



AN OBSERVATIONAL STUDY OF LEFT ATRIAL DIMENSIONS AND VOLUMES BY TWO DIMENSIONAL TRANSTHORACIC ECHOCARDIOGRAPHY IN NORMAL INDIAN ADULT POPULATION

Cardiology

Dr .Sandeep.S	Post graduate, DM Cardiology, Institute of Cardiology Madras Medical College Chennai - 600003.
Dr Swaminathan.N*	Director and Professor of Cardiology, Institute of Cardiology Madras Medical College Chennai - 600003.*Corresponding Author
Dr. PrathapKumar.G	Assistant Professor of Cardiology Institute of Cardiology Madras Medical College Chennai - 600003.

ABSTRACT

Left atrial dimensions and volumes are considered valuable prognostic markers in various conditions like hypertension, obesity, atrial fibrillation, chronic kidney disease, sleep apnea syndrome, mitral valve disease, LV systolic and diastolic dysfunction etc. They are also described as strong predictors of major cardiovascular adverse events. Left atrium is difficult to detect by clinical examination. 2D echocardiography helps in quantifying this chamber. It is also the best method for assessment and follow-up of left atrial size in various disease states. The method also has an added advantage of being radiation free and does not require contrast enhancement. Left atrial dilatation, which is a hallmark of left atrial structural remodeling can happen because of both pressure and volume overload. Also, left atrial dilatation can indicate raised LV filling pressures. In this article, we attempt to define the left atrial dimensions and volumes by 2D transthoracic echocardiography in normal Indian adult population. The information thus obtained will help us understand the abnormal which can have prognostic implications.

KEYWORDS

Left atrium, 2D transthoracic echocardiography, quantification

INTRODUCTION:

Left atrium is a posteriorly situated structure and receives blood from the pulmonary veins. The chamber is difficult to detect by clinical examination. 2D echocardiography helps in quantifying this chamber. It is also the best method for assessment and follow-up of left atrial size. The method also has an added advantage of being radiation free and does not require contrast enhancement. Echocardiography can also help in describing left atrial physiological parameters like conduit function, reservoir function and booster function. Left atrial dilatation, which is a hallmark of left atrial structural remodeling can happen because of both pressure and volume overload. Increased left atrial volume is known to be associated with adverse outcomes in patients with mitral valve disease, aortic valve disease, left ventricular systolic and diastolic dysfunction, obesity, sleep apnea syndrome, hypertension, heart failure, stroke and atrial fibrillation. Therefore, it is imperative that normalcy be defined and in this article we attempt to define the left atrial dimensions and volumes in normal Indian adult population.

MATERIALS AND METHODS:

After careful selection of patients by applying inclusion and exclusion criteria, the patients were chosen to undergo a thorough 2D transthoracic echocardiography. Left atrial dimension in the anteroposterior view was measured at end systole in the parasternal long axis view perpendicular to the aortic root axis and measured at the level of aortic sinuses using the leading edge to leading edge convention.

For left atrial volume, the endocardial borders should be traced in both the apical 4 and 2 chamber views. The tracings should exclude atrial appendage and pulmonary veins. At the mitral valve level, the contour is closed by connecting the two opposite sections of the mitral annulus with a straight line.

In the area length method, assuming an ellipsoid configuration, left atrial length L is defined as the shortest of the two long axes measured in the apical 2 and 4 chamber views. Volumes can be calculated using the formula - $\frac{8}{3}\pi [(A1-A2)/L]$ where A1 and A2 are planimetered areas in apical 4 chamber and apical 2 chamber view respectively.

In the disk summation technique, LA volume is calculated by adding the volume of a stack of cylinders of height h and area calculated by orthogonal minor and major transverse axes (D1 and D2) assuming an oval shape: $\pi/4 h \Sigma(D1)(D2)$.

The volumes were further indexed to body surface area.

RESULTS:

200 adult patients who visited our outpatient department from October 2019 and December 2019, aged between 18 and 60 years were chosen to undergo thorough 2D transthoracic echocardiography after careful application of inclusion and exclusion criteria. A total of 134 males and 66 females participated in the study after obtaining proper informed consent. The mean age of patients was 39 years.

