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Original Research Article

The Echo Graphic Assessment of Inappropriate Left Ventricular Mass and Left Ventricular Hypertrophy in Patients with Diastolic Function

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Abstract: ***Objective:*** To evaluate the echo graphic assessment of inappropriate left ventricular mass and left ventricular hypertrophy in patients with diastolic function. ***Method:*** This cross sectional study was carried out at tertiary medical hospital where Two-dimensional echocardiography was performed on 200 patients with simple hypertension at a tertiary medical center. If a woman had an LVM index of more than 88 g/m2 of body-surface area, or if a man had an LVM index of more than 102 g/m2 of body-surface area, they were considered to have an unhealthy amount of LVM. Women with a septal wall thickness of more than 0/9 cm and males with a thickness of more than 1 cm are considered to have LVH. Early diastolic peak velocity (E) was compared to late diastolic peak velocity (A), deceleration time (DT), and early diastolic peak velocity (E′) were also assessed as echocardiographic parameters. ***Results:*** Patients' averaged systolic and diastolic blood pressure readings on the day of admission were 142.87 18.12 and 88.45 9.18 mmHg, respectively. Twenty-one percent of the individuals had an abnormal LV mass, with 5.6% having a mild abnormality and 5.6% having a severe abnormality. Patients with mild left ventricular hypertrophy had a higher mean age and body mass index (P 0.05). Patients with more severe ventricular hypertrophy had longer E/A ratios and longer deceleration times after controlling for age, gender, body mass index, and systolic and diastolic blood pressures. The mean body mass index (BMI) of subjects with severe was 33. 7 3.7 (P 0.001). Slightly different levels of diastolic dysfunction were associated with varying degrees of improper LV mass (P = 0.065). However, there was no correlation between E/A, E/E′, or deceleration time and excessive LV mass (P > 0.05). The relationship between diastolic dysfunction and LV mass was analyzed using Spearman's Rank test (P = 0.025). ***Conclusion:*** While LVH is a strong predictor of diastolic dysfunction severity as measured by the E/A value and deceleration duration, incorrect LVM provides only a modest predictor of diastolic dysfunction severity in uncomplicated hypertension.

Keywords: Echocardiographic, left ventricular mass (LVM), left ventricular hypertrophy (LVH), Diastolic dysfunction.

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INTRODUCTION

Significant prognostic markers for cardiovascular events in individuals with acute myocardial infarction or progressive heart failure include an abnormality of left ventricular mass (LVM) and left ventricular hypertrophy [1]. Some hemodynamic parameters, such as high blood pressure and stroke work, and some constitutional characteristics, such as body size, female gender, and advanced age, have been shown to possibly alter LVM in physiological tests [2, 3]. Given that left ventricular hypertrophy and its improper mass remains a powerful predictor of fatal cardiovascular end points, echocardiographic evaluation of the heart's chambers appears warranted [4]. Diastolic dysfunction has been linked to decreased ventricular filling, lower stroke volume and cardiac output, and the development of serious complications like pulmonary congestion and edema that can lead to heart failure and even cardiac death, making this evaluation especially important for patients with diastolic dysfunction impairment. Moreover, left ventricular diastolic dysfunction is seen in around one-third of the general population and in the

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majority of individuals with the evidences of cardiovascular ischemia, making it crucial to evaluate the association between ventricular morphology and diastolic function indices [5, 6]. Therefore, avoiding diastolic and systolic heart failure and the associated morbidity and mortality may be aided by treating ventricular abnormalities and dysfunction. We used data from the Isfahan Healthy Heart Program to examine the correlation between left ventricular hypertrophy and adequacy of ventricular mass and the development of diastolic dysfunction in a Bangladeshi patient population (IHHP).

OBJECTIVE

To evaluate the echo graphic assessment of inappropriate left ventricular mass and left ventricular hypertrophy in patients with diastolic function.

