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Left ventricular hypertrophy and its association with blood pressure

Physiology

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ABSTRACT

Hypertension is associated with markers of cardiovascular end-organ damage such as left ventricular (LV) hypertrophy. As such, LV hypertrophy is often thought to be a long-standing consequence of hypertension. However, some evidence suggests that increased LV mass precedes the onset of hypertension Prospective studies have demonstrated a relation of higher levels of LV mass, assessed by echocardiography, with subsequent increases in blood pressure.Hence this study was undertaken in 200 individuals to study the correlation between left ventricular wall thickness and blood pressure.The study showed a positive correlation between left ventricular wall thickness and blood pressure.

KEYWORDS:

Blood pressure, left ventricular wall thickness

INTRODUCTION:-

LEFT ventricular hypertrophy (LVH) plays a dual role in patients with systemic hypertension — being both a necessary adaptation to pump a normal amount of blood against the increased pressure load and a pathologic manifestation of hypertensive cardiovascular disease.1. LV hypertrophy is often thought to be a long-standing consequence of hypertension. However, some evidence suggests that increased LV mass precedes the onset of hypertension (2–7. Prospective studies have demonstrated a relation of higher levels of LV mass, assessed by echocardiography, with subsequent increases in blood pressure (1, 2) or a greater risk of incident hypertension (4–7) in individuals without hypertension. Thus, alterations in LV mass may contribute to a sustained increase in blood pressure.Therefore this study was undertaken to find the association of left ventricular hypertrophy with systemic arterial hypertension.

MATERIALS AND METHODS

In this cross sectional study 200 hypertensive young male adults in the age group of 18-22 years were selected from the general population of Dibrugarh randomly. The ethical committee clearance and an informed consent of the subjects were taken. Subjects less than 18 years and more than 22 years and individual with overt cardiovascular disease,respiratory disease, electrolyte abnormalities, renal failure,diabetes mellitus and with other serious co-morbid conditions, obese individual or trained athletes or on medication which can affect B.P,Echocardiography was excluded from the the study. Blood pressure was recorded in the right upper arm after the subject had rested for at least 5 minutes with with standard mercury sphygmomanometer to the nearest 2 mm Hg as per the guidelines of sixth report of the joint national committee for the detection, evaluation and treatment of high blood pressure8.M mode Echocardiography was performed in each subject.All the measurements were made at the end of diastole using the American society of Echocardiography standard criteria9 as well as Penn convention10. Left ventricular mass was calculated using the formula as proposed by devereux [10].

LV mass (g) = 1.04 [(IVSd + LVIDd + LVPWTd) 3 - (LVIDd)3]} -13.6
Where:-
IVSd -interventricular septum-diastolic dimension
LVIDd –Left Ventricular internal diameter
LVPWTd - Left Ventricular Posterior wall dimension
Statistical analysis of data was carried out using SPSS Version16. Data were presented in the forms of mean±standard deviation and also in the forms of diagrams. Statistical significance was ascertained-test and by ANOVA.

RESULT AND OBSERVATION:-

The Blood pressure of the subjects were classified as shown in table 1.The percentage of subject in each group is shown in table 2.The mean±SD of the value of left ventricular hypertrophy in the study population is shown in table 3.Results shows a increase in left ventricular thickness with increase in blood pressure. On comparison between normal and prehypertensive, Stage 1 hypertension and Stage 2 hypertension, a increase in left ventricular wall thickness was observed, which was statistically highly significant ($p<0.001$). On comparison between prehypertensive, Stage 1 hypertension and Stage 2 hypertension a increase was noted which was statistically significant

Table 1.: Classification of Blood Pressure (BP)

Classification	Systolic BP (mmHg)	Diastolic BP (mmHg)
Normal	<120	And <80
Prehypertension	120-139	Or 80-89
Stage 1 hypertension	140-159	Or 90-99
Stage 2 hypertension	≥160	Or ≥100

TABLE2:Showing the number and percentage of subject in each group of blood pressure

classification	number	Percentage%
Normal	15	7.5
Prehypertension	78	39
Stage 1 hypertension	86	43
Stage 2 hypertension	21	10.5

Table 3:showing the value of left ventricular hypertrophy in different groups of blood pressure

classification	Mean±SD
Normal	79.3±0.08
Prehypertension	115.12±0.4
Stage 1 hypertension	168±0.09
Stage 2 hypertension	191.64±0.32

Table 4:-showing the comparision between different groups of blood pressure

categories	significance
Normal vs prehypertensive	S
Normal vs Stage 1 hypertension	HS
Normal vs Stage 2 hypertension	HS
Prehypertensive vs Stage 1 hypertension	S
Prehypertensive vs Stage 1 hypertension	S
Stage 1 hypertension vs Stage 2 hypertension	S

{p value > 0.05 was non-significant (NS);p value < 0.05 was as significant(S) ;p value < 0.01 was highly significant (HS);p value < 0.001 was very highly significant(VHS)}

DISCUSSION:-

The results of the present studies show a positive correlation between left ventricular wall thickness and systemic arterial blood pressure. Increased LV mass has been proposed to be a compensatory response to elevated blood pressure 11. Left ventricular hypertrophy occursas a response of the left ventricle to the stresses of pressure or volume overload.12 However, evidence is increasing that LV mass is associated with development of hypertension 2–7

The underlying mechanisms responsible for increased LV mass in the absence of hypertension ie in normal individuals, and for prehypertensive , are complex and probably multietiologic. Genetic factors could play a role in promoting myocardial hypertrophy and hypertension onset 13,14 Extracardiac factors such as an exaggerated sympathetic drive and a dysregulated renin-angiotensin-aldosterone system 15, in addition to vascular structural changes such as arterial stiffness 16, may also have influenced both LV mass and later hypertension incidence.

CONCLUSION:-

Left ventricular hypertrophy is both a major maladaptive response to chronic pressure overload and an important risk factor in patients with hypertension. Complications of left ventricular hypertrophy include atrial fibrillation, diastolic heart failure, systolic heart failure, and sudden death. Both earlier recognition and improved understanding of cardiac hypertrophy may lead to more effective therapeutic strategies for this cardiovascular risk factor.

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