



ORIGINAL RESEARCH PAPER

Cardiology

Evaluation And Prognostic Significance Of Left Atrial Volume Index Assessed By Doppler Echocardiography In Patients With First Acute Myocardial Infarction.

KEY WORDS: Left Atrial Volume Index , Acute Myocardial Infarction, Tissue Doppler Imaging

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ABSTRACT

Introduction: Left Atrial (LA) enlargement has been proposed as a barometer of diastolic burden and a predictor of Common Cardiovascular outcomes such as atrial fibrillation, stroke, congestive heart failure and cardiovascular death. The aim of this paper to study to evaluate the role of left atrial volume index as a predictor of in-hospital events in patients with acute myocardial infarction by two dimensional and Doppler echocardiography.

Materials and Methods: It is a single centre prospective observational study of all newly diagnosed first episode of 100 acute myocardial infarction patients who were hospitalized in the department of Cardiology Govt.MohanKumaramangalam Medical College, Salem between August 2016 to August 2017.

Results: Out of 100 patients enrolled in our study, 70 (70%) were males with mean age of 52 ±12 years and 30(30%) were females with the mean age of 60 ±10 years. AWMl was more common (68%) than the IWMI (32%).Risk factors were smoking, hypertension, diabetes and dyslipidemia in 40%, 46.10%, 45% and 54.65% respectively. The patients (71%) had LA volume Index <32ml/m² and 29 patients (29%) had LA volume Index >32ml/m². In hospital events like death, Re-MI, Arrhythmias, LV dysfunction and Mechanical complications were present in 10%, 12%, 37%, 76% and 6% respectively.

Conclusion: Our study demonstrates that LA enlargement implies a poor prognosis in patients with first AMI. It has proved as a prediction of in hospital events in patients with acute myocardial infarction.

Introduction:

The LA volume has been compared to “the glycated hemoglobin of diabetes mellitus” as it is a reflection of long standing hemodynamic condition¹. Because left atrial size can be measured noninvasively by echocardiography, measurement of LA size is part of the standard echocardiographic examination². Multiple Doppler echocardiographic variables may be used to assess left ventricular diastolic dysfunction. Doppler indices of diastolic function have been shown to predict morbidity and mortality in patients with acute myocardial infarction. In particular, a restrictive diastolic filling pattern, characterized by an abbreviated mitral E wave deceleration time predicts a poor outcome. The measurement of LA volumes after STEMI and NSTEMI may be useful to monitor chronic diastolic dysfunction resulting from ischemic burden and the severity of Coronary artery disease²³.

Materials and Methods:

This study was carried out in the period of August 2016 to August 2017 in the department of Cardiology, Govt. MohanKumaramangalam Medical College, Salem. Informed consent obtained from every patient included in the study. 100 consecutive patients presenting to ICCU with first episode of acute myocardial infarction were enrolled, in this study after excluding patients based on exclusion criteria. The diagnosis of myocardial infarction was based on following three criteria ¹. Typical chest pain ₂. ECG changes suggestive of STEMI ³. Elevated cardiac enzymes. The exclusion criteria were patients with previous history of myocardial infarction, unstable angina and previous history of left ventricular dysfunction.

In all patients, we recorded detailed history recording through physical examination, blood samples, serial ECG’s and complete echocardiogram. Echocardiography was performed on a median of 1 day (range 0 to 4 days) after admission using Philips IE 33 3D Echo machine equipped with Tissue Doppler and Harmonic Imaging Technology. Accordingly, the American Society of Echocardiography has recommended quantification of LA size by biplane 2D echocardiography using either the method of discs (By Simpson’s rule) or the area-length method¹⁴. The Biplane area-length method was used which requires measuring LA area from two orthogonal apical views (A1 and A2) and LA length (L) from which LA volume is calculated as (0.85 x A1xA2)/L. When LA length

is measured from two apical views, the shorter value is used to calculate LA volume.