METHODOLOGY

This cross sectional study was carried out at tertiary medical hospital where Two-dimensional echocardiography was performed on 200 patients with simple hypertension at a tertiary medical center. If a woman had an LVM index of more than 88 g/m2 of body-surface area, or if a man had an LVM index of more than 102 g/m2 of body-surface area, they were considered to have an unhealthy amount of LVM. Women with a septal wall thickness of more than 0/9 cm and males with a thickness of more than 1 cm are considered to have LVH. Early diastolic peak velocity (E) was compared to late diastolic peak velocity (A), deceleration time (DT), and early diastolic peak velocity (E′) were also assessed as echocardiographic parameters. In this trial, the exclusion criteria were defined as having diabetes mellitus, secondary hypertension, recent surgery, any chronic disease, unstable and stable angina, any valvular heart disease, and pericardial disease, cardiomyopathy based on the echocardiographic findings, congestive heart failure, known coronary artery disease and incomplete clinical data, or unwillingness to participate or inability for logistic reasons.

Also hypertension can induced premature coronary artery disease as smoking with respect to number of vessel involvement and left main disease butparticipants underwent a comprehensive noninvasive diagnostic workup at the baseline, including echocardiography, exercise stress test, and cardiovascular computed tomography (CT). Baseline characteristics were collected by interviewing at the admission time and height, weight, abdominal circumference, blood pressure, and heart rate were measured before echocardiography. Systolic and diastolic blood pressures were measured two times in 1 minute interval by the same instrument. The study protocol was approved by the Institutional review board of Isfahan Cardiovascular Research Institute. Informed consent was obtained from each patient regarding the process of the examination and use of the data.

RESULTS

Table-1 shows base line status of the patients with left ventricular hypertrophy where The mean of age and BMI was significantly higher in patients with moderate left ventricular hypertrophy ($P < 0.05$) [Table 1]. Both systolic and diastolic blood pressures as well as left ventricular ejection fraction had not any differences based on the severity of left ventricular hypertrophy ($P > 0.05$), while left ventricular systolic diameter (LVESD) and LVPWD showed significant differences with severity of left ventricular hypertrophy ($P < 0.001$).

Table-1: **Base line status of the patients with left ventricular hypertrophy**

Base line character	**Left ventricular hypertrophy**				**P value**
	Normal	**Mild**	**Moderate**	**Severe**	
Age (yr)	52.1± 11.8	57.3 ± 10.3	57.5 ± 4.4	60.3 ± 8.1	0.044
Gender					
Male	44.1%	42.9%	33.3%	66.7%	0.886
Female	55.9%	57.1%	66.7%	33.3%	
BMI (kg/m2)*	28.9 ± 4.8	30.6 ± 3.4	32.5 ± 4.6	30.4 ± 2.6	0.043
Systolic BP	140.3 ± 17.3	147.9 ± 20.1	152.2 ± 23.9	156.7 ± 15.3	0.076
Diastolic BP	88.3 ± 9.5	87.6 ± 8.7	88.9 ± 7.8	96.7 ± 11.5	0.526
LV ejection fraction‡	64.5 ± 7.2	64.1 ± 7.4	66.1 ± 5.6	62.5 ± 13.0	0.871

Table-2 explains parameter of diastolic function in patients with the different level of left ventricular hyper trophy where With respect to the difference between the appearance of left ventricular hypertrophy and indices of diastolic function, significant difference were found between E/A and the severity of left ventricular hypertrophy 0.83 ± 0.06, respectively ($P = 0.023$). When adjusted by age, gender, BMI, and systolic and diastolic blood pressures, both E/A ratio and deceleration time were higher in those with the severer ventricular hypertrophy.

Table-2: Parameter of diastolic function in patients with the different level of left ventricular hypertrophy

Base line character	Inappropriate left ventricular mass				P value
Diastolic function grade	Normal	Mild	Moderate	Severe	
Normal	30.4%	4.8%	0.0%	0.0%	0.006
Grade I	48.9%	76.2%	44.4%	100%	
Grade II	20.7%	19.0%	55.6%	0.0%	
Deceleration time	234.4 ± 72.0	288.6 ± 92.9	214.8 ± 58.2	315.0 ± 31.1	0.034
E/A	1.11 ± 0.36	0.88 ± 0.23	1.02 ± 0.34	0.83 ± 0.06	0.023
E/E'	9.90 ± 3.46	11.49 ± 5.46	12.24 ± 3.11	9.70 ± 0.89	0.18

Table-3 explains Baseline characteristics in the patients with the different level of inappropriate left ventricular mass No significant differences were found in the sex ratio and mean age between the patients with appropriate LV mass and other ones (P > 0.05), whereas subjects with severe showed significantly higher BMI 33.7±3.7.

