

ELECTROCARDIOGRAPHIC CORRELATION OF LEFT VENTRICULAR HYPERTROPHY (IN CASES OF HYPERTENSION) WITH ECHOCARDIOGRAPHY

ABID AMIN KHAN , ZAHEER ALAM, SARA INAYAT

SUMMARY

This study was designed to determine the specificity of electrocardiography compared to echocardiography in detecting left ventricular hypertrophy. It included 50 patients of age 26-80 years, mean age 56 ± 18 years S.D., having longstanding hypertension where LVH was suspected. 84 % were found to have left ventricular hypertrophy (LVH) and 16% were negative for left ventricular hypertrophy on echocardiography. Patients with left ventricular hypertrophy was 44% and without left ventricular hypertrophy 56% on electrocardiography.

It was concluded that echocardiography is more sensitive and specific investigation for detecting left ventricular hypertrophy than electrocardiography.

INTRODUCTION

Left ventricular hypertrophy (LVH), associated with hypertension is characterized by an increase in myocardial collagen. It impairs the functional properties of myocardium first affecting diastolic then systolic functions^{1,11}. LVH occurs in 30 - 60 % of hypertensive patients depending upon the diagnostic criteria and severity of hypertension. LVH defines high risk population of hypertensives¹. In the Framingham study, LVH was the strongest predictor of cardiovascular mortality in the middle aged adults² The risk of stroke and myocardial infarction in hypertensive with LVH Bolan Medical Complex Hospital, Department of Cardiology, Quetta compared with patients without LVH is increased five folds³. LVH itself may cause malignant cardiac arrhythmias and heart failure e.g. the risk of symptomatic heart failure is increased¹⁷ folds in patients with LVH . Consequently LVH substantially increase the risk of premature cardiovascular death . Therefore presence of LVH associated with elevated blood pressure is an indication for early and effective blood pressure control^{4,10}.

Keeping in view the importance of detecting LVH in cases of hypertension ,this study is conducted to see the correlation of electrocardiographic diagnosis of

Department of Cardiology, Bolan Medical Complex Hospital, Quetta

LVH with echocardiography among the local population in cases of hypertension.

METHODOLOGY:

About 50 males and females of age 26 -80 years, mean age 56 ± 18 years S.D.,having longstanding hypertension where LVH is suspected were included in the study and ECG and echocardiography was done on the same day. The blood pressure was recorded under basal conditions and patients were classified into various stages of hypertension according to the seventh report of joint national committee on detection evaluation and treatment of high blood pressure. The patients having systolic blood pressure 140-159 mmHg and diastolic blood pressure 90-99 mmHg were in stage I hypertension, while patients having systolic blood pressure³ 160 mmHg and diastolic blood pressure³ 100 mmHg were labeled as stage II hypertension (JNCVII).

The criteria for LVH in ECG was that proposed by sokolow and lyon⁵ of $[SV1+RV6]$ or $[SV1 + RV6]$ ≥ 35 mmHg.The cases having LBBB were excluded from the study .

On echocardiography following criteria was adopted (shubc, klein.AL) 6 Male: Interventricular septum thickness (IVS)³ 12.6mm Posterior wall thickness(pw)³ 11.9 mm

Female : IVS thickness³11.3 mm
 Pw thickness ³10.6 mm

Echocardiography machine used was Toshiba model SSH-140A, 3.7MHz and 2.5 MHz probe phased array, sector probes with 90 degree sector arc.

RESULTS:

A total of 50 patient were studied. 42 (84 %) were found to have left ventricular hypertrophy(LVH) and 8 (16%) were negative for left ventricular hypertrophy on echocardiography.

Electrocardiographically number of patients with left ventricular hypertrophy was 22 (44%) and without left ventricular hypertrophy 28 (56%), out of a total patient population of 50. Majority of patients were female i.e. male to female ratio 23:27. (46%: 54%) age range was between 26 - 80 years with a mean age of 58 ±16 S.D. Most of the patients i.e. 42/50 were in stage II hypertension (84%) and patients in stage I were 8/50 (16%) (see Fig 1).Among stage I hypertension 28 were negative for left ventricular hypertrophy both on ECG and ECHO.

2/8 had LVH on ECG alone and 4 /8 had left ventricular hypertrophy on echocardiography alone. 42 / 50 patients were found to have stage II hypertension . 20/42 (42%) patients had left ventricular hypertrophy on electrocardiography(see Fig 2) and 38 /42 had left ventricular hypertrophy on echocardiography (91%)(p<0.004) (see Fig3).

Only 20 /42 patients had LV H on both ECG and ECHO(see Fig 4).

Figure - 1
 No. of patients with hypertension

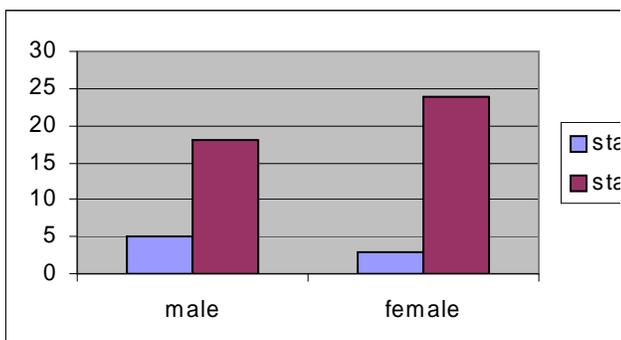


Figure - 2
 Percentage of pts with ECG +ve LVH

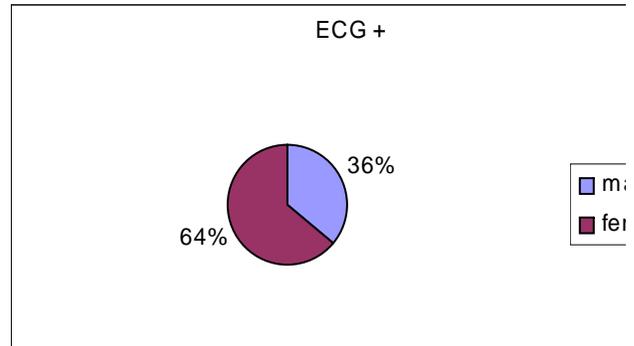


Figure - 3
 Percentage of pts with ECHO +ve LVH(p<0.004)

