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RESEARCH ARTICLE

ECHOCARDIOGRAPHIC ASSESSMENT OF LEFT ATRIAL VOLUME INDEX IN MYOCARDIAL INFARCTION

Gupta Charchit*, Sharma RS, Siddiqui S*****

***Post graduate resident 3rd**
****Senior Cardiologist , Associate Professor**
*****Cardiologist , Assistant Professor**
Department of Medicine, N.S.C.B. Medical College, Jabalpur
Corresponding Author: Dr. Charchit Gupta

ABSTRACT:
Enlarged Left atrium predicts outcomes in patients with heart failure, atrial fibrillation and stroke. Left atrial volume especially when corrected for body size (LAVi), is a more accurate representation of true left atrial size.The aim of our cross-sectional study was to assess LAVi in patients with myocardial infarction and to compare with control group and also to correlate LAVi with LVEF and with transmitral Doppler flow velocities.100 subjects including 70 cases of MI and 30 controls were included in our study. In all subjects complete ECG analysis and transthoracic 2D-ECHO evaluation was done in lateral decubitus position.LAV was calculated by using biplane area length method from apical four chamber and two chamber view respectively at end systole just before mitral valve opening ,which was indexed to BSA to obtain LAVi. LVEF was calculated as percentage of changes in LV chamber volumes between diastole and systole using formula EDV- ESV/ EDV X 100. Transmitral Doppler flow velocities were also calculated.BSA was calculated using weight and height of patients using Dubois formula.In our study LAVi was found significantly higher in MI cases 31.04+_12.25 ml/m2 as compared to controls -18.57+_4.6 ml/m2. . There was significant negative correlation of LAVi with LVEF and E wave peak velocity.Thus, LAVi is a predictor of outcome in MI is intimately related to LV hypertrophy , systolic and diastolic function .LAVi > 29 ml/m2 at rest is a good predictor of cardiovascular outcomes including heart failure ,atrial fibrillation ,stroke and overall mortality.

Keywords : BSA – Body surface area, EDV- Endiastolic volume, ESV- Endsystolic volume, LAV- Left atrial volume, LAVi –Left atrial volume Index, MI –Myocardial infarction.

INTRODUCTION:

Recent evidences highlight the importance of enlarged left atrium (LA) as a barometer of diastolic burden and good predictor of cardiovascular outcome s include heart failure, atrial fibrillation, stroke and mortality[2] .It is considered a validated marker of chronically increased left atrial pressure and volume .The LA volume has been compared to the glycosylated haemoglobin of diabetes mellitus[3], as it is a reflection of long standing hemodynamic condition. Because left atrial size can be measured noninvasively by echocardiography ,measurement of LA size is part of standard echocardiography examination. However ,though traditional method of assessing maximum end systolic anteroposterior dimension of left atrium from the parasternal long axis view in M mode is simple and convenient. However, its accuracy may be limited by the anatomical confinement afforded by the spine and sternum and the resulting assymetrical or pillow shaped enlargement of left atrium .[4]Therefore measurement of a single LA diameter may underestimate actual LA size. For these reasons , multiple linear dimensions or measurement of left atrial volume (LAV) especially when corrected for body size (LAVi), is a more accurate representation of actual LA size.

[5]LAVi is a predictor of outcome in Myocardial infarction and is intimately related to LV hypertrophy , systolic and diastiolic function.LAVI rise above 32 ml/ square meter is associated with increased risk of stroke independent of age and other clinical risk factors.

AIMS AND OBJECTIVES

Our aim of study was to assess LAVi in patients with myocardial infarction and to compare with control group and also to correlate LAVi with LVEF and with transmitral Doppler flow velocities.

MATERIALS AND METHODS

The present study was conducted at Cardiology OPD in department of medicine at Netaji Subash Chandra Bose Medical College, Jabalpur from 1st October 2014 to 30th September 2015 after approval from ethical committee of our institution.