The normal value of indexed LA volume has been reported to be 20±6 ml/m². Patients were therefore divided according to the mean value plus 2 SDS, Corresponding to 32ml/m². LV systolic function was assessed semi quantitatively with a visually estimated ejection fraction and wall-motion score index mitral inflow was assessed with pulsed-wave Doppler echocardiography from the apical 4-Chamber view. From the mitral inflow profile, the E and A-wave velocity and E/A velocity ratio were measured. Doppler tissue imaging of the mitral annulus was also obtained.

Patients with acute myocardial infarction who had undergone thrombolysis alone included in this study. In-hospital complication occurred like death, Re-MI, Arrhythmias and Mechanical complications which were correlated with left atrial volume index by 2D and Doppler echocardiography. The data are expressed as mean ± SD of echo for quantitative data which are expressed as frequency and percentage. The probability value less than 0.05 was considered significant by using SPSS software. Pearson Chi Square test was used to compare LA volume index with all parameters including in-hospital events.

Results:

We studied 100 consecutive patients admitted in our ICCU with first episode of acute myocardial infarction were included. Among 100 patients 70(70%) were males with the mean age of 52 ± 12 years and 30(30%) were females with the mean age of 60 ± 10 years. AWMl was more common (68%) than IWMI (32%). The risk factors were smokers, hypertension, diabetes and dyslipidemia present in 40%, 46.10% 45% and 54.65% respectively which are all statistically significant P value (0.0001)

The patients were in killip class I, II, III and IV present in 41%, 38%, 21%, and 0% respectively. 32 Patients(32%) were required inotropic support. 19% patients were present with normal systolic function. Diastolic dysfunction in the grade I, grade II, grade III and grade IV patients in 39%, 30.90% 29.90% and nil 71 patients (71%) had LA volume index <32ml/m² and 29 patients (29%) had LA volume index Index >32ml/m².

Table 1LA Volume Index

LAVI	No of Patients	Percentage
<32ml/m ²	71	71%
>32ml/m ²	29	29%
Total	100	100%

In hospital events were occurred in the form of Re-MI, Arrhythmias, systolic dysfunction mechanical complication and death in 12%, 37%, 76%, 8%and 10% respectively.

Table 2 In-Hospital Events

Re MI	Yes	12	12%
Arrhythmia	Yes	37	37%
	No	63	63%
LV Dysfunction	Yes	76	76%
	No	24	24%
Mechanical complication	MR	6	6%
	VSR	2	2%
	No	92	92%
Death	Yes	10	10%
	No	90	90%

The Re-MI occurred 36.6% of patients in larger LA volume index group compared to 1.4% in smaller LA volume index group resulting in statistically significant P value (0.000)1.

Table 3: Re MI and LAVI

LAVI	Yes	No	Total	P Value
<32ml/m ²	1(1.4%)	69(98.5%)	70 (100%)	0.0001
>32ml/m ²	11(36.6%)	19(63.3%)	30(100%)	
Total	12 (12%)	88(88%)	100 (100%)	

Recurrent arrhythmia occurred in 67.5 patients in larger LA volume index group compared to 16.5 in smaller LA volume index group. This resulted in a statistically significant P value (0.000)

Table 4 Arrhythmia and LAVI

LAVI	Yes	No	Total	P Value
<32ml/m ²	12(19.04%)	51(80.9%)	63(100%)	0.0000
>32ml/m ²	25(67.5%)	12(32.5%)	37(100%)	
Total	37 (37%)	63(63%)	100 (100%)	

In patients with large LA volume index group 94% of patients had LV systolic dysfunction compared to 66% with smaller LA volume index group. This resulted in statistically significant P value (0.0245).

