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GENDER DIFFERENCES IN LEFT VENTRICULAR MASS IN HEALTHY ADULTS AFTER INDEXING FOR BODY SIZE

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All the authors contributed significantly to the research that resulted in the submitted manuscript.

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ABSTRACT

Objective: : The study was conducted to demonstrate the gender distribution of echocardiography based LV mass in healthy adults after indexing for body surface area (BSA) and height.

Methodology: The study group consisted of 1137 healthy subjects on the basis of clinical assessment, electrocardiography and X-ray. LV mass values were calculated from standard parasternal long-axis M-mode echocardiographic readings. The LV mass values were then indexed for body size parameters in terms of BSA and body height.Gender based comparisons were carried out for LV mass after indexing for BSA and body height.

Results: The study included 1137 adults including 53% males and 47% females. Mean body surface area was higher for males than females (1.7 ± 0.19vs 1.5 ± 0.15 m2). Mean height was higher for males (1.7 ± 0.08 vs 1.5 ± 0.06 m). Mean LV mass was 127.39 ±36.18SD in males and 104.95 ± 29.06 SD in females with P value of <0.05.

Conclusion: Males have greater LV mass as compared to females independent of respective body sizes.

Keywords: Heart Ventricles, Body Surface Area, Gender

INTRODUCTION:

Increased left ventricular mass is associated with a significant increase in cardiovascular mortality and morbidity and is an independent predictor of the presence of coronary artery disease or hypertension.[1] Transthoracic echocardiography has been validated as a tool for estimation of LV mass in several studies and is now widely being used for this purpose.[2] Normative reference values for LV anatomy and function are important for accurate identification of disease, risk stratification and selection of therapy.[3] Echocardiography is now recognized as an integral diagnostic tool that provides non-invasive quantification of cardiac chamber size, ventricular mass and function in the clinical setting. Different body habitus in both genders, particularly increased body size in males with a consequent increased cell growth of cardiac myocytes may impart cardiac structural variations. There is little information, however, on the effect of gender on changes in LV geometry and function in healthy subjects.

Gender differences in LV mass are first noticed around puberty and continue to evolve in following years of life. The effect of estrogen and postmenopausal status on smooth muscle proliferation and vascular function may play a role in gender-based differences in echocardiographic LV parameters.[4-6] Recognition of these differences is critical not only in routine clinicalpractice, but also in interpreting the results of clinical trials that use echocardiography to measure cardiac geometry and function. The study was conducted to demonstrate the distribution of echocardiography based left ventricular (LV) mass in healthy adults after indexing for BSA and height.

METHODOLOGY

The study population consisted of 1950 healthy adults without history of heart diseases or hypertension over a period of five years starting from May 2005. All participants had a normal physical examination along with normal baseline ECG and chest x-ray. Echocardiographic evidence of pericardial effusion, valvular lesions, left ventricular (LV) wall motion abnormalities or diastolic dysfunction was also considered an exclusion criterion for the study. The final study group consisted of 1137 subjects. BSA was calculated according to the DuBois and DuBois formula.

Echocardiographic dimensions were measured with "Powervision 7000" scanner (Model SSA-380A software version 4.0, Toshiba, Nasu, Japan) using a 2.5 MHz sector probe with the subjects in left lateral position. The parameters were recorded by M-mode readings from standard parasternal long axis views, taking mean of three consecutive readings. The left ventricular internal diameters (LVID), left ventricular (LV) septal wall thickness (SWT) and posterior wall thickness (PWT) were recorded in end diastole, defined by the beginning of QRS complex on integrated ECG. LV mass was calculated by ASE recommended formula of LV linear dimensions:

LV mass = 0.8 X {1.04[(LVIDd + PWTd + SWTd)3 – (LVIDd)3]} + 0.6 g

The LV mass values were then indexed for body size parameters in terms of BSA(m2) and body height (m). The echocardiographic measurements were computed for analysis into the software "Statistical Package for Social Sciences (SPSS) version 17". Gender specific body size parameters i.e., BSA and body height were described as mean ± SD. LV mass was correlated with body height and BSA using Pearson's two-tailed correlation. Regression analysis was applied to assess the relationship of LV mass values with respective heights and BSA separately. Gender based comparisons were carried out for LV mass, LV mass/BSA and LV mass/Height using t-test considering a p-value of < 0.05 to be significant.

RESULTS

The study included 1137 adults including 53% males and 47% females. Mean body surface area was higher for males than females (1.7 ± 0.19vs 1.5 ± 0.15 m2). Mean height was also higher for males (1.7 ± 0.08 vs 1.5 ± 0.06 m). LV mass values correlated well with height and BSA at a level of 0.01.

Regression analysis revealed a linear relationship of LV mass with BSA and height, with a more significant R-squared value for BSA regression model (Figure-1). The values of LV mass turned out to be significantly greater in males even after indexing for BSA and body height. (Table-1)

DISCUSSION

Individuals with increased LV mass carry at least a double risk for cardiovascular morbidity and mortality irrespective of other risk factors.7 We have demonstrated in our study that the gender based difference in LV mass is not merely due to difference in body size of either sex. For this purpose we have eliminated its impact on by indexing the healthy young adults for body size. Our results indicate that the gender has an independent impact on LV mass and this impact continues to be observed even after eliminating the body size bias.