Grouping of Subjects

1.Control group (n=30) : This group consisted of 30 subjects > 40 yrs of age without history of ischaemic heart disease and systemic hypertension and with normal findings in ECG .

2. Study group (n=70) : This group consist of 70 age and sex matched patients with acute MI having history of ischaemic chest pain > 30 minutes ,ST segment elevation > 2mm in anterior leads I ,aVL, V1-V6 and ST segment elevation > 1mm in leads II,III and aVF and positive serum markers (Troponin T and I and CPKMB.) and also pt with old myocardial infarction on basis of q wave appearance in inferior and anterolateral leads or poor R wave progression followed by echocardiographic evaluation.

Inclusion criteria: Subjects willing to be part of the study

Exclusion criteria:

a. Subjects who don't want to be part of study .
b. Significant valve lesions (mitral stenosis , or more than moderate mitral regurgitation)
c. Large shunts
d. Atrial flutter and atrial fibrillation
e. Bundle branch block
f. Poor acoustic window

METHODOLOGY:

In all subjects following detail analysis will be done.
a.**ECG:** Complete and thorough analysis of inferior and anterior leads will be done .
b. **Transthoracic 2D-Echocardiography**

A transthoracic 2D-echocardiographic examination will be performed with patient in lateral decubitus position in Cardiology OPD in NSCB medical college Jabalpur. With the use of apical four chamber view ,LVEF will be calculated as percentage of LVEDV – LVESV/ LVEDV x 100. LA volume will be measured from apical four chamber view and two chamber view at end systole just before mitral valve opening using biplane area length method by formula : 0.85xA1xA2/L where A1and A2 are LA areas in apical four chamber

and apical two chamber views respectively and borders of left atrium consist of walls of left atrium excluding pulmonary veins and left
atrial appendage. L is the distance between the plane of mitral annulus to posterior wall and is the shortest of the length obtained from orthogonal view. Above formula is indexed to body surface area to get LA volume index .Body surface area is calculated from weight and height of subjects using Dubois formula.

Statistical analysis

All the records were rechecked for their completeness and consistencies. Illogical entries were resolved before analysis. Non numeric entries were coded numerically into nominal/ordinal distribution before analysis. Categorical variables were summarized in frequency and percent distribution and Chi-square or Fishers exact test was performed as appropriate. Continuous variables were analyzed using
mean±sd or median with inter quartile range as appropriate. Mean difference between two independent groups and two observation on same subject were analyzed by using independent t-test and paired t-test respectively after normalized the distribution otherwise non-parametric test was applied. For test the null hypothesis, 0.05 Alpha and 95% confidence limit was applied.

OBSERVATIONS

Table no. 1 Age Wise Distribution of Cases and Controls

AGE GROUP (YEARS)	N0. 0F CASES	PERCENTAGE (%)	NO. OF CONTROLS	PERCENTAGE
40-60 yrs	36	51.42%	26	86.66%
61 - 80 yrs	30	42.85%	4	13.33.%
Above 80 yrs	4	5.71%	0	0.00%
TOTAL	70	100%	30	100%

