

Assessment of Left Atrial Function in Hypertrophic Cardiomyopathy and Hypertrophic Obstructive Cardiomyopathy Patients using Conventional Echocardiography and Two-Dimensional Speckle Tracking Method

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INTRODUCTION

Hypertrophic cardiomyopathy (HCM) is a chronic disease condition, with a predominance of 1 in 500 individuals in general population, which is nearly around 2 million people in India. Hypertrophic cardiomyopathy is defined as the presence of improper left ventricular wall thickness in the absence of other conditions which are capable of producing hypertrophy. Due to the abnormal filling process, the left ventricular end-diastolic pressure increases which lead to the augmentation in left atrial pressure. The rise in LA (left atrium) pressure consequently results in the increase in left atrial size and volume that can cause atrial fibrillation and flutter.

AIMS AND OBJECTIVES

It has been reported that left atrial diameter, volume and LA strain values are the better predictors of new-onset atrial fibrillation in patients with hypertrophic cardiomyopathy. The current study was aimed to assess the left atrial size and function in obstructive and non-obstructive HCM patients, using conventional echocardiography and two dimensional speckle tracking method.

MATERIALS AND METHODS

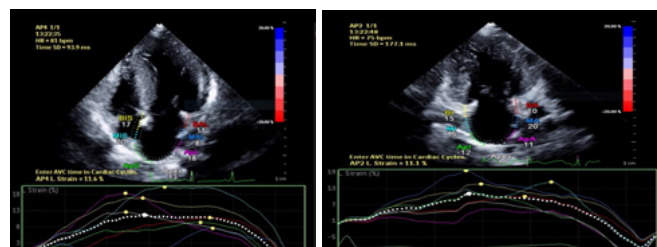
This hospital based prospective study was conducted for the period of one year i.e. from February 2019 to January 2020, in the Department of Cardiology, KLE's Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi, Karnataka. A total of 40 patients with Hypertrophic cardiomyopathy and Hypertrophic obstructive cardiomyopathy who have visited outpatient department of cardiology, patients incidentally diagnosed to have HCM during screening for minor surgery and also known case of hypertrophic cardiomyopathy patients referred to cardiology department were enrolled.

RESULTS AND DISCUSSION

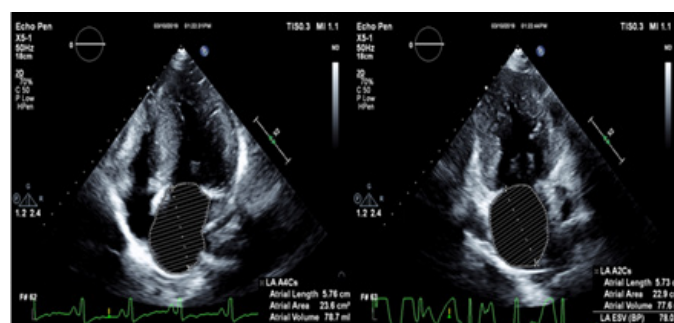
In this study, 70% (n=28) of the patients were males and 30% (n=12) were females. Most of the patients (37.50%) were aged between 51-60 years. The mean age was 52.80 ± 14.21 years. 72.50% (n=29) of subjects presented with elevated left atrial volume index (LAVI). Out of them, 28 had reduced LA strain values ($p < 0.001$). The mean LA strain values in AP4CH, AP3CH and AP2CH are $22.50 \pm 8.18\%$, $20.79 \pm 7.24\%$ and $22.25 \pm 8.16\%$ respectively with a mean global longitudinal strain of $21.66 \pm 6.73\%$. The mean left atrial strain value in patients with maximum wall thickness of ≥ 2.3 cm and LAVI of ≥ 28 mL/m² is $18.13 \pm 3.82\%$. 89.47% of subjects with LVOT obstruction had augmented LAVI ($p = 0.022$) and varying degrees of mitral regurgitation ($p = 0.010$).

Speckle tracking echocardiography of LA:

STE is performed on standard two dimensional gray-scale imaging. ECG gated standard AP4CH, AP2CH and AP3CH views are acquired on EPIQ 7C echo machine connected with X5 matrix transducer. The software automatically divides the left atrium into 6 segments. Then the region of interest should be adjusted with the shape of LA. After the adjustments, Left atrial strain can be calculated throughout the cardiac cycle.



Left Atrial Volume: ECG gated AP4CH and AP2CH views are acquired at the end of systole. LA area is traced by Simpson's method in both images, which gives left atrial volume. While tracing the area, pulmonary veins and left atrial appendage should be excluded.



The severity of MR is directly proportional to the gradient across left ventricular outflow tract obstruction. Out of 72.50% (n=29) with elevated left atrial volume index, 68.96% (n=20) had diastolic dysfunction of Grade I to IV. Left ventricular ejection fraction (LVEF) was normal in all patients ($60.85 \pm 1.09\%$).

CONCLUSION

Left atrial diameter, volume and strain values are the better predictors of left atrial dysfunction in patients with hypertrophic cardiomyopathy. The elevated Left atrial volume indexed to body surface area (LAVI) is an indirect indicator of left atrial dysfunction. LAVI and LA strain values are inversely proportional to each other. As the LAVI increases, the LA strain value decreases (reduction in LA function). LAVI is a better parameter over LA (A-P) diameter, because LA dimension is a measure of distance which may foreshorten and provide false information. Severe left ventricular outflow tract obstruction and mitral regurgitation can also cause left atrial dysfunction. The present research work also shows that, the severity of mitral regurgitation depends upon the severity LVOT gradient, compared to the degree of systolic anterior motion (SAM) of mitral valve.

For the assessment of HCM patients, the routine echocardiography should include the estimation of left atrial volume index and left atrial function (using strain and strain rate imaging) even in patients with normal LA diameter. The early detection of changes in left atrial size and function is helpful for the treatment selection and follow-up of patients.

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