Table 5: LV Systolic Dysfunction and LAVI

LAVI	Yes	No	Total	P Value
<32ml/m ²	44(66.6%)	22(33.3%)	66 (100%)	0.0245
>32ml/m ²	32(94.2%)	2(5.8%)	34(100%)	
Total	76 (76%)	24(24%)	100 (100%)	

Mechanical complications like MR and VSR were more common among larger LA volume index group but the number is very less. Hence no statistically significant P value

Table 6: Mechanical Complications and LAVI

LAVI	MR	VSR	No	Total	P Value
<32ml/m ²	2(2.8%)	0(0%)	68(97.2%)	70 (100%)	Significant 0.124
>32ml/m ²	4(13.4%)	2(6.6%)	24(80%)	30(100%)	
Total	6(6%)	2(2%)	92(92%)	100 (100%)	

Death was more common in larger LA volume index group (31%) compared to small LA volume index (1.4%). This resulted in statistically significant P value (0.0012)

Table7: Death and LAVI

LAVI	Yes	No	Total	P Value
<32ml/m ²	1(1.4%)	70(98.6%)	71 (100%)	0.0012
>32ml/m ²	9(31.04%)	20(68.96%)	29(100%)	
Total	10 (10%)	90(24%)	100 (100%)	

Discussion:

This study has been conducted to demonstrate that LA volume index is a predictor of In-hospital events after first acute myocardial infarction. Furthermore, 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. In our study population of 100 patients,70% were males and 30% were females. Males were more in number, in LA volume index >32ml/m² and <32ml/m² categories. Gender differences in LA volume index does not occur as per reviewed literature^{14, 15, 19} Similarly in their study also there were no significant gender bias in LA volume index analysis. (P value 0.0624). There exists a direct correlation between advancing age and increased LA volume index. There was no independent correlation exists between regional location of MI and magnitude of LA volume index. Similarly, in our study also, it confirms that (P<0.905)

Our study results clearly support **Teresa SM Sang MD et al**²⁵ studies who suggested the left atrial volume was found to correlate positively with age, history of systemic, hypertension, diabetes mellitus, hyperlipidemia and smoking. In this study smokers had higher incidence of LA volume index (>32ml/m²) indicating significant cardiovascular risk. Hypertension was more common among patients with LA volume index >32ml/m² (74.02)In our study population of 100 patients 70% were males and 30% were females (25.98%) in the group of patients with LA volume index <32ml/m². As a result P value was significant (0.000)

In our study 72.98% of patients were diabetic among patients with LA volume >32ml/m² and only 27.02% were diabetic in the groups with LA <32ml/m² giving rise to significant P value (0.000) the number of patients with dyslipidemia among LA volume index >32ml/m² was 85.44% and 14.56% among LA volume index <32 ml/m².The P value was significant (0.000). **Moller JE, Hillis GS et al** in their study has proven that killip class was higher in patients with larger LA volume and Kilip class is a predictor of increasing LA volume with disease progression. In our study,it also confirms that those with killip class 2 and 3 had a larger LA volume index (>32ml/m²) with a statistically significant P value (0.000)

Re-MI occurred more commonly in the LA volume index >32ml/m² which was 36.6% while it was only 1.4% in the LA volume index <32ml/m² group resulting in a significant P value (0.0001). It confirm **Moller JE et.al**²² studies Arrhythmia were more common (67.5% in those with LA index >32ml/m² group compared to 19.04% in LA volume index <32ml/m²resulting in a significant P value (0.000). Mechanical complication which included moderate MR and VSR were more common among LA volume index >32ml/m².The P value was 0.124 which is not significant since the number of subjects under these categories were less.(8%).

Two recent studies have investigated the relation between LA dilation and all-cause mortality after AMI^{21, 24}. Our study also confirms that more deaths (31.04%) occurred in those with LA volume index >32ml/m² resulting in significant P Value (0.0012). In this study, higher E/e ratio >15) was found in patients with larger LA volume index (>32ml/m²) than those with smaller LA volume index (<32ml/m²) with significant P value (0.0004) which supports study by **Teresa SM sang MD et al**²⁵.

Conclusion:

This single centre observation 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. Measurement of LA volume is simple and important tool which can be easily done and reproducible and may be incorporated in routine assessment of diastolic function. 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 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 perspective studies.

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