Echocardiographic LV mass assessment may show significant variability in due to measurement inaccuracies and lower imaging resolution of older equipment. Nowadays, improved off-line analysis of digitalized image calculations has led this variability of considerably smaller magnitude.[8] However, M-mode has been suggested to averagely underestimate LV mass.[9,10] The body surface area correction, using the Dubois formula, reduces variability due to body size and gender, but this index has been known to underestimate LV mass.[11-13] Levy and coworkers suggested a correction based on height alone that would allow evaluation of the separate role of obesity in LVH.[14] A gender

Figure-1: Relationship Of LV Mass With BSA And Height

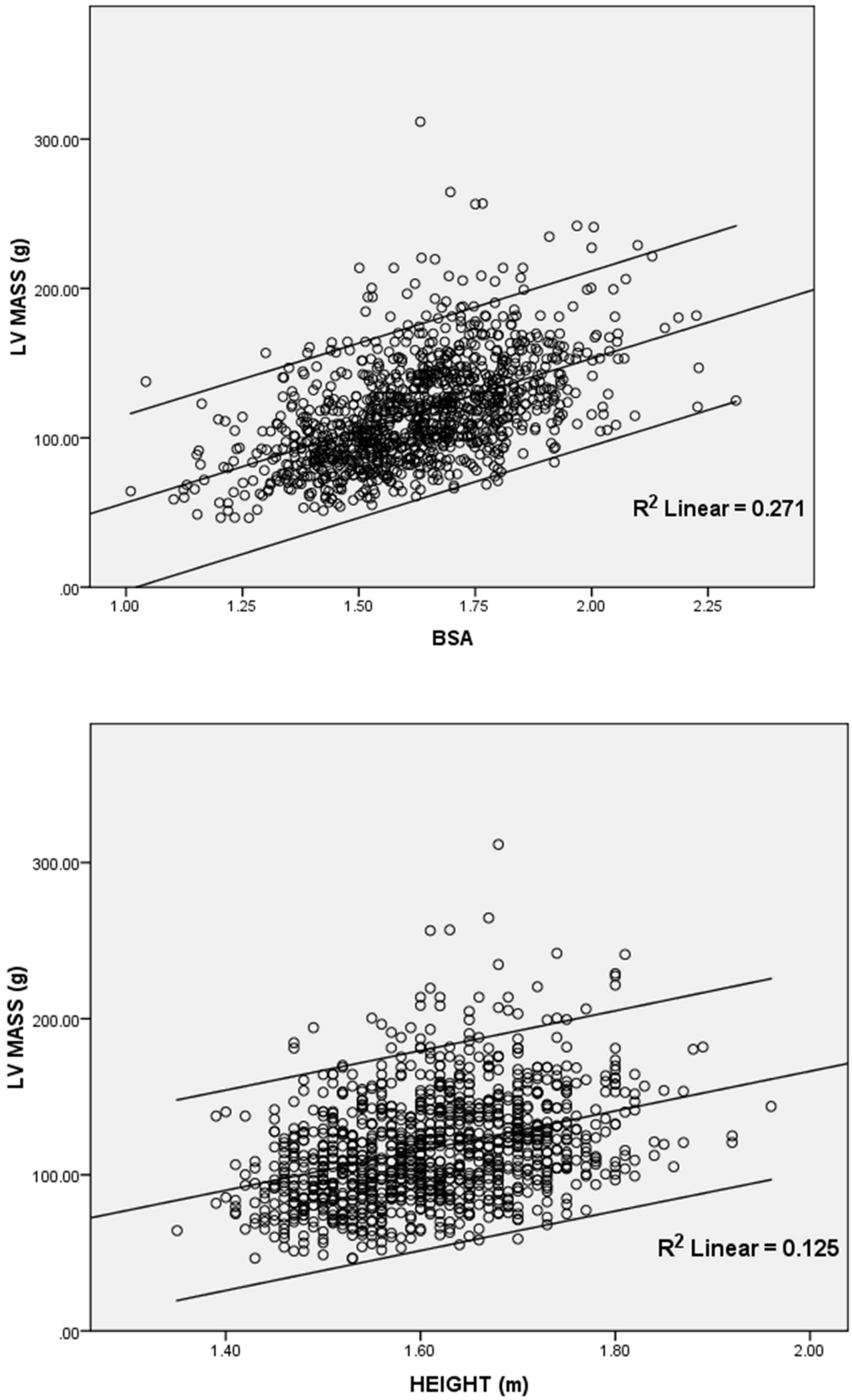

Table-1: Comparison Of LV Mass, LV Mass/BSA And LV Mass/Height Between Males And Females

	Male		Female		P Value
Variables	Mean±SD	95% CI	Mean±SD	95% CI	
LV Mass	127.36±36.18	124.50-130.28	104.95±29.306	102.48-107.43	<0.05
(g) Mass / BSA (g/m^2)	74.91±19.52	73.35-76.47	67.90±16.67	66.49 - 69.32	<0.05
LV Mass / Height (g/m)	76.34 ± 21.41	74.63-78.05	67.84±18.31	66.29-69.40	<0.05

difference in the left ventricular response to diabetes has been suggested to be more pronounced in females.[15,16]

In a study by Daimon et al,LV mass index was significantly lower in women than in menin the 2 youngest age groups (20–29 years and 30–39 years),and a more pronounced increase in LV mass index was observed in females with age. These results suggest gender differences to be considered in association with age in the management of cardiovascular disease.[17] The study by Salton et al showed all unadjusted LV parameters significally greater in men than in women ($p< 0.001$)except for EF and this gender difference persisted after adjustment for height. However, adjustment for BSA resulted in greater linear dimensions in women compared with men.[3] In our study, the LV mass values remained greater in males after adjustment for height as well as BSA.

CONCLUSION

Males have greater LV mass as compared to females independent of respective body sizes.

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