Table-3: Baseline characteristics in the patients with the different level of inappropriate left ventricular mass

Base line character	Left ventricular hypertrophy				P value
	Normal	Mild	Moderate	Severe	
Age (year)	52.7 ± 11.5	56.0 ± 10.1	56.4 ± 10.5	57.0 ± 12.1	0.381
BMI (kg/m2)*	28.6 ± 4.5	32.3 ± 3.0	32.4 ± 3.7	33.7 ± 3.7	< 0.001
Gender	45.9% 54.1%	30.8% 69.2%	57.1% 42.9%	28.6% 71.4%	0.432
Systolic BP	142.6 ± 18.1	143.1 ± 18.3	142.5 ± 19.9	151.4 ± 24.1	0.757
Diastolic BP	88.8 ± 9.4	87.7 ± 9.3	86.7 ± 8.2	88.6 ± 6.9	0.896
LV ejection fraction‡	64.0 ± 7.5	67.3 ± 4.3	64.1 ± 8.5	66.1 ± 7.0	0.454

Table-4 identify Parameter of diastolic function in patients with the different level of inappropriate left ventricular mass there was a slight difference between the grade of diastolic dysfunction and the severity of inappropriate LV mass (P = 0.065). However, no significant difference was found between E/A, E/E', and deceleration time and the level of inappropriate LV mass (P > 0.05).

Table-4: Parameter of diastolic function in patients with the different level of inappropriate left ventricular mass

Base line character	Inappropriate left ventricular mass				P value
Diastolic function grade	Normal	Mild	Moderate	Severe	
Normal	27.8%	7.7%	14.3%	0.0%	0.065
Grade I	52.6%	53.8%	42.9%	85.7%	
Grade II	19.6%	19.6%	42.9%	14.3%	
Deceleration time	234.8 ± 73.8	262.7 ± 82.4	267.7 ± 94.2	268.7 ± 44.4	0.220
E/A	1.09 ± 0.36	1.00 ± 0.28	1.04 ± 0.29	0.80 ± 0.11	0.121
E/E'	9.83 ± 3.43	12.7 ± 5.2	10.6 ± 3.6	12.5 ± 4.8	0.096

Table-5 shows Association between the grade of diastolic dysfunction and the severity of inappropriate LV mass.

Table-5: Association between the grade of diastolic dysfunction and the severity of inappropriate LV mass

Diastolic Function and Dysfunction	LV Mass
Correlation coefficient	0.201
Sig. (2-tailed)	0.025

DISCUSSION

Although it was previously believed that individuals with LVH were more likely to develop heart failure with normal ejection traction (HFnlEF), studies that have thoroughly assessed LV mass reveal that fewer than 50% of patients meet echocardiographic criteria for LVH [12, 13]. Despite having a normal LV mass, patients with HFnlEF have an elevated average relative wall thickness and mass-to-volume ratio [12]. Thus, contrary to common belief, the cardiac phenotype in HFnlEF is varied, and LVH is not always present in this condition. The results demonstrated that left ventricular hypertrophy is a strong predictor for diastolic dysfunction, measured by deceleration time and E/A ratio, even after controlling for age, systolic and diastolic blood pressure, and gender. However, the findings did not demonstrate that the inappropriateness of left ventricular mass is an independent factor determining diastolic dysfunction. Both the adjusted

E/A value and the deceleration time were greater in the left ventricular hypertrophic group, demonstrating the detrimental effect of left ventricular hypertrophy on diastolic function. However, there was no correlation between the degree of diastolic dysfunction and the amount of inappropriate left ventricular mass. Although our conclusion about the predictive value of left ventricular hypertrophy was in accordance with other research, improper ventricular mass did not predict severe diastolic function, which contradicts the findings of several other studies. Lim *et al.*, [1, 13, 14] found that an improper LV mass is independently linked with higher E/E', and that the resulting E/E' ratio was lower in the incorrect ventricular mass group compared to another group. However, the lower sample size compared to prior research may explain the observed weak relationships between diastolic dysfunction severity and E/E' ratio and abnormal left ventricular mass. Our results imply that left ventricular hypertrophy and left ventricular mass abnormality may not interact in an additive or synergistic manner. A bigger sample size is required to adequately analyze the correlation between healthy left ventricular hypertrophy and unhealthy left ventricular mass.

