

# Prognostic Significance of Left Atrial Volume Index in Acute Myocardial Infarction and its Angiographic Correlation.

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## ABSTRACT

**Background:** Evaluating left atrium volume is a good way to estimate prognosis in acute myocardial infarction patients because it indicates to time and severity of diastolic dysfunction and longer-term results of acute myocardial infarction. Left atrial (LA) volume is a prognostic predictor across a wide spectrum of cardiac and non-cardiac diseases. Aim: To assess the left atrial volume index in Myocardial Infarction & Angiographic correlation and to assess any correlation between with left atrial volume index and outcomes of MI such as heart failure, short term mortality, arrhythmias, and ejection fraction. **Methods:** 100 patients with ST elevation in ECG, with history, examination, ECG changes and elevated CK-MB, Anterior, Inferior, Right ventricle & Posterior wall Myocardial infarction were included. The patients were studied considering demographic factors, risk factors, echocardiography indexes such as systolic and diastolic functions and left atrium volume and angiography. **Results:** Among LAVI >34, 22 had (70-90%) of RCA, 7 had (70-90%) of LCX, 29 had (70-90%) of LAD. Among LAVI>34, 14 patients had TVD, 5 had DVD, 29 had SVD, 9 normal coronaries, which are not statistically significant. Among LAVI >34, 22 patients undergone PCI, 7 patients underwent CABG, 1 patient had CHB, 3 patient had VT and 9 patients had AF, which is statistically significant. Among LAVI>34, 24 patients had HF at 30 days follow-up. Among LAVI>34, in 30 days follow up 1 patient expired. When compared with LAVI <34 it was not statistically significant. **Conclusion:** LA Volume index provides prognostic information incremental to clinical data and standard Echocardiographic predictors of outcome, including LV systolic function and Doppler assessment of Diastolic Function.

**Keywords:** Left Atrial Volume Index, Myocardial infarction, prediction.

## INTRODUCTION

Acute coronary syndrome (ACS) is one of the major causes of cardiovascular mortality in the modern world, left ventricular function is an important prognostic marker for patients with that syndrome. Patients with ACS and clinical signs of congestive heart failure have a worse prognosis, and, in general, should be referred to an interventional cardiology service to undergo reperfusion. Asymptomatic individuals with evidence of subclinical dysfunction also have a worse prognosis. In addition, it is speculated that proper treatment might benefit that subgroup of patients. Thus, the development and identification of early markers of left ventricular dysfunction are required to select ideal candidates for invasive therapy.<sup>[1,2]</sup>

Left ventricular diastolic function assessed by use of Doppler echocardiography, complementary to systolic function, provides important prognostic information, after acute myocardial infarction (AMI). Left atrial volume index (LAVI) is less sensitive to acute variations, reflecting subacute or chronic changes in diastolic function. Individuals with increased LAVI, i.e., with significant diastolic dysfunction, are at high risk for complications and could benefit from choosing the most appropriate treatment.<sup>[3]</sup>

Several clinical studies have reported the usefulness of left atrial volume (LAV) in the prognosis of several diseases.<sup>[5,6]</sup> Doppler indices of left ventricular (LV) diastolic function have been shown to predict cardiovascular events in a wide spectrum of individuals ranging from apparently healthy subjects to patients with end-stage dilative cardiomyopathy. In particular, a restrictive LV filling pattern has been identified as a strong predictor of morbidity and mortality in patients with acute myocardial infarction (MI). Because the left atrium (LA) is exposed to LV filling pressures

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through the open mitral orifice during diastole, its size is influenced by the same factors that determine diastolic filling pressure. However, in contrast to other Doppler variables of LV diastolic function, which are affected by acute hemodynamic changes, LA volume is more stable parameter, integrating the effects of elevated LV filling pressures from pre-existing cardiovascular conditions as well as acute disease. The close association between LV diastolic function and LA volume, which provides a sensitive morph physiologic expression of the severity of LV diastolic dysfunction and appears to be a useful index of cardiovascular risk. LA enlargement implies a poor prognosis in patients with acute MI.<sup>[7]</sup>

**AIM**

To assess the left atrial volume index in Myocardial Infarction & Angiographic correlation and to assess any correlation between with left atrial volume index and outcomes of MI such as heart failure, short term mortality, arrhythmias, and ejection fraction.

**MATERIALS AND METHODS**

This prospecting study was conducted in 100 patients who are admitted in Govt. Rajaji Hospital, Madurai with history and features of Myocardial Infarction from August 2015 to February 2016.

**Inclusion Criteria:**

Age > 18 years, both sex, ST elevation in ECG, with history, examination, ECG changes and elevated CK-MB, Anterior, Inferior, Right ventricle & Posterior wall Myocardial infarction. Exclusion criteria: Patients with previous MI, Patients with Significant valve lesions (mitral stenosis, or greater than moderate mitral regurgitation), Patients with Large shunts, Patients with Atrial flutter and fibrillation, Patients with Bundle branch block, Patients with Poor acoustic window.

