ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

EVALUATION AND PROGNOSTIC SIGNIFICANCE OF LEFT ATRIAL VOLUME INDEX IN PATIENTS WITH ACUTEST ELEVATION MYOCARDIAL INFARCTION

[1]Dr jwala kumar , DM Cardiology Resident , Department of cardiology , Indira Gandhi institute of medical sciences (IGIMS), Patna , Bihar , India .
[2]Dr. Ravi Vishnu Prasad , Professor and Head , Department of cardiology , Indira Gandhi institute of medical sciences (IGIMS), Patna , Bihar , India .
[3]Dr. Chandra Bhanu Chandan , Assistant Professor , Department of cardiology , Indira Gandhi institute of medical sciences (IGIMS), Patna , Bihar , India .
Corresponding author;-
Dr jwala kumar , DM Cardiology Resident , Department of cardiology , Indira Gandhi institute of medical sciences (IGIMS), Patna , Bihar , India .

ABSTRACT

Objective: To evaluate Left Atrial Volume Index (LAVI) and its prognostic significance in patients with acute ST Elevation Myocardial Infarction (STEMI) and its correlation with major adverse cardiovascular events (MACE).

Methods: This prospective observational study was carried out in Department of Cardiology at Indira Gandhi Institute of Medical Sciences, Patna, Bihar.A total of 100 patients of Acute STEMI were observed prospectively for period of 1 year. LAVI was assessed at admission, at discharge and after 1 month by echocardiography. Patients were monitored for heart failure, reinfarction, and severe arrhythmias.

Results: Patients with a LAVI > 34 mL/m² had a significantly higher incidence of MACE compared to those with a LAVI ≤ 34 mL/m². Elevated LAVI in acute STEMI patients was associated with a 26% increase in heart failure incidence and overall higher rates of adverse cardiovascular outcomes in comparison to lesser LAVI group.

Conclusion: Elevated LAVI strongly predicts poor outcomes in acute STEMI patients. LAVI measurement in routine clinical practice can identify patients at higher risk of post-infarction consequences, prompting more aggressive treatment.

Keywords: STEMI, Left Atrial Volume Index, Major Adverse Cardiovascular Events, Prognostic Biomarker.

INTRODUCTION

Cardiovascular diseases remain the primary cause of death globally, impacting millions of people from various geographic and socio-economic backgrounds. Acute ST Elevation Myocardial Infarction (STEMI), a critical type of heart attack, continues to be a significant issue within the wider context of coronary artery diseases [2]. Timely and efficient intervention

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

for STEMI is essential because of its urgent risk to life, primarily resulting from the sudden interruption of blood circulation due to a blockage in a coronary artery [3].

The advancement of imaging methods has enhanced our comprehension and handling of cardiac occurrences. Echocardiography offers essential insights into the structure and function of the heart, which are dynamically affected during and after acute cardiac events [4]. One such parameter, the Left Atrial Volume Index (LAVI), has become an important prognostic indicator. The LAVI indicates variations in the size of the left atrium, which are closely associated with atrial pressures and the overall haemodynamic function of the heart throughout cardiac cycles [5].

Studies have emphasised the predictive value of LAVI in relation to STEMI. It is proposed that changes in LAVI, given its connection to the filling pressures of the left ventricle and overall diastolic function, may act as a significant indicator for assessing outcomes in patients with STEMI [6]. Grasping the intricacies of LAVI may enhance current diagnostic approaches and possibly inform treatment strategies, to reduce post-infarction issues like heart failure and arrhythmias, which have a considerable impact on long-term survival and quality of life [7,8].

This research seeks to assess the predictive value of the Left Atrial Volume Index in individuals undergoing their initial episode of Acute ST Elevation Myocardial Infarction (STEMI) and to examine its relationship with clinical outcomes, such as major adverse cardiovascular events. This research aims to position LAVI as both a diagnostic indicator and a predictor of recovery pathways, potentially impacting the management and treatment strategies for patients with STEMI.

METHODOLOGY

Study Setting

The study was conducted in Department of Cardiology, Indira Gandhi Institute of Sciences (IGIMS), Patna, a premier institution known for its comprehensive healthcare services and advanced research facilities.

