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Medicine

STUDY OF LEFT VENTRICULAR MASS IN PATIENTS OF STROKE

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ABSTRACT

Background: The incidence of stroke is associated with hypertension and hypertension induced myocardial lesions. Left Ventricular Hypertrophy is said to be associated with cerebral ischemic episodes. This emphasizes to assess the left ventricular mass in patients of stroke. The assessment can be carried out with MRI or Echocardiography. In our study echocardiographic technique is used as an economical method of Left ventricular mass assessment.

Methods: Study conducted on hundred cases of stroke and 50 age- sex matched controls admitted in the medicine ward of a tertiary care hospital. Assessment of the left ventricular mass was done by using Devreanx formula. The normal values of LVMI considered were less than 131 gm/m^2 (<131 gm/m^2) in males and less than 100 gm/m^2 in females. Values more than 131 gm/m^{2}in males and more than 100 gm/m^2 in females were taken as increased LVMI.

Results: The results showed that 48 cases (48%) had LVMI to be more than 131 gm/m^2 and included 38 males (38%) and 10 females (10%). The LVMI <100 gm/m^2 in 23 cases (23%) that included 2 males (2%) and 21 females (21%). Further 29 cases (29%) were found in between 101-131 gm/m^2 and included 8 males (8%) and 21 females (21%).

Conclusions: Left ventricular mass has been found to be an independent risk factor for stroke in all age and sex groups.

KEYWORDS : Hypertrophy, Left ventricular Mass Index, Echocardiography, Stroke.

Introduction

The increased incidence of transient ischemic attack or stroke is associated not only with the hypertension but also with other myocardial lesions. Preclinical hypertensive lesions for most target organs are clearly identified: left ventricular hypertrophy (LVH) for the heart, microalbuminuria for the kidney, and fundus abnormalities for the eye.[1,2,3] Untreated hypertension is a main risk factor for cardiovascular and cerebrovascular accidents.[4,5,6] It has also been suggested that major cerebrovascular injury may precede asymptomatic cerebrovascular damage, which parallels the onset of LVH.[7,8,9,10]

LVH is a powerful predictor of future cardiac events in patients with recent cerebral ischemia. The correlation between echocardiographic evidence of left ventricular hypertrophy and/or mortality is well documented.[11] It has also been suggested that individuals with left ventricular mass may be predisposed to the ischemic stroke owing to the association of left ventricular mass to the left atrial enlargement. Left atrial enlargement increases the risk for the ischemic stroke by potentiating the formation of a clot in atrial chamber because of atrial arrhythmias, such as atrial fibrillation that result in increased risk of thromboembolism.[12] It has been said that regression of LVH may reduce the risk of cardiovascular disease.[13] This emphasizes the usefulness of assessment of LVH in risk profiling for cerebrovascular events.[14] Keeping this in mind the study is planned to assess the left ventricular mass in patients of Stroke.

Magnetic resonance imaging (MRI) is highly accurate and reproducible for assessing three-dimensional ventricular size and shape and thus may allow additional insight into the pathophysiology of the cerebrovascular stroke but it is not economically affordable by all. This association was confirmed with more sensitive echocardiography technique in our study.

Aim and Objectives

The study aimed to assess the left ventricular mass as an independent risk factor for stroke with the specific learning objectives of:

a) To calculate the left ventricular mass in patients of stroke
b) To assess the type of cerebrovascular episodes among males and females.

Methodology

The prospective cross sectional open label study after taking IEC approval and written informed consent in the vernacular language was carried out in department of medicine of a tertiary care hospital.

Case Group

Hundred cases admitted in medicine department with diagnosis of stroke were included. All cases of stroke were subjected for computed tomography using Philips 16 slice Brilliance CT machine or Magnetic Resonance imaging using GE 0.2 Tesla machine to know the type of stroke and to localize the lesion. Stroke patients with previous hypertension and diabetes mellitus were part of the study. Exclusions were patients with head injury, valvular heart diseases predisposing to CVA, cortical venous sinus thrombosis and ischemic heart disease.

Control Group

Fifty age and sex matched control patients with no hypertension, diabetes mellitus and prior history of atherosclerosis were included. After a detailed clinical examination, all the cases from control and study group were subjected to 2D Echocardiography to calculate Left ventricular mass index. The machine used for echocardiography was Philips Envisor 2D Echo. The specific parameters studied on 2D echocardiography included interventricular septum thickness (normal= 5-10mm), left ventricular diameter in diastole (normal= 32-50 mm) and posterior wall thickness (normal 4-9mm). The left ventricular mass index was calculated in all cases using Devreanx formula.[15] All the measurements were takes in millimeters (mm) and left ventricular mass index (LVMI) was calculated in gm/m^2 per body surface area.