A previously designed proforma will be used to collect the demographic and clinical details of the patients. A thorough clinical examination will be done. An ECG will be recorded in each case as soon as possible (within 15 minutes of admission). Serial ECGs will be obtained daily during the period of stay at the hospital. Echocardiogram at the time of admission and Coronary Angiogram in further days. Echocardiography was performed immediately after thrombolysis in patients with AMI using GE VIVID T8 machine, 3 Sc-Rs transducer adult probe equipped with Tissue Doppler and speckle tracking technology.

After informed consent coronary angiogram was performed in the study population is a standard access site was either radial or femoral. The standard view of coronary angiogram study AP, RAO, LAO, caudal and cranial.

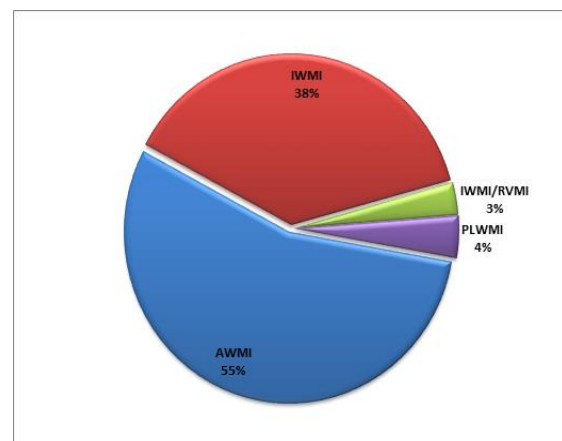
The information collected regarding all the selected cases were recorded in a master chart. Data analysis

was done with the help of computer by using SPSS 16 software and Sigma Stat 3.5 version (2012).

**RESULTS**

One hundred consecutive patients admitted in our ICCU with the first episode of acute myocardial infarction were included in the study. Among 100 patients, 75 were male and 25 were female patients. The mean age of the male patients was 53.11 years and female patients were 61.10 years. In this study 7 patients were less than 35 years, a higher number in 51 to 65 years 43 patients. 55 patients had AAMI, 38 patients had IWMI, 3 patients had RVMI and 4 patients had PLWMI. 76 patients had thrombolysis and 24 not had thrombolysis. 28 patients were known cases of diabetes mellitus. 25 patients have known the case of systemic hypertension. 57 patients were smokers. In this study LAVI>34 was significantly correlated with LVEF less than 40% and this statistically significant. Among LAVI>34m 22 patients had E/A<1 and 11 patients had E/A>1.5 which was statistically significant. Among LAVI>34, e/e' between 10-15 were 22 patients and e/e' 15> were 2 patients. Among LAVI>34, patients with BSA>17 were 20. Moderate 28 cases, severe diastolic dysfunction 16 cases were more among in LAVI>34. Among coronary artery distribution, significant lesion of left main coronary artery patients 6 are more with LAVI >34.

Among LAVI >34, 22 had (70-90%) of RCA, 7 had (70-90%) of LCX, 29 had (70-90%) of LAD. Among LAVI>34, 14 patients had TVD, 5 had DVD, 29 had SVD, 9 normal coronaries, which are not statistically significant. Among LAVI >34, 22 patients undergone PCI, 7 patients underwent CABG, 1 patient had CHB, 3 patient had VT and 9 patients had AF, which is statistically significant. Among LAVI>34, 24 patients had HF at 30 days follow-up. Among LAVI>34, in 30 days follow up 1 patient expired. When compared with LAVI <34 it was not statistically significant.



**Figure 1: Distribution of Diagnosis.**

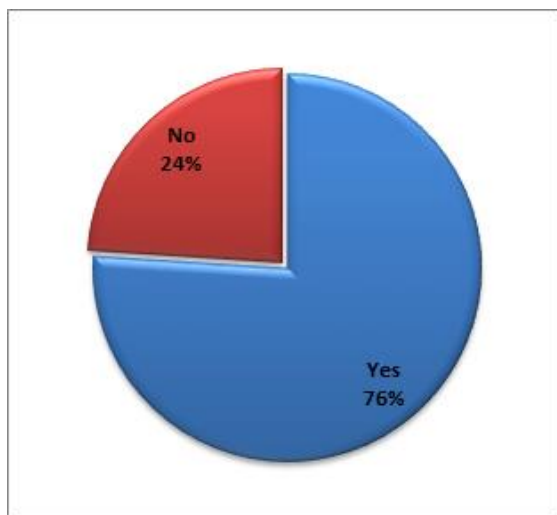


Figure 2: Distribution of Thrombolysis

Table 1: Cross-tabulation of demographic parameters with LAVI

Variables	LAVI		P value
	≤34	>34	
Age	<40	10	0.766
	41-60	29	
	>61	11	
Gender	Male	39	0.888
	Female	36	