Study Design

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

This was a prospective observational study aimed at evaluating Left Atrial Volume Index (LAVI) and its prognostic significance in patients with Acute ST Elevation Myocardial Infarction (STEMI).

Study Duration

The study conducted a period of one year, providing a robust time frame to observe and analyse the outcomes of interest in the STEMI patient cohort.

Study Population

The study included a total of 100 patients admitted in Cardiology Department of IGIMS,patna with a confirmed diagnosis of the first episode of STEMI.

Inclusion Criteria

1. Patients diagnosed with first episode of STEMI.
2. Diagnosis based on clinical presentation, electrocardiographic findings, and elevation of cardiac biomarkers.

Exclusion Criteria

1. Patients with a history of previous myocardial infarction.
2. Presence of any significant valvular heart diseases.
3. Patients with chronic atrial fibrillation or other significant arrhythmias.
4. Those who had undergone previous major cardiac surgeries or interventions.

Data Collection

Data were systematically collected at admission, during the hospital stay, and at discharge. Key data points included:

- Demographic information.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

- Clinical history and physical examination findings.
- Detailed echocardiographic assessment including LAVI measurement.
- Laboratory results including cardiac biomarkers.
- Outcome data including mortality, hospital readmissions, and occurrence of major adverse cardiovascular events (MACE) during the follow-up period.

Echocardiographic Evaluation

LAVI was measured using standard echocardiographic techniques. The biplane area-length method was employed from apical four-chamber and two-chamber views at the frame before mitral valve opening to calculate the LAVI, which was then indexed to the body surface area.

Follow-up

Patients were followed throughout their hospital stay and outcomes were recorded at discharge and after 1 month post-discharge to assess the long-term impact of LAVI on patient prognosis.

Statistical Analysis

Data were examined utilizing suitable analytical techniques to investigate the connection between LAVI and clinical results in patients with STEMI. Comprehensive analyses were performed to account for possible confounding factors.

RESULTS

The baseline characteristics of the study population reveal a diverse group comprising 100 patients diagnosed with STEMI, split between 72% male and 28% female participants. Among study population, 60% were below 60 years of age with mean age of 52.74± 5.092 and 40% were about 60 years with mean age of 68.15± 4.540 years. A significant portion of the study group presented with comorbid conditions; 46% of the patients were hypertensive, 24% were diabetic, and 28% had hyperlipidemia. Regarding smoking status, 18% of the patients were current smokers, whereas the remaining 82% did not smoke. This demographic and health profile provides a comprehensive overview of the patient population

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

being studied, highlighting common risk factors and the gender distribution that could influence the outcomes of the study on STEMI.

Echocardiographic Findings

Diastolic Dysfunction

58% had grade I, 28% had grade II and 8% had grade III diastolic dysfunction.

TABLE,1

NORMAL	I	II	III	TOTAL
6	**58**	**28**	**8**	**100**
6%	**58%**	**28%**	**8%**	**100%**

LA Volume Index

64 Patients (64%) had LA Volume Index < 34ml/m2 and 36 patients (36%) had LA Volume Index > 34ml/m2

TABLE,2

≤34	64	64%
>34	36	36
TOTAL	100	100

Major Adverse Cardiovascular Events (MACE)

Major adverse cardiovascular events were death (10%), LV systolic dysfunction (54.5%), heart failure (27.5%), reinfarction (6.5%), arrhythmias (26.5%), significant MR (16%), mechanical Complications (2%) and cardiogenic shock (4%).

TABLE,3

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

Death	**YES**	**10**	**10%**
	NO	**90**	**90%**
LV systolic dysfunction	**YES**	**56**	**56%**
	NO	**44**	**44%**
Heart failure	**YES**	**28**	**28%**
	NO	**72**	**72%**
Reinfarction	**YES**	**4**	**4%**
	NO	**96**	**96%**
Arrhythmia	**YES**	**26**	**26%**
	NO	**74**	**74%**
Significant MR	**PRESENT**	**16**	**16%**
	ABSENT	**84**	**84%**
Mechanical Complications	**YES**	**2**	**2%**
	NO	**98**	**98%**
Cardiogenic shock	**YES**	**6**	**6%**
	NO	**94**	**94%**

Correlation of LAVI with Clinical Outcomes

Multivariate analysis indicated that a higher LAVI was significantly associated with an increased risk of heart failure ($p < 0.01$) and overall MACE ($p < 0.05$).

