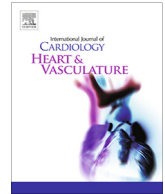




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Reduced left atrial strain can predict stroke in atrial fibrillation – A meta-analysis



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To the Editor,

Atrial Fibrillation (AF) is the most common cardiac arrhythmia with a worldwide prevalence of over 46 million cases [1]. There has been over a 30% increase in its prevalence in the last 20 years [2]. AF can cause sequelae such as cardiac failure, emboli, etc., which consequently cause a significant clinical burden. The risk of ischemic stroke in AF is increased five-fold as compared to the general population. About 25–30% of strokes can be attributed to cerebral emboli which are caused by AF [3]. About 1/3rd of cases of AF are asymptomatic and are commonly undetected clinically [3,4]. Hence, it could be significantly underestimated as a causing factor of ischemic stroke. In the USA, about 795,000 people experience a stroke each year. Stroke has a significant impact on quality of life, morbidity, and mortality in the US with 1 in 19 deaths attributed to it [4].

Traditionally, clinical assessments like the CHA₂DS₂-VASc score and echocardiographic parameters like left atrial (LA) size, LA appendage flow velocity and/or thrombi/spontaneous echo contrast, left ventricular systolic function have been used to predict stroke in patients with AF [5,6,7]. Structural, functional, and electrical changes of the left atrium are noted in patients with AF [8]. LA strain and strain rate are subtle measures of left atrial compliance and remodeling [7] and are being increasingly used to evaluate LA structure and function in clinical practice. However, its role as a determinant of cerebrovascular events and risk stratification in AF is unclear.

We performed a systematic search of PUBMED and Google Scholar Databases to find studies evaluating the role of left atrial strain in risk stratification of cerebrovascular events such as stroke/Transient ischemic attack (TIA) in patients with atrial fibrillation (AF). Keywords used for the search included- 'stroke', 'cerebrovascular disease', 'transient ischemic attack', 'atrial fibrillation', 'left atrial', 'strain', 'echocardiography', and 'speckle tracking'. A

random-effects model was employed to calculate the pooled odds ratio. I² statistics were employed to test heterogeneity. Publication bias was detected using Funnel Plot and sensitivity analysis with leave one out approach. Open MetaAnalyst and metaXL were used for analysis.

The initial search yielded 315 articles, out of which six [7,8,9,10,11,12] were included in the final analysis after excluding reviews and duplicate items. The sample size consisted of 3587 patients with AF, of which 361 (10.1%) suffered from a cerebrovascular accident. The mean age of the population was 68.81 ± 11.74 years and it comprised of 2325 (64.8%) males. All studies reported peak atrial longitudinal strain measured using the Echo Pac software (GE). The baseline characteristics of the included studies have been summarized in Table 1. The meta-analysis of odds ratio revealed that reduced left atrial strain is predictive of cerebrovascular accident in AF patients (Odds ratio 0.88, 95% CI: 0.81–0.96, P = 0.005). Moderate-high heterogeneity was observed between the studies (I² = 86%, P < 0.001) [Fig. 1]. Although publication bias was detected; the funnel plot and trim and fill analysis is not considered very reliable for meta-analysis of less than 10 studies.

Speckle-tracking echocardiography is a technique used to characterize and quantify myocardial deformation and is based on images obtained by traditional transthoracic 2-dimensional (2D) echocardiography, which can be stored and later analyzed offline using software to measure cardiac deformation parameters like strain and strain rate.

The studies included in this meta-analysis utilized speckle-tracking echocardiography to measure parameters of LA strain like peak positive longitudinal strain during atrial filling (LASp), peak strain rate during reservoir phase of the left atrium (LASr), Global Longitudinal Strain (GLS), etc., and assess their value in predicting subsequent stroke/TIA. The results showed a significant inverse association between peak atrial longitudinal strain (reservoir phase) and cerebrovascular accident occurrence in AF population. LA strain was lower in AF patients with stroke/TIA and was also found to be an independent predictor of its occurrence. Although

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Table 1
Baseline characteristics of included studies.

Author	Year	Type of study	Country/Region	Sample size (AF)	Mean age	Males, n (%)	Stroke/TIA, n (%)	Mean LA strain in control group	Mean LA strain in stroke group
Liao et al	2020	Prospective observational study	Taiwan	1457	71.6 ± 12.4	809 (55.5%)	111 (7.6%)	-	-
Mao et al	2021	Retrospective observational study	China	208	63.58 ± 10.37	133 (63.9%)	31 (14.9%)	19.99 ± 9.79	13.09 ± 7.01
Leung et al	2018	Prospective observational study	Netherlands	1361	65 ± 12	1008 (74%)	100 (7.3%)	18.9 (11.0, 28.5)	14.5 (9.2, 22.7)
Hsu et al	2016	Prospective observational study	Taiwan	190	70 ± 10	128 (67%)	15 (7.8%)	-	-
Obokata et al	2014	Cross sectional study	Japan	305	74 ± 10	209 (68.5%)	66 (21.6%)	18.9 ± 6.0	12.6 ± 3.7
Shih et al	2011	Retrospective cross sectional study	Taiwan	66	75.9 ± 9.4	38 (57.6%)	20 (30%)	15.69 ± 5.08	10.44 ± 4.23

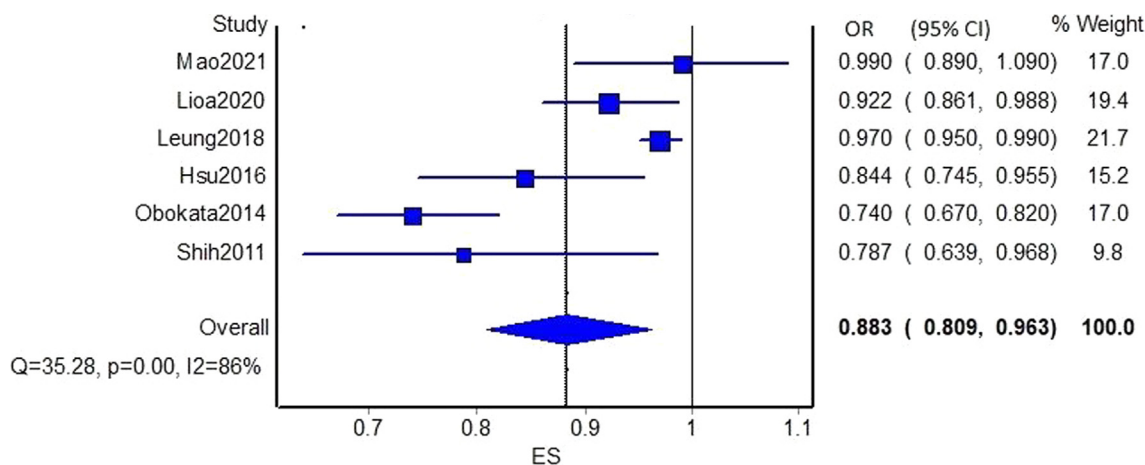


Fig. 1. Forest plot for LA strain as a predictor of stroke.

the CHA₂DS₂-VASc score is recommended by most of the guidelines pertaining to AF and stroke, it largely fails to incorporate information needed for comprehensive characterization of LA structure/function. Left atrial strain offered incremental value beyond traditional clinical and echocardiography methods in the prediction and risk stratification of cerebrovascular accident in atrial fibrillation patients [7,8,10,11,12]. Measuring LA strain by speckle-tracking echocardiography in AF is a feasible and convenient tool; it may aid in predicting CVA in this patient population and providing a timely opportunity for prophylactic intervention.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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