

CORRELATION OF SERUM CREATININE WITH LEFT VENTRICULAR MASS INDEX IN HYPERTENSIVE PATIENTS

Hitesh A. jani*, Priti C. bhanderi**, Maulik S. varu***, Anup M. vegad***, Varsha joshi****

*Assistant Professor, **Tutor, ****Professor & Head, department of physiology, M.P. Shah Government Medical College, Jamnagar,

***Assistant Professor, department of physiology, Government Medical College, Bhavnagar

Abstract: Background & objectives: The kidneys and the heart are the major target organs affected by hypertension. In essential hypertension, echocardiographically determined left ventricular hypertrophy (LVH) is known to be an independent risk factor of future cardiovascular complications. The aim of this study is to correlate serum creatinine level with left ventricular mass index (LVMI) in two different age groups of hypertensive patients. **Methods:** The study was conducted on 65 patients suffering from essential hypertension. Out of these 65 patients 36 patients were below age of 60 years (group 1) and 29 patients were age of 60 years and above (group 2). Serum creatinine was estimated by "modified jaffe's "reaction with initial rate colorimetry and single reagent density by using picric acid. Two-dimensionally guided M-mode echocardiography was performed by standard methods using a 7340 ESAOTE echocardiograph. Left ventricular internal dimension (LVID) and interventricular septal and posterior wall thickness (IVST and PWT) were measured at end-diastole and end-systole. Left ventricular mass index (LVMI) was calculated at end-diastole by using the American Society of Echocardiography (ASE) convention. **Result:** relations of left ventricular mass index to serum creatinine level shows that serum creatinine level positively correlates with LVMI in both the age groups (group 1 $r=0.61, p=0.001$, group 2 $r=0.59, p=0.01$). **Interpretation & conclusion:** According to the present study the serum creatinine is sensitive indicator for estimating hypertensive target organ damage in both the age groups. **Clinical significance:** From this study it is advisable to perform echocardiography in hypertensive patients whose serum creatinine level shows higher values and in that way we can prevent cardiac morbidity and mortality by implementing early intervention.

Key Words: Hypertension, Left ventricular mass index, serum creatinine

Author for correspondence: Hitesh A. Jani. Department of Physiology, M.P. Shah Government Medical College, Jamnagar – 361008. E-mail: janidreams9@yahoo.com

Introduction:

Hypertension currently defined as a usual BP of 140/90 mm Hg or higher, for which the benefits of drug treatment have been definitively established in Randomized controlled trials (RCTs)¹. Essential hypertension is the most common type of hypertension where no underlying cause for hypertension is apparent/ found.

The kidneys and the heart are the major target organs affected by hypertension. In essential hypertension, echocardiographically determined left ventricular hypertrophy (LVH) is known to be an independent risk factor of future cardiovascular complications.²⁻⁵

The aim of this study is to correlate serum creatinine level with left ventricular mass index (LVMI) in two different age groups of hypertensive patients.

Material and Methods:

The study was conducted after Institutional Ethical Committee approval.

In some study¹³ it is seen that serum creatinine level and left ventricular mass index (LVMI) shows significant correlation in middle age patients with essential hypertension but fail to show significant correlation in old age patients. So to counter check the earlier finding we divided the subjects into two age groups.

At the beginning of the study total 80 subjects (40 in each group) were participated in study. But after excluding the drop outs total 65 patients suffering from essential hypertension were selected for the study. They were divided into two age groups.

Group 1 (< 60 years): n=36

Group 2 (≥60 years): n= 29

Informed consent was obtained prior to study.

Hypertension is defined as per JNC VII criteria⁶. A complete medical history and clinical examination was done. Patients diagnosed with essential hypertension without any associated disease like diabetes, hyperthyroidism, renal failure, coronary artery disease were included in study.

Patients with following Exclusion criteria were not included in the study.

Diabetic patients, patients diagnosed with secondary hypertension, uncooperative patients, Patients suffering from urinary tract infection, renal stone, abnormal blood urea and creatinine level due to any other reasons, any other major illness, m-mode echocardiograms inadequate for clearly detecting the internal lines of the interventricular septum and left ventricular posterior wall.

Blood pressure was measured in triplicate by a single physician who was expert in the evaluation of hypertension, with an appropriate arm cuff and a mercury sphygmomanometer after 5 minutes rest in the sitting position. The arithmetic mean of the last two measurements was calculated. Korotkoff phase V was taken for diastolic blood pressure.

Serum creatinine was estimated by modified jaffe's reaction with initial rate colorimetry and single reagent density by using picric acid.⁷ (normal range for our laboratory- 0.5 – 1.2 mg/dl).

Echocardiography was done by experienced echocardiologist. Two-dimensionally guided M-mode echocardiography was performed by standard methods using a 7340 ESAOTE echocardiograph.