LAVI & HEART FAILURE

44.44% of patients in larger LA volume index group had heart failure in comparison 18.75% in smaller LA volume index group. This resulted in statistically significant p value(P=0.006).

Table 4: Correlation of LAVI with Clinical Outcomes

LAVI	YES	NO	TOTAL	P VALUE
≤34	12 (18.75%)	52 (81.25%)	64(100%)	

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

>34	16(44.44%)	20 (55.55%)	36(100%)	0.006
Total	28(28)	72 (72)	100(100%)	

Arrhythmia and LA Volume Index

44.44% of patients in larger LA volume index group had Arrythmia in comparison 18.75% in smaller LA volume index group. This resulted in statistically significant p value(P=0.006).

LAVI	YES	NO	TOTAL	P VALUE
≤34	4(6.25%)	60(93.75%)	64(100%)	
>34	8(22.22%)	28(77.77%)	36(100%)	0.018
TOTAL	12(12%)	88(88%)	100(100%)	

Arrhythmia and LA Volume Index

44.44% of patients in larger LA volume index group had Arrythmia in comparison 18.75% in smaller LA volume index group. This resulted in statistically significant p value(P=0.006).

Death and LA Volume Index

Mortality was more common in larger LA volume index group (25% patients) compared to small LA Volume Index group (1.5% patients). This resulted in statistically significant p value. (P=0.0002)

LAVI	YES	NO	TOTAL	P VALUE
≤34	1(1.5%)	63 (98.5%)	96 (100%)	
>34	9(25%)	27(75%)	54(100%)	0.0002
TOTAL	10(10%)	90(90%)	100(100%)	

In STEMI patients, LAVI appears to predict poor outcomes. Higher LAVIs raise the risk of heart failure and other serious cardiovascular events. LAVI assessment should be included in standard echocardiographic evaluations for STEMI patients to identify high-risk patients and

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

recommend more aggressive treatment.

DISCUSSION

This study demonstrate that Left Atrial Volume Index (LAVI) exhibit a significant prognostic indicator for individuals experiencing acute ST elevation myocardial infarction (STEMI) The findings indicate that major cardiovascular events, including heart failure, reinfarction, and serious arrhythmias, were observed more frequently in individuals with a LAVI exceeding 34 mL/m^2. The results align with previous research indicating a relationship between elevated LAVI and adverse outcomes after myocardial infarction, underscoring LAVI's role as an indicator of increased filling pressures and left ventricular diastolic dysfunction [9,10]. The results are consistent with the findings from research conducted by Moller et al. and Beinart et al., which indicated that elevated LAVI correlates with unfavourable outcomes after a myocardial infarction [9,11].

The findings from these studies, in conjunction with the VALIANT trial, emphasise the value of LAVI not just as a diagnostic instrument but also as a prognostic marker in patients following a myocardial infarction [12]. Our findings support the need for routine evaluation of LAVI in clinical practice, especially for patients with STEMI, by being compared to these well-established studies. Considering the strong link between elevated LAVI and a heightened risk of heart failure and major adverse cardiovascular events, LAVI may serve as an effective instrument for risk assessment in patients with STEMI. This indicates possible advantages in customising treatment approaches according to LAVI measurements, including more intensive management for patients classified as high-risk due to increased LAVI [13]. Incorporating LAVI into standard echocardiographic assessments may facilitate timely interventions and enhance patient outcomes in this vulnerable group.