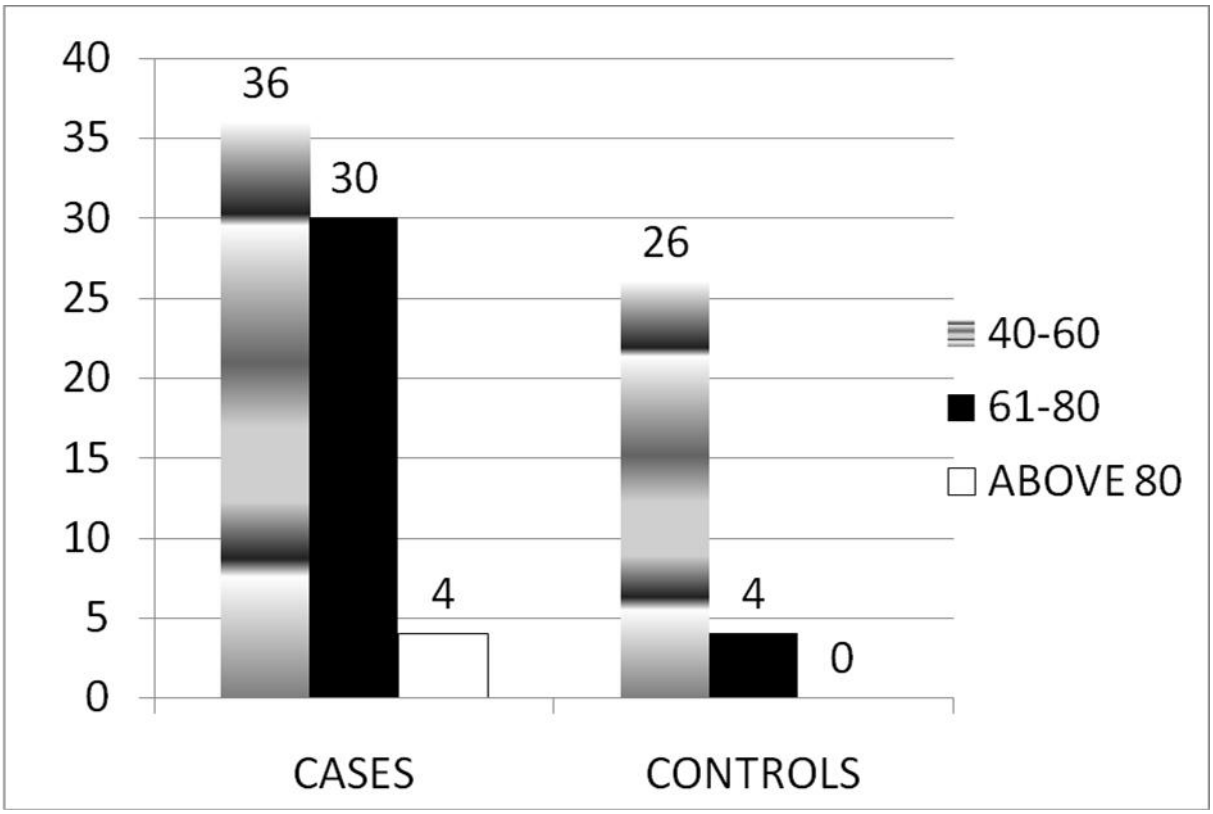
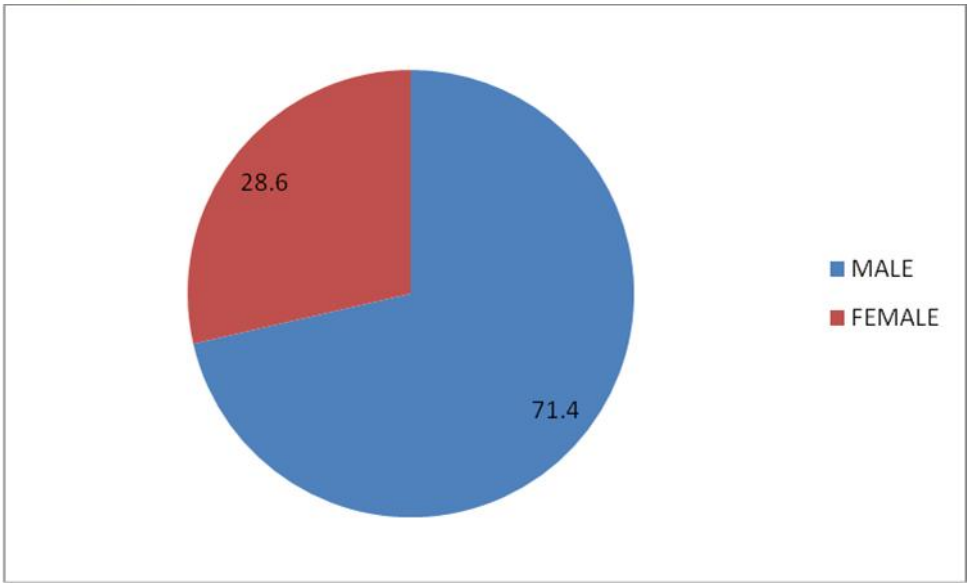


