

Correlation between Left Atrial Dimensions with Age and Body Mass Index Among Various Groups Of Hypertensives And Controls

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Abstract

Introduction: Hypertension is known to cause changes in the LV that impact negatively on the LA both structurally and functionally posing clinically significant risk to patients. LA size assessment until recently was limited to determination of LA linear diameter and much has not been elucidated with respect to left atrial volume (indices), age, BMI and cardiac indices as surrogates for LA and cardiac function. It is therefore important to see how LA indices (size, linear diameter and volume), age, BMI and cardiac indices relate to LV diastolic function among hypertensive subjects.

Objectives: To compare age, BMI and left atria indices within various left ventricular function/dysfunction among hypertensive and controls

Methods: It is an echocardiographic based descriptive cross-sectional study. A total of 200 hypertensive patients were recruited from the cardiology clinics using systematic sampling method with 100 age and sex match controls

Results: Majority of the cases had isolated diastolic dysfunction n=149 (74.5%), thirty six (18%) had normal diastolic and systolic functions while 7.5% had combined systolic and diastolic dysfunction (n=15). Left atrial

maximum volume correlated significantly with E/E Prime (P= 0.003) and E/A Ratio (P= 0.003). While Left atrial pre A wave volume (P=0.025), Left atrial diameter did not correlate with IVRT, E/E', E/A ratio.

Conclusion: Among the hypertensive patients E/E' significantly correlated positively with all phasic LA volumes compared to E/A ratio. LV mass independently predicted all LA phasic volumes

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I. INTRODUCTION:

The burden of cardiac diseases is a major problem in the world, with hypertension, ischaemic heart disease and cardiomyopathies as major causes of mortality amongst people. This is particularly worse in developing countries in Africa where there is increased burden of both communicable and non-communicable diseases (for which hypertension and cancers are prevalent). This result in loss of manpower, financial stress on care givers and may also have other socioeconomic implications.^{1,2}

Hypertension particularly is found to be more prevalent among Blacks. Patients with hypertension have many target organ damage for which heart disease is an example. Others include stroke and chronic kidney disease. Hypertension notably causes problems of impaired relaxation of the heart (diastolic dysfunction) and this has been found to impact negatively on the heart chamber size particularly the left atrium and left ventricle.¹

As our understanding of diastology increases and with availability of non-invasive techniques like echocardiography, this will lead to increase in the early diagnosis of diastolic dysfunction (a notable risk factor for increased cardiovascular morbidity) especially so in patients with systemic hypertension. This study will help increase knowledge base and ultimately improve intervention since most hypertensives are asymptomatic in early stages of the disease. This will create opportunities for clinicians, policy makers and those at decision making levels to adopt solutions towards preventing progression into overt heart failure.

II. METHODOLOGY:

It is an echocardiographic based descriptive cross-sectional study done in DELSUTH (Delta State University Teaching Hospital). A total of 200 hypertensive patients with diastolic dysfunction were recruited from the cardiology clinics using systematic sampling method. And 100 normotensives as control. P value less than 0.05 is regarded as significant. **Aims of the Study:** To compare age, BMI, echocardiographic left atrial indices with left ventricular (diastolic, systolic dysfunction and normo function) in hypertensives. Inclusion Criteria: 1) Males and females ≥ 18 years. 2) Hypertensive patients, irrespective of, blood pressure control, whether on antihypertensive medications or not and duration of hypertension. Exclusion Criteria: 1) Overt heart failure. 2) Cardiomyopathy, 3) Suboptimal echocardiographic images, 4) Rheumatic valvular heart disease (regurgitation or stenosis), 5) Non consenting patients, 6) Patients with atrial fibrillation 7) Pregnant women.