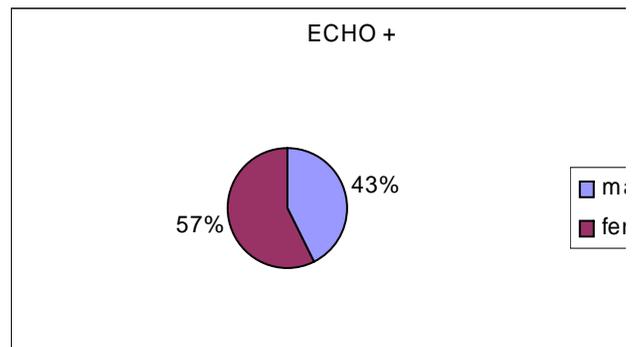
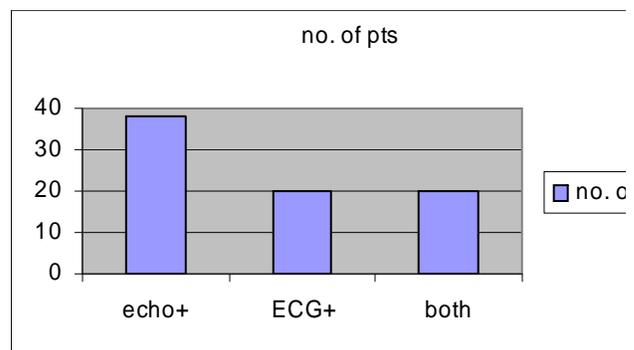


Figure - 4
 No. of pts with LVH on ECG, ECHO and both



DISCUSSION:

Left ventricular hypertrophy is the marker of severity of hypertension, as an indication of target organ damage, and has it's implication on the course of disease in terms of morbidity and mortality⁵. It is also a better predictor of relapse of hypertension after drugs have been stopped².

The overall prevalence of left ventricular hypertrophy in adult population is between 10 - 15% , it steadily increases with age and 10 % above the age of 65

years has Left ventricular hypertrophy. It is 10 times commoner in hypertensive and obese subjects⁷. In the present study, the ECG criteria has shown a good specificity for left ventricular hypertrophy, particularly when strain pattern was seen, but is very insensitive⁸. As shown in the results, the M mode / 2D echocardiography has shown a greater precision and sensitivity in detecting left ventricular hypertrophy in long standing hypertension especially when ECG was negative for left ventricular hypertrophy. The only disadvantage of echocardiography is that it is a time consuming procedure.

The higher prevalence of left ventricular hypertrophy in this study is because of selection of population, since majority of the subjects were known hypertensives, with long standing history, poorly controlled blood pressures and poor compliance to regimens. Majority of the female population were above the age of 50 years and were in post menopausal period . Most of them were obese .

In terms of sensitivity and specificity of echocardiography for left ventricular hypertrophy and in order to obtain critical results in terms of reproducibility, the left ventricular mass measurement would be more appropriate as it also involves left ventricular dimensions⁹. As 15 -20 % of patients in obese population are poorly echogenic, the interventricular septum and posterior wall thickness echocardiography may sometimes give technical problems in measurements.

CONCLUSION:

The electrocardiographic criteria for the presence of left ventricular hypertrophy in the standard 12 lead ECG is still the most commonly applied investigation and is strongly suggestive of left ventricular hypertrophy.

The 2 D / M mode echocardiography is more sensitive and offers a greater precision for detecting left ventricular hypertrophy especially when interventricular septum and posterior wall thickness measurements are taken into account . To make the left ventricular hypertrophy more specific on echocardiography, the left ventricular mass measurement is a better diagnostic tool.

REFERENCES:

1. Kannel WB. Left ventricular hypertrophy as a risk factor: the Framingham experience. *J Hypertens.* 1991;9(suppl 2):S3-S9.
2. Post WS, Larson MG, Levy D. Impact of left ventricular structure on the incidence of hypertension. The Framingham Heart Study. *Circulation.* 1994;90:179-185.
3. Devereux RB, Roman MJ, Ganau A, et al. Cardiac and arterial hypertrophy and atherosclerosis in hypertension. *Hypertension* 1994;23 (part 1): 802-809. Guidelines sub committee.
4. 1999 World Health Organization-international society of Hypertension guidelines for the management of hypertension. *Blood pressure.* 1999;8(suppl.) 9-43.
5. Mosterd A, D'Agostino RB, Silbershatz H, et al. Trends in the prevalence of hypertension, antihypertensive therapy and left ventricular hypertrophy from 1950-1989. *N Engl J Med.* 1999;340:1221-1227.
6. Schub C, Klein AL, Zachariah PK, Bailey KR, Tajik AJ. Determination of left ventricular mass by echocardiography in a normal population: effect of age and sex in addition to body size.
7. *Mayo Clin Proc* 1994;69:205-211. Gottdiener JS, Reda DJ, Materson BJ, et al. Importance of obesity, race and age to the cardiac structural and functional effects of hypertension .The department of Veterans Affairs Cooperative Study Group on