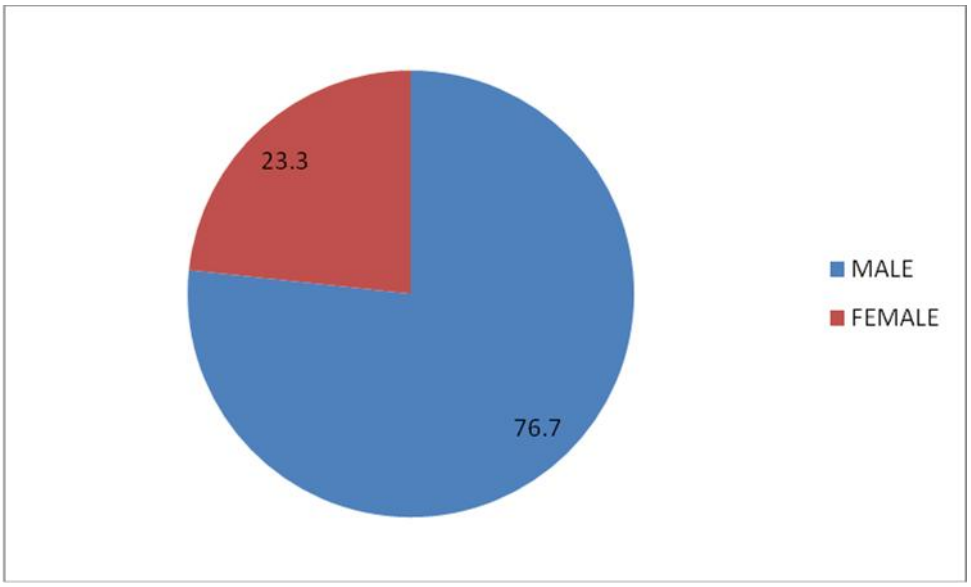
Fig 1. -Bar graph showing the age distribution of cases and controls

Table no. 2 Sex Wise Distribution of Cases and Controls

GENDER	CASES	PERCENT	CONTROL	PERCENT
FEMALE	20	28.60%	7	23.30%
MALE	50	71.40%	23	76.70%
	70	100%	30	100%



CASES



CONTROLS

Fig 2. Showing sexwise distribution of cases and controls.

Table 3 : Basal clinical characteristics of the two groups

PARAMETER	CONTROL	STUDY	P VALUE
AGE(years)	53± 8	61± 11	>0.05
SEX (M/F)	23/7	50/20	>0.05
BMI(kg/m2)	25.41± 3.24	29.01± 3.82	>0.05

Table 4 : Raised LAVi in study group.

PARAMETER	CONTROL	STUDY	P VALUE
LAVi(ml/m2)	18.57±4.16	31.04±12.25	<0.0001
LVEF(%)	66.22±6.11	55.55±13.68	0.0001
E wave peak velocity(m/s)	0.57± 0.26	0.73±0.36	0.0015
Awave peak velocity(m/s)	0.50± 0.21	0.82±0.42	0.0027

Table 5: Significant negative correlation of LAVi with LVEF and E wave peak velocity

PARAMETER 1	PARAMETER 2	CORRELATION	LEVEL OF SIGNIFICANCE
LAVi	LVEF	R= -0.5147	P <0.0001
LAVi	E wave peak velocity	R=-0.237	P<0.0176
LAVi	A wave peak velocity	R= 0.1407	P=0.1627

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Diagram 1: **Apical four chamber view - left atrium area calculation by perimetry**