It is essential to acknowledge the constraints of the study, even in light of these encouraging findings. The design of this study, being single-center with a limited sample size, may restrict its applicability to broader populations. Additional multicenter studies with larger sample sizes are necessary to validate these results and assess the impact of LAVI on the long-term outcomes of STEMI patients [13]. Longitudinal studies could investigate how interventions aimed at reducing LAVI influence clinical outcomes. This research reinforces previous conclusions that

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

patients with STEMI and increased LAVI experience poorer outcomes. These findings indicate that regular evaluation of STEMI patients ought to incorporate LAVI measurement to aid in predicting and addressing issues. Future research should elucidate the role of LAVI in the management of myocardial infarction and explore targeted interventions for elevated LAVI levels.

CONCLUSION

The study demonstrates that the Left Atrial Volume Index (LAVI) is a prognostic factor for acute ST-elevation myocardial infarction patients. Elevated LAVI, reflecting left atrial size alterations and higher left ventricular filling pressures, strongly predicts heart failure and reinfarction. These findings suggest that STEMI patients should undergo routine echocardiographic examinations using LAVI to stratify risk and guide more targeted treatment interventions. LAVI as a regular assessment tool could improve clinical decision-making and long-term results in high-risk patients. Future research should validate these findings in bigger, multicenter investigations.

REFERENCES

1. Benjamin EJ, Virani SS, Callaway CW, et al. Heart Disease and Stroke Statistics—2018 Update: A Report From the American Heart Association. Circulation. 2018;137(12):e67-e492.
2. Nagueh SF, Smiseth OA, Appleton CP, et al. Recommendations for the evaluation of left ventricular diastolic function by echocardiography: An update from the American Society of Echocardiography and the European Association of Cardiovascular Imaging. J Am Soc Echocardiogr. 2016;29(4):277-314.
3. Patel DA, Lavie CJ, Milani RV, et al. Left atrial volume index predictive of mortality independent of left ventricular geometry in a large clinical cohort with preserved ejection fraction. Mayo Clin Proc. 2011;86(8):730-737.
4. Blume GG, Mcleod CJ, Barnes ME, et al. Left atrial function: physiology, assessment, and clinical implications. Eur J Echocardiogr. 2011;12(6):421-430.

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 11, 2024

5. Tsang TS, Barnes ME, Gersh BJ, et al. Prediction of risk for first age-related cardiovascular events in an elderly population: the incremental value of echocardiography. J Am Coll Cardiol. 2003;42(7):1199-1205.

6. Abhayaratna WP, Seward JB, Appleton CP, et al. Left atrial size: physiologic determinants and clinical applications. J Am Coll Cardiol. 2006;47(12):2357-2363.

7. Rossi A, Cicoira M, Zanolla L, et al. Determinants and prognostic value of left atrial volume in patients with dilated cardiomyopathy. J Am Coll Cardiol. 2002;40(8):1425.

8. European Society of Cardiology. Guidelines for the diagnosis and treatment of acute and chronic heart failure. Eur Heart J. 2018;39(22):2077-2087.

9. Moller JE, Hillis GS, Oh JK, Seward JB. Left atrial volume: a powerful predictor of survival after acute myocardial infarction. *Circulation*. 2006;113(5):670-6.

10. Solomon SD, Anavekar N, Skali H, McMurray JJ, Swedberg K, Yusuf S, et al. Influence of ejection fraction on cardiovascular outcomes in a broad spectrum of heart failure patients. *J Am Coll Cardiol*. 2005;44(12):2333-8.

11. Beinart R, Boyko V, Schwammenthal E, Kuperstein R, Sagie A, Hod H, et al. Long-term prognostic significance of left atrial volume in acute myocardial infarction. *J Am Coll Cardiol*. 2004;44(2):327-34.

12. Tsang TSM, Barnes ME, Gersh BJ, Bailey KR, Seward JB. Left atrial volume as a morphophysiologic expression of left ventricular diastolic dysfunction and relation to cardiovascular risk burden. *Am J Cardiol*. 2002;90(12):1284-9.

13. Meris A, Amigoni M, Uno H, Thune JJ, Verma A, Køber L, et al. Left atrial remodeling in the year after myocardial infarction: a key target with implications for prognosis. *Heart*. 2009;95(24):1983-9.