Among males, the average anteroposterior dimension measured by 2D parasternal long axis view was 3.2 cm and among females the average anteroposterior dimension measured was 3 cm.

The mean LA volume measured in males by area length method was 27 ± 5 ml/m² and in females was 26 ± 5 ml/m². Similarly, the mean LA volume measured by disk summation method was 27.5 ± 5 ml/m² and in females was 27 ± 5 ml/m².

TABLE 1 - SEX DISTRIBUTION OF STUDY POPULATION:

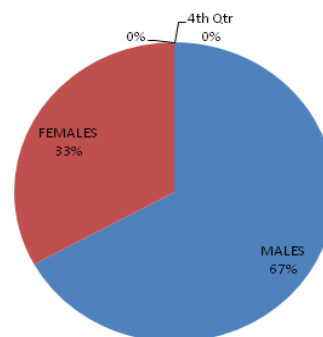


TABLE 2 - AVERAGE ANTEROPOSTERIOR LEFT ATRIAL DIMENSION:

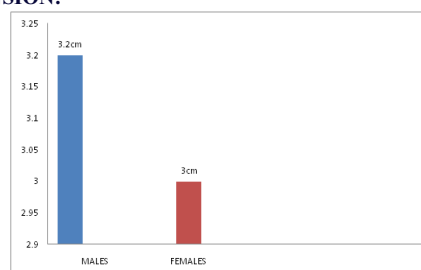
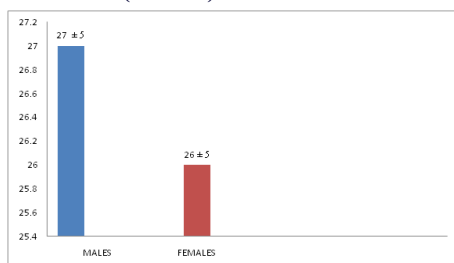
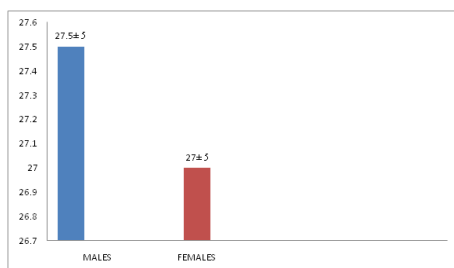


TABLE 3 - AVERAGE INDEXED LA VOLUME BY AREA LENGTH METHOD (in ml/m²)**TABLE 4 - AVERAGE INDEXED LA VOLUME BY DISK SUMMATION METHOD (in ml/m²):****CONCLUSION:**

Defining the normal left atrial dimension and volume is of utmost clinical importance as deviation from the normal has important prognostic implications.

REFERENCES:

1. Rosca M, Lancellotti P, Popescu BA, Pierard LA. Left atrial function : pathophysiology, echocardiographic assessment, and clinical applications. Heart 2001; 85:272-7
2. Spencer KT, Mor-Avi V, Gorcsan J, DeMaria AN, Kimball TR, Monaghan MJ, et al. Effects of aging on left atrial reservoir, conduit, and booster pump function: a multi-institution acoustic quantification study. Heart 2001;85:272-7.
3. Bouzas-Mosquera A, Brouillon FJ, Alvarez-Garcia N, Mendez E, Peteiro J, Gandara-Sambade T, et al. Left atrial size and risk for all-cause mortality and ischemic stroke. Can Med Assoc J 2011;183:E657-64.
4. Kizer JR, Bella JN, Palmieri V, Liu JE, Best LG, Lee ET, et al. Left atrial diameter as an independent predictor of first clinical cardiovascular events in middle-aged and elderly adults: The Strong Heart Study (SHS). Am Heart J 2006;151:412-8
5. Lancellotti P, Donal E, Magne J, Moonen M, O'Connor K, Daubert JC, et al. Risk stratification in asymptomatic moderate to severe aortic stenosis: the importance of the valvular, arterial and ventricular interplay. Heart 2010;96:1364-71.
6. Le Tourneau T, Messika-Zeitoun D, Russo A, Detaint D, Topilsky Y, Mahoney DW, et al. Impact of Left Atrial Volume on Clinical Outcome in Organic Mitral Regurgitation. J Am Coll Cardiol 2010;56:570-8.
7. 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;90:1284-9.