III. RESULT:

Correlation between Left Atrial Dimensions with Age and Body Mass Index among the various groups of Cases and controls

	AGE				BODY MASS INDEX			
	IDD* r(p-value)	SDD* r(p-value)	NSDF* r(p-value)	CONTROL r(p-value)	IDD* r(p-value)	SDD* r(p-value)	NSDF* r(p-value)	CONTROL r(p-value)
LA Linear Diameter (mm ³)	0.07 (0.428)	0.47 (0.074)	0.16 (0.342)	0.07 (0.490)	-0.11 (0.172)	-0.39 (0.156)	0.24 (0.158)	-0.07 (0.502)
LA Maximum Volume (mm ³)	0.05 (0.546)	0.48 (0.068)	0.30 (0.079)	0.40 (<0.001)	-0.08 (0.329)	-0.37 (0.170)	0.17 (0.326)	0.31 (0.001)
LA Pre A Volume (mm ³)	0.03 (0.677)	0.24 (0.384)	0.24 (0.159)	0.49 (<0.001)	0.11 (0.192)	0.01 (0.965)	0.01 (0.990)	0.19 (0.062)
LA Minimum Volume (mm ³)	0.01 (0.924)	-0.17 (0.546)	0.08 (0.651)	0.08 (0.651)	0.14 (0.095)	0.11 (0.697)	0.08 (0.633)	0.27 (0.006)

*Hypertensive group

Pearsons Correlation is Significant when $P < 0.05$.

Key: LA – Left Atrial, ISD – Isolated Systolic Dysfunction, IDD – Isolated Diastolic Dysfunction, SDD – Systolic and diastolic dysfunction, NSDF – Normal Systolic and diastolic function

There was no significant correlation between age, body mass index versus LA linear diameter and volumes among cases with isolated LV diastolic dysfunction. (As shown in Table)

There was no significant correlation between age, body mass index versus LA linear diameter and volumes among cases with both LV systolic and diastolic dysfunction. (As shown in Table)

There was no correlation between Left Atrial Dimensions/volumes with Age and Body Mass Index among Cases with Normal Left Ventricular Systolic and Diastolic Function. (As shown in Table)

Age correlated significantly with Left atrial Maximum volume ($P < 0.001$) and Left Atrial pre a wave volume ($P = < 0.001$) while Body mass index correlated with Left Atrial Maximum volume ($P < 0.001$) and Left Atrial minimum volume ($P = 0.006$). (As shown in Table)

IV. DISCUSSION:

When analysis was done on the subgroups of patients in this study, there was significant correlation between age and all LA phasic volumes and linear diameter among the control group. There was however, no correlation among the various subgroups of hypertensive patients. Age has been shown to correlate with LA enlargement from several studies³⁻⁶. Adewole et al⁷ showed that age correlated with LA size, however a similar study done by Adebayo et al⁸ did not show correlation between age and LA maximum volume. As one ages left ventricular compliance reduces this can then lead to diastolic dysfunction causing progressive increase in LA size. This finding may suggest that advancing age being a risk factor for cardiovascular disease can impact negatively on left atrial function by contributing to LV diastolic dysfunction even among normotensive individuals. The apparent absence of correlation in the subgroups of hypertensive patient may be attributed to the heterogeneity of the groups as most of them may have other factors contributing to diastolic dysfunction as well as being hypertensive. This may suggest that a good correlation may not exist when multiple factors like hypertension, age, and increase in BMI are all present.

LA maximum volume correlated with BMI among the normotensive controls. This finding is in agreement with the study done by Mohammed et al⁹ and others^{7,8} which showed that obesity was directly associated with abnormal parameters of LV diastolic dysfunction and was an independent predictor of left atrial enlargement. Ebenezer et al¹⁰ in a study done in Nigeria comparing LA size in obese and non-obese patients showed that LA size was consistently higher among the obese group compared to those in the overweight and normal BMI categories.

Obesity is known to cause left ventricular hypertrophy even in the absence of hypertension and these changes affect the size and function of the left atrium. These findings also suggest a stronger association between obesity and left atrial volume compared to LA linear diameter even in the absence of hypertension.

V. CONCLUSION

Age correlated with all left atrial phasic volumes in normotensive but not in the various subgroups of hypertensive. Left atrial maximum volume correlate with BMI in normotensives

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