CONCLUSION

While LVH is a strong predictor of diastolic dysfunction severity as measured by the E/A value and deceleration duration, incorrect LVM provides only a modest predictor of diastolic dysfunction severity in uncomplicated hypertension.

REFERENCES

1. Lim, Y. H., Lee, J. U., Kim, K. S., Kim, S. G., Kim, J. H., Lim, H. K., ... & Shin, J. (2009). Association between inappropriateness of left ventricular mass and left ventricular diastolic dysfunction: a study using the tissue doppler parameter, e/e'. *Korean Circulation Journal*, *39*(4), 138-144.
2. De Simone, G., Daniels, S. R., Kimball, T. R., Roman, M. J., Romano, C., Chinali, M., ... & Devereux, R. B. (2005). Evaluation of concentric left ventricular geometry in humans: evidence for age-related systematic underestimation. *Hypertension*, *45*(1), 64-68.
3. Paulus, W. J., Tschöpe, C., Sanderson, J. E., Rusconi, C., Flachskampf, F. A., Rademakers, F. E., ... & Brutsaert, D. L. (2007). How to diagnose diastolic heart failure: a consensus statement on the diagnosis of heart failure with normal left ventricular ejection fraction by the Heart Failure and Echocardiography Associations of the European Society of Cardiology. *European heart journal*, *28*(20), 2539-2550.
4. Kuznetsova, T., Herbots, L., López, B., Jin, Y., Richart, T., Thijs, L., ... & Staessen, J. A. (2009). Prevalence of left ventricular diastolic dysfunction in a general population. *Circulation: Heart Failure*, *2*(2), 105-112.
5. Rusconi, C. (2000). Diastolic function of the left ventricle and congestive heart failure with normal systolic function. *Italian Heart journal. Supplement: Official Journal of the Italian Federation of Cardiology*, *1*(10), 1273-1280.
6. Sarraf-Zadegan, N., Sadri, G., Malek-Afzali, H., Baghaei, M., Mohammadi-Fard, N., Shahrokhi, S., ... & Yousefie, A. (2003). Isfahan Healthy Heart Programme: a comprehensive integrated community-based programme for cardiovascular disease prevention and control. Design, methods and initial experience. *Acta cardiologica*, *58*(4), 309-320.
7. Shemirani, H., & Separham, K. (2007). The relative impact of smoking or hypertension on severity of premature coronary artery disease. *Iran Red Cresent Med J*, 9, 177–81.
8. Muiesan, M. L., Salvetti, M., Paini, A., Monteduro, C., Galbassini, G., Bonzi, B., ... & Agabiti Rosei, E. (2007). Inappropriate left ventricular mass changes during treatment adversely affects cardiovascular prognosis in hypertensive patients. *Hypertension*, *49*(5), 1077-1083.
9. De Simone, G., Verdecchia, P., Pede, S., Gorini, M., & Maggioni, A. P. (2002). Prognosis of inappropriate left ventricular mass in hypertension: the MAVI Study. *Hypertension*, *40*(4), 470-476.
10. Marshall, A. C., & Lock, J. E. (2000). Structural and compliant anatomy of the patent foramen ovale in patients undergoing transcatheter closure. *American Heart Journal*, *140*(2), 303-307.
11. Sohn, D. W., Choi, Y. J., Oh, B. H., Lee, M. M., & Lee, Y. W. (1999). Estimation of left ventricular end-diastolic pressure with the difference in pulmonary venous and mitral A durations is limited when mitral E and A waves are overlapped. *Journal of the American Society of Echocardiography*, *12*(2), 106-112.
12. Gökçe, M., Karahan, B., Erdöl, C., Kasap, H., & Özdemirci, S. (2003). Left ventricular diastolic function assessment by tissue Doppler echocardiography in relation to hormonal replacement therapy in postmenopausal women with diastolic dysfunction. *American journal of therapeutics*, *10*(2), 104-111.
13. Zile, M. R., & Brutsaert, D. L. (2002). New concepts in diastolic dysfunction and diastolic heart failure: Part I: Diagnosis, prognosis, and measurements of diastolic function. *Circulation*, 105, 1387.

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