

Left atrial volume index measurement and LA strain in acute coronary syndrome patients and its correlation with outcome

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ABSTRACT:

Background: Acute coronary syndrome (ACS) is associated with substantial morbidity and mortality. Echocardiographic markers of left atrial (LA) size and function may improve risk stratification. **Objective:** To evaluate the association of left atrial volume index (LAVI) and LA strain with clinical characteristics and 1-year adverse outcomes (major adverse cardiovascular events, MACE) in ACS. **Methods:** Hospital-based prospective observational study (n=50). Two-dimensional echocardiography was performed within 48 hours of admission with follow-up at 6 and 12 months. Patients were grouped by LAVI (> 34 vs. ≤ 34 mL/m²). Outcomes included cardiovascular death (primary) and MACE (secondary). **Results:** MACE occurred in 13/50 (26%). LAVI and LA strain were significantly associated with MACE at 6 and 12 months (both p < 0.05), while associations at presentation were not significant. **Conclusion:** In this cohort, follow-up measures of LAVI and LA strain were associated with MACE, suggesting potential value for monitoring after ACS; larger studies are needed to refine thresholds and confirm prognostic performance.

Keywords: Acute Coronary Syndrome; Left Atrial Volume Index; Left Atrial Strain; Speckle Tracking Echocardiography; Major Adverse Cardiovascular Events; Risk Stratification; Prognosis

INTRODUCTION:

Acute coronary syndrome (ACS) encompasses a wide range of presentations including unstable angina, non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI), and remains a major contributor to mortality and morbidity worldwide. Despite advances in ACS management strategies, the incidence of major adverse cardiovascular events (MACE) remains high [1].

Elevated left ventricular filling pressure (LVFP) is a key prognostic indicator of cardiovascular out-comes, as classically described by Killip et al. [2]. Forrester et al. highlighted pulmonary capillary wedge pressure as a surrogate marker of left atrial pressure, underscoring the importance of LVFP assessment [3].

The left atrium (LA) is a critical interface between the pulmonary veins and the left ventricle. The left atrial

volume index (LAVI) is a recommended parameter for assessing LA remodeling and has been associated with adverse outcomes [4, 5]. However, LAVI primarily reflects the cumulative effect of chronically elevated filling pressures and may not fully capture acute functional deterioration in short time windows.

LA strain, derived from speckle-tracking echocardiography, is an emerging marker of LA intrinsic function and has been shown to correlate with LVFP and detect earlier functional impairment than volumetric indices [6, 7]. This study investigated the relationship of LAVI and LA strain with clinical features and 1-year outcomes in ACS.

Aims and objectives:

To determine the relationship of LAVI and LA strain with clinical presentation, co-morbidities, and adverse events

in ACS patients at admission and during 1-year follow-up.

MATERIALS AND METHODS:

This hospital-based prospective observational study was conducted in the Department of Cardiology, IPGMER and SSKM Hospital, Kolkata. Patients meeting inclusion criteria were enrolled with a target sample size of 50 over 12 months, after institutional ethics approval and written informed consent.

Inclusion Criteria:

Presumed first-episode ACS patients (MI diagnosed by history, ECG, and enzymes), age > 18 years, of both sexes.

Exclusion Criteria:

Chronic stable angina; previous PCI/CABG; significant valvular heart disease; chronic kidney dis-ease (eGFR < 60 mL/min/1.73 m²); chronic atrial fibrillation; suspected/confirmed pulmonary embolism; pulmonary hypertension; cor pulmonale; viral myocarditis/pericarditis/cardiomyopathy; malignancy or anemia.

Treatment and Investigations:

All patients received guideline-directed medical therapy. Eligible patients without contraindications to fibrinolysis received tenecteplase per weight-based dosing. Coronary angiography was performed per standard protocol. Two-dimensional echocardiography was performed within 48 hours of admission. LV systolic function was assessed by Simpson's disc method, and regional wall motion abnormalities were recorded. Patients were classified by LAVI: Group A (LAVI > 34 mL/m²) and Group B (LAVI ≤ 34 mL/m²).

Endpoints:

Primary endpoint: cardiovascular death.

Secondary endpoint: MACE (repeat hospitalization for heart failure, in-stent restenosis, re-infarction, target vessel revascularization, repeat revascularization, atrial fibrillation, or ischemic stroke).

Statistical Analysis:

SPSS v23.0 was used. Independent t-tests and ANOVA were applied as appropriate. ROC analysis assessed cut-off values, sensitivity, specificity, and predictive values. Pearson correlation assessed associations between LAVI/LA strain and E/e'; p < 0.05 was considered significant.