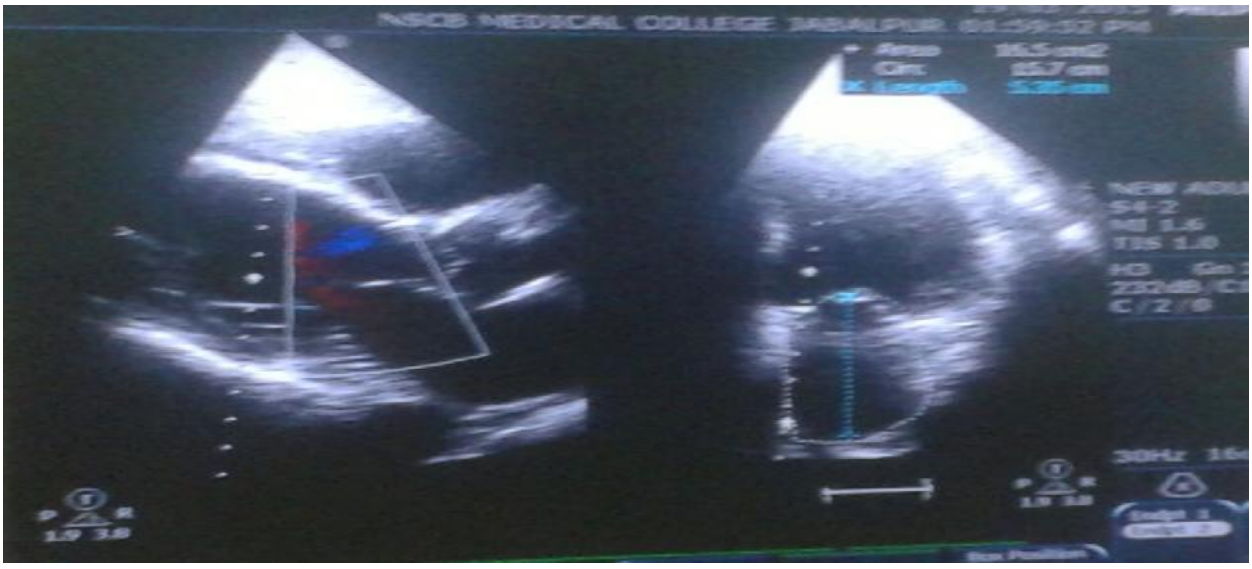

DIAGRAM 2. Apical two chamber view - left atrium area calculation by perimetry

Diagram 3: Showing transmitral velocities calculations using Doppler 2D-ECHO

DISCUSSION

LAVi <28 ml/m2 at rest predicts normal stress echocardiogram[6] and LAVi >32ml/m2 predicts mortality in patients with acuteMI.[7]LAVi (>50ml/m2) predicts heart failure (HF) hospitalization and mortality with similar statistical power as LVEF (<45%) in ambulatory adults with coronary artery disease.[8] Increased LA volume is also a predictor of stroke and death. An indexed LA volume of ≥32 ml/m2 is associated with an increased risk of stroke independent of age and other clinical risk factors for cerebrovascular disease[9]. LA volume is intimately related to LV mass / hypertrophy, systolic and diastolic dysfunction.

LAVi is significantly raised in elderly patients with anterior wall MI and there was significant negative correlation between LAVi and LVEF and with E wave peak velocity.[1]LA volume is intimately related to LV mass / hypertrophy, systolic and diastolic dysfunction.[3]The only determinant of LA size is body surface area. LA size in healthy person is independent of age. Indeed increase in LA size is a reflection of pathophysiologic perturbations that accompany advancing age rather than consequence of chronologic aging.[10]

In our study ,LAVi was found significantly higher in MI cases 31.04+_12.25 ml/m2 as compared to controls -18.57+_4.6 ml/m2. . There was significant negative correlation of LAVi with LVEF ,(p value <0.0001) and E wave peak velocity,(p value <0.0176).

CONCLUSION

Patients with advanced left ventricular systolic and diastolic dysfunction had a significantly larger LAVi than healthy subjects.

Our study describes that use of LAVi for risk stratification and prognostication in Myocardial infarction and for guiding therapy may prove to have a very important public health impact.

Acknowledgement

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