The formula included: - LVMI g/m^2= 0.8(1.04[{IVS+LVDD+PWT}^{3}-LVDD^3] + 0.6) / Body surface area (m^2)
Where IVS = inter ventricular septum thickness
LVDD = Left ventricular diameter in diastole
PWT = Posterior wall thickness
Body surface area calculated as 0.20247* height (m)$^{0.725}$ * weight (Kg)$^{0.425}$

The normal values of LVMI considered were less than 131 gm/m^2 (<131 gm/m^2) in males and less than 100 gm/m^2 in females. Values more than 131 gm/m^2 in males and more than 100 gm/m^2 in females were taken as increased LVMI.[16]

Statistical Analysis
Results were analyzed using descriptive statistics, chi square test and student's T test

Results

Demographics of the study population are shown in Table 1

Demography	Cases	Controls	
Mean Age	63.9	62.7	P < 0.5
Sex (M:F)	48:52	25:25	P < 0.5
Hypertension %	28 (%)	00 (%)	
Diabetes mellitus	19 (%)	00 (%)	
Hypercholestrolemia	16 (%)	00 (%)	
Atherosclerosis	14 (%)	00 (%)	

Body surface area was calculated according to Dubois's formula. The normal BSA in the population in the area was considered to be ranging between 1.5 – 1.7. Amongst 100 cases, 78 cases (78%) had body surface area in the range of 1.5 – 1.7 whereas 17 cases (17%) had BSA more than 1.7 (>1.7) and only 5 cases (5%) had BSA less than 1.5 (<1.5).

Left ventricular mass index (LVMI)

Left ventricular mass index (LVMI): Based on the Devreanx formula left ventricular mass index was calculated. The normal range of LVMI for females was considered to be ≤100 gm/m^2 and for males <131 gm/m^2.

The observation showed that 48 cases (48%) had LVMI to be more than 131 gm/m^2 and included 38 males (38%) and 10 females (10%). The LVMI <100 gm/m^2 in 23 cases (23%) that included 2 males (2%) and 21 females (21%). Further 29 cases (29%) were found in between 101-131 gm/m^2 and included 8 males (8%) and 21 females (21%).

Thus, in the present work, left ventricular mass index in cases with stroke was increased to > 131 gm/m^2 in 38 males cases out of 48 in total. In females it was found to be 31 (> 101 gm/m^2)out of total of 52 females.

Thus, LVMI was abnormally increased in total of 69 cases.

LVMI(gm/m^2)	Cases (100)		Control (50)	
	Males	Females	Males	Females
≤100	2	21	8	20
101-131	8	21	17	5
>131	38	10	0	0
Total	48	52	25	25

Table No.2: Left ventricular mass index of cases and control group..

Amongst 50 control cases the Left ventricular mass index was calculated. Left ventricular mass index is less than 100 gm/m^2 in 28 control cases (56%) including 8 males (32%) and 20 females (80%). In 17 males (68%) and 5 females (20%) LVMI was within normal range that is 101-131 gm/m^2.

Type of CVA among males and females.

Type of CVA	Male (mean LVMI)	Female (mean LVMI)	Mean ± SD	t - value
Anterior circulation	43 (132.65 ± 18.17)	37 (127.75 ± 23.27)	130.88 ± 20.14	1.01 p=0.31 NS,p>0.05
Posterior circulation	9 (124.07 ± 12.77)	11 (129.61 ± 19.18)	132.11 ± 15.71	0.69 p=0.45 NS,p>0.05

There was no statistically significant difference between the type of stroke among males and females. (p =0.4) Mean LVMI for male and female patients with the anterior circulation stroke and posterior circulation stroke was also found to be statistically insignificant (t=1.01, p=0.31), (t=0.69, p=0.45).

LVMI as an independent risk factor for stroke.

In present study, out of 100 cases of stroke 42 cases had some risk factor in the form of hypertension, diabetes mellitus, atherosclerosis or hypercholestremia. In remaining 58 cases, there was no evidence of risk factor. Out of which thirty cases had LVMI more than 131. It can be inferred; therefore, that LVMI to be an independent risk factor in these cases (Chi^{2}value= 6.32, p <0.01).

Table No: 4 LVMI as an independent risk factor

LVMI	Males	Females	Total
≤100	1	5	6
101-131	6	14	20
>131	24	8	32
Total	31	27	58
Chi^{2}value	6.32		
p-value	< 0.01		

Discussion:

The observation in the risk factor for stroke clinically or on investigation, despite all efforts, significant number of cases may not exhibit any detectable risk factor for stroke. The occurrence of stroke increases with increasing age. In all such cases where the risk factors for stroke is detectable or otherwise the LVMI should be measured. Rather estimation of LVMI should be done in all cases of stroke to find out its role as risk factor either independently or in association with other risk factors.

LVH is an established risk factor for cerebrovascular diseases like stroke. The mechanisms of the association between LVH and stroke are not clear. LVH might be a marker of subclinical disease or predispose to other conditions directly involved in stroke etiology.[4,5,]

.LV mass correlates with carotid wall thickness and luminal diameter and predict carotid atherosclerosis. LVH predisposes to hypertension and atrial fibrillations.[12] So, assessment of LV mass index should be included for the evaluation of risk of stroke. Treatment is available for regression of LVH, possibly associated with reduction in the incidence of cardiovascular events, including stroke.[1]

Conclusions

The LVMI was evaluated as an independent risk factor for stroke. It was observed that LVMI was an independent risk factor in significant number of cases. It can therefore be concluded that left ventricular mass index is an independent risk factor for stroke in the present work. It is recommended that LVMI should be measured in all cases of stroke to detect its association as risk factor for it.

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