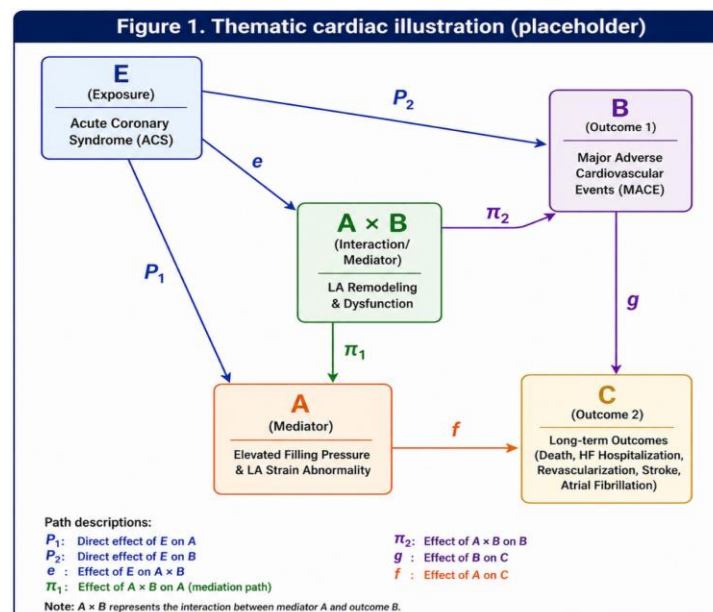
RESULTS:

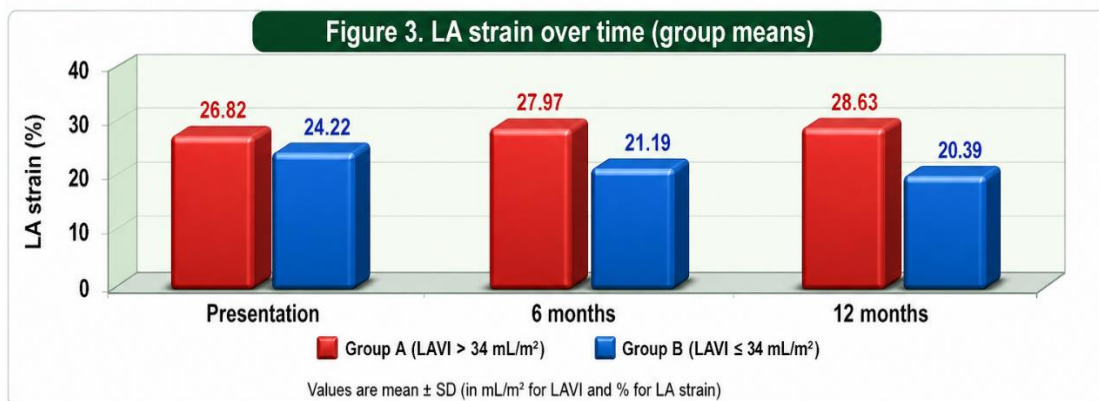
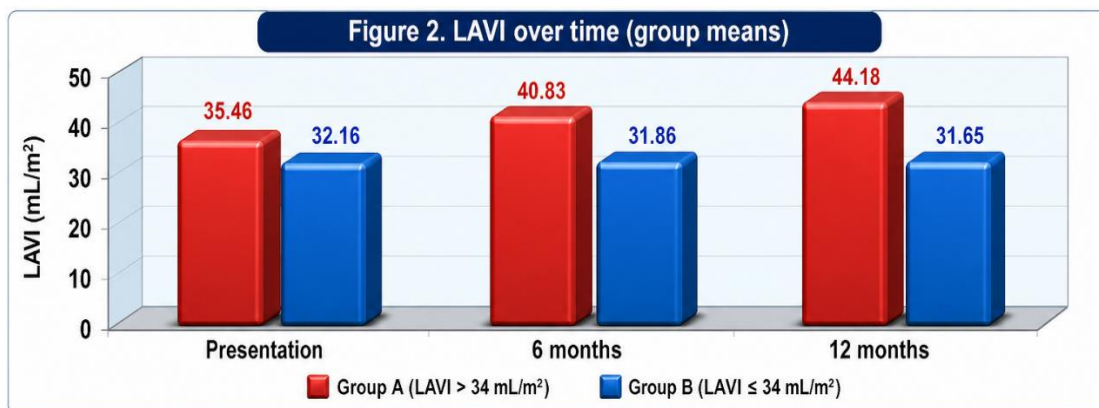
The mean age was 62 ± 6.7 years; 56% were male. Common comorbidities included hypertension (56%), diabetes (54%), and dyslipidemia (32%). Presentations were NSTEMI (46%), STEMI (40%), and unstable angina (14%). MACE occurred in 13 patients (26%), including 2 deaths, 5 heart failure hospitalizations, 2 atrial fibrillation events, 3 revascularizations for recurrent chest pain, and 1 CABG.

LAVI and LA strain showed significant differences between patients with and without MACE at 6 and 12 months (both p < 0.05), while associations at presentation were not significant.

3D-style colorful charts:

Figures 2 and 3 are 3D-style charts created from the summary statistics in the manuscript (not raw patient-level data). Replace with exported SPSS charts if desired.





DISCUSSION:

This single-center prospective cohort suggests that follow-up measures of LA size and deformation (LAVI and LA strain) are associated with MACE after ACS. Because LA dysfunction can precede structural enlargement, strain-based assessment may provide complementary information to volumetric indices, particularly during post-ACS follow-up.

CONCLUSION:

In this cohort, LAVI and LA strain at follow-up (6 and 12 months) were associated with MACE, while baseline values had limited discriminatory power. Larger multicenter studies are warranted to clarify optimal cut-offs and clinical integration.

Limitations:

Single-center design and modest sample size. LA volume was calculated using a two-dimensional method, which may be less accurate than three-dimensional approaches in the setting of complex LA geometry.

Ethical Approval:

The study was approved by the Institutional Ethics Committee of IPGMER & SSKM Hospital, Kolkata. Written informed consent was obtained from all participants.

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Conflict of Interest:

The authors declare no conflict of interest.

Funding:

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