Left ventricular internal dimension (LVID) and interventricular septal and posterior wall thickness (IVST and PWT) were measured at end-diastole and end-systole, according to the American Society of Echocardiography guidelines.⁸

Left ventricular mass (LVM) was calculated at end-diastole by using the ASE convention.⁹

LV mass (ASE): $0.8 (1.04 ([LVIDD + PWTD + IVSTD]^3 - [LVIDD]^3)) + 0.6 \text{ g}$.

LV mass index was measured as follows:

LV mass index = LV mass/body surface area.

Statistical Analysis:

Statistic analysis of all the data were done with the use of software IBM SPSS version 20. All the values were recorded in mean and standard deviation. Comparison between two groups was done by using Mann Whitney test. Correlation of serum creatinine and LVMI was done by bivariate sample test.

Result:

Table 1: Comparison of serum creatinine and LVMI (left ventricular mass index)

Parameter	Group 1	Group 2	P Value
Serum creatinine	0.84 ± 0.21	0.96 ± 0.30	0.08
LVMI	82.07 ± 22.22	92.55 ± 18.16	0.20

From the above table serum creatinine level in group 1 and group 2 are different. In group 2 serum creatinine level is higher compare to group 1 but it is not significantly high.

Left ventricular mass index (LVMI) value in group 2 is higher than group 1 but it is not significantly high. LVMI is a marker of hypertensive target organ damage.

Table 2: Comparison of all parameters between two age groups

	Below 60: Group 1 (N=36)	60 & Above: Group 2 (N=29)
Men/Women	18/18	14/15
Age (yrs)	48.64 ± 7.67	69 ± 9.01
Systolic blood pressure (mmhg)	166.22 ± 29.12	167.14 ± 28.75
Diastolic blood pressure (mmhg)	95.61 ± 12.66	94.34 ± 11.51
Serum creatinine (mg/dl)	0.84 ± 0.21	0.96 ± 0.30
Left ventricular mass index (g/m ²)	82.07 ± 22.22	92.55 ± 18.16
Hypertension duration (years)	2.34 ± 2.94	6.31 ± 7.20

The duration of hypertension is shorter in below 60 years of age compare to above 60 years of age. The office systolic blood pressure is slightly higher in above 60 years of age. While diastolic blood pressure is slightly lower in above 60 years of age. Left ventricular mass index differs between the two hypertensive groups.

Serum creatinine level is higher in above 60 years of age group but the difference is not significant.

Table 3: Relations of left ventricular mass index to serum creatinine level

CHARACTERISTICS	LEFT VENTRICULAR MASS INDEX	
	r	p
Serum Creatinine		
Group 1	0.61	0.001
Group 2	0.59	0.001

From above table it is seen that serum creatinine level is positively correlate with LVMI in both the age groups and it is statistically significant because p value is <0.05.

Discussion:

In our study, there was a significant positive correlation between serum creatinine level and LVM index in patients of both the age groups. It has been well established that the heart and kidneys are the major target organs of hypertension. Several studies have shown that hypertensive renal involvement varies in parallel with the degree of LVH in essential hypertension.^{10,11} LVH is a potent sign of generalized preclinical hypertensive disease.

Study done by Shirafkan A. et al.¹² has also suggested that routine measurement of serum creatinine can predict the risk of cardiovascular complications in the hypertensive patient.

Yuji shigematsu et al.¹³ observed that serum creatinine level was not significantly related to LVM index in elderly hypertensive patients. In contrast, there was a significant positive correlation between serum creatinine level and LVM index in middle-aged hypertensive patients. While in this study there is significant correlation between serum creatinine level and change in LVMI in both the age groups. Further more in essential hypertension most of the morbidity and mortality are either of cardiac cause or of renal cause. So to prevent these, it is necessary to timely diagnosed and intervene. Most of the time it is seen that in essential hypertensive patient clinician mostly prescribe to estimate serum creatinine level because it is also necessary to initiate pharmacological treatment, but echocardiography is done only when patient has any cardiac symptom. And in this way most of the time the

cardiac pathology was remained undiagnosed. So we need some indicator which helps to suggest the requirement for echocardiography.

Conclusion:

From this study it can be said that the serum creatinine is sensitive indicator for estimating hypertensive target organ damage. So it is advisable to perform echocardiography in hypertensive patients whose serum creatinine level shows higher values. And in that way we can prevent cardiac morbidity and mortality by implementing early intervention.

Limitation of this study:

First, not only LVM index, but also age shows consistent and strong relations to the incidence of cardiovascular events in both sexes. Furthermore, the left ventricular wall thickness and LVM significantly increased with advancing age in healthy normotensive subjects. Therefore, it is speculated that the clinical significance of the LVM index may differ between middle-aged and elderly hypertensive patients.

Second, the normal ranges of some parameter, such as LVM index differ between men and women. so, we can't completely exclude the influence of gender difference on the present study.

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