Table 2: Cross tabulation of cardiac parameters with LAVI

Variables	LAVI		P value
	≤34	>34	
EF (Mean)	44.04	38.01	<0.0001
E/A (Mean)	0.91	1.25	0.017
DD	4	22	0.007
e/e' (Mean)	8.19	10.75	<0.0001
BSA (Mean)	1.69	1.72	0.186
LVD (Mild)	5	5	0.002
LVD (Moderate)	43	28	
LVD (Severe)	0	16	
LMCA	2	11	0.007
LAD	18	33	0.003
LCX	14	14	0.877
RCA	21	22	0.956
SVD	22	21	0.95
DVD	8	5	0.733
TVD	3	11	0.148
Normal coronaries	9	9	0.776
PCI	28	22	0.23
CABG	1	7	0.027
Mortality	0	1	0.992
HF (30 days follow-up)	9	41	0.038

## DISCUSSION

This study has been conducted to assess the prognostic significance of left atrial volume index in acute myocardial infarction and its angiographic correlation that LA volume index is a predictor of In-hospital events after Acute Myocardial Infarction (STEMI). Furthermore, the LA volume index provides prognostic information incremental to clinical data and standard echocardiographic predictors of outcome, including LV systolic

function, Doppler assessment of diastolic function and Angiographic correlation.

Age Group and LA volume index, in this study of 100 patients there is no correlation between age and LA volume index. Previous studies had shown there is a correlation between old age and increased LA volume index.<sup>8</sup> No independent correlation exists between the regional location of MI and the magnitude of the LA volume index. Similarly in this study also, though anterior wall MI was more common, in the total study population, as well as in the 2 categories of LA volume index, there was no statistically significant difference. In this study among 100 patients 57 patients are smokers and 43 were non-smokers. In similar articles by Teresa S M Sang MD et al Left atrial volume there was found to correlate positively with age, history of systemic hypertension, diabetes mellitus, hyperlipidemia, and smoking.<sup>19</sup>

In our study, 73.68% of patients were diabetic among patients with LA volume > 34 ml/m<sup>2</sup> and only 27.77% were diabetic in the group with LA < 34 ml/m<sup>2</sup> giving rise to a significant p-value (0.000)121. This is similar to the study by Teresa S M Sang MD et al where LA volume was found to correlate positively with Diabetes mellitus and other parameters of the cardiovascular risk score.<sup>17</sup>

LA volume >34 ml/m<sup>2</sup> was associated with an increased incidence of CHF, independent of age, myocardial infarction, diabetes mellitus, hypertension, LV hypertrophy, and mitral inflow velocities. LV dysfunction is more common with larger LA volumes. LAVI and E/A Among LAVI more than 34 groups, 22 patients had E/A<1 and 11 patients had E/A >1.5 which were statistically significant, p-value 0.017.<sup>19</sup>

LAVI and dimensions progressively increased with DD grade increase. There was a relative decrease of the E-wave and E/A ratio, and an increase of the mitral deceleration time in the grade I DD groups (altered relaxation) in comparison to the group with normal diastolic function; the opposite was observed in the group with grade III DD (restrictive pattern). Progressive increase of the E/e' ratio was observed with worsening DD. Among the LAVI > 34 groups, 29 patients had Single Vessel Disease. 5 patients had Double vessel Disease, 14 patients had Triple Vessel Disease. even though the patients who had LAVI > 34 had single vessel disease than double or triple vessel the incidence of left main coronary artery block is more than the patients of LAVI <34.<sup>10</sup>

On analyzing further results other vessels such as LAD, LCX, RCA were almost equal incidence among the two groups which is statistically non-significant. The significant correlation in patients having LAVI >34 is LMCA occlusion. On analyzing the results LAVI >34 group 44% had undergone PCI vs 56% of LAVI <34. 14 % had CABG in LAVI >34 and it is only 2% in LAVI <34. This result signifies more surgical risk in LAVI >34 groups and

almost equal incidence of PCI when compared to LAVI <34. This accounts for more morbidity and mortality in these patients. This may be due to the involvement of more of Left main coronary artery in LAVI >34 which need to be studied further in the large scale of patients. 4% vs 0 % of patient in the group of LAVI >34 had an arrhythmia, 48 % vs 18% had heart failure and 1 patient expired during the 30-day followup. These results signify more morbidity in the form of raised incidence of heart failure and arrhythmia and even one patient had expired during the 30 days followup.<sup>[7,9,11,12]</sup>

## CONCLUSION

The present study demonstrates that LA enlargement implies a poor prognosis in patients with AMI. It has proved as a predictor of In-hospital events in patients with acute myocardial infarction. LA Volume index provides prognostic information incremental to clinical data and standard Echocardiographic predictors of outcome, including LV systolic function and Doppler assessment of Diastolic Function. Measurement of LA volume is a simple and important tool which can be easily done and reproducible and may be incorporated in routine assessment of diastolic function. Measurement of the LA volume index could emerge as a simple and important tool for Risk stratification and as a guide for future surveillance and therapy in patients with Acute myocardial infarction if confirmed by prospective studies. The utility of LA volume and function for monitoring cardiovascular risk and for guiding therapy is an evolving science and may prove to have a very important public health impact. In this study on coronary angiographic correlation those who had LA volume index >45 had more of Left main coronary artery involvement than other arteries.

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