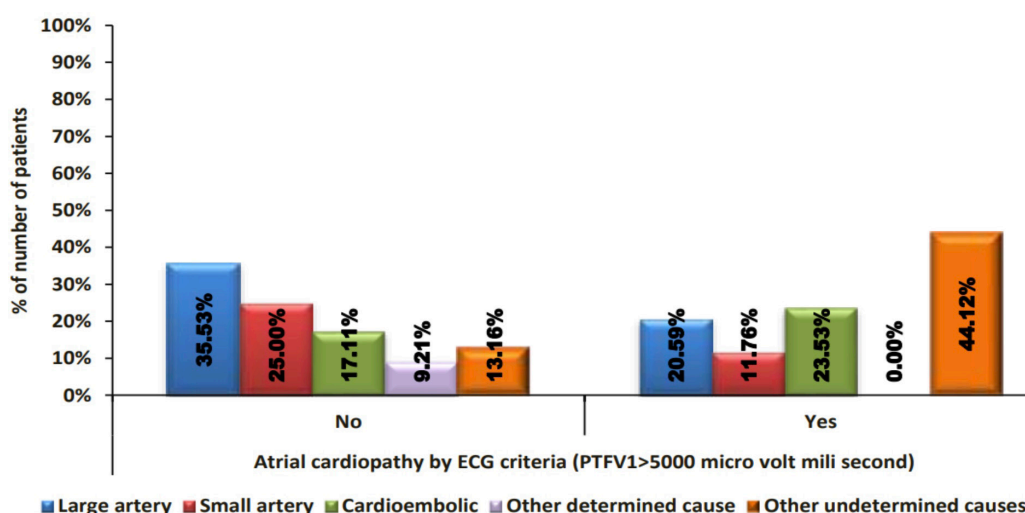


Figure 2. Comparison of atrial cardiopathy by ECG criteria (PTFV1>5000 micro volt mili second) between stroke subtypes using Fischer exact.

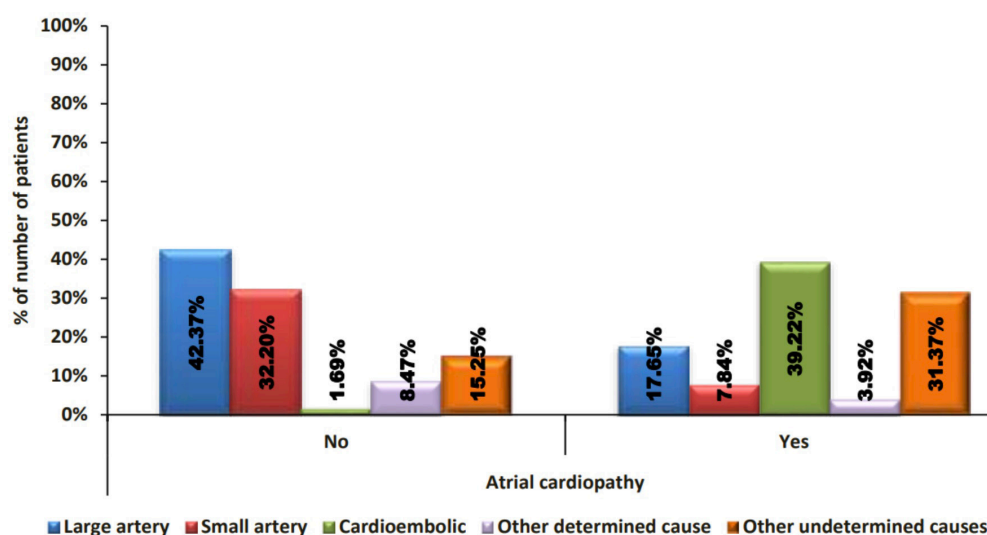


Figure 3. Comparison of atrial cardiopathy between stroke subtypes using Fischer Exact.

linked to vascular brain injury without documented AF.

In our study, the proportion of patients with atrial cardiopathy was significantly higher in the cardio-embolic and undetermined cause groups (39.22% and 31.37%, respectively) compared to patients with large artery, small artery, and other determined causes (17.65%, 7.84%, 3.92%, respectively) (p -value<0.0001). This observation can be explained by the fact that parameters of atrial cardiopathy, such as atrial diameter, NT-pro BNP level, and PTFV1>5000, were significantly higher in the cardio-embolic and undetermined cause groups compared to the other groups. This is supported by studies conducted by Leifer *et al.*⁴, which demonstrated advanced cardiac disease as a common factor in the cardio-embolic subtype, and S. Jalini *et al.*⁵, which indicated an embolic etiology in the undetermined cause group.

In conclusion, assessing atrial cardiopathy in patients who have experienced a stroke with an undetermined cause (cryptogenic stroke) is crucial. Evaluating the left atrial size, NT pro-BNP levels, and PTFV1 in every patient is advisable as part of the assessment process. By incorporating these three parameters into our evaluation, we can improve our capacity to address atrial cardiopathy as a modifiable risk factor for stroke.

DISCLOSURE

Ethics: All investigational protocols and methodologies were approved by Indraprastha

Apollo Hospitals, New Delhi Ethics Committee. A written informed consent was taken from each participant.

Data availability: All data are available with the corresponding author.

Financial support: None

Conflict of interest: None

REFERENCES

1. RodríguezYáñez M, Sobrino T, Blanco M, *et al.* High serum levels of probrain natriuretic peptide (proBNP) identify cardioembolic origin in undetermined stroke. *Dis Markers* 2009;26(4):189-95. doi:10.3233/DMA20090630
2. Kamel H, Soliman EZ, Heckbert SR, *et al.* Pwave morphology and the risk of incident ischemic stroke in the MultiEthnic Study of Atherosclerosis. *Stroke* 2014;45(9):2786-8. doi:10.1161/STROKEAHA.114.006364
3. Kamel H, Bartz TM, Elkind MS, *et al.* Atrial cardiopathy and the risk of ischemic stroke in the CHS (Cardiovascular Health Study). *Stroke* 2018;49(4):980-6. doi:10.1161/STROKEAHA.117.020059
4. Leifer D, Rundek T. Atrial cardiopathy: A new cause for stroke? *Neurology* 2019;92(4):155-6. doi:10.1212/WNL.0000000000006749
5. Jalini S, Rajalingam R, Nisenbaum R, Javier AD, Woo A, Pikula A. Atrial cardiopathy in patients with embolic strokes of unknown source and other stroke etiologies. *Neurology* 2019;92(4):e288-94. doi:10.1212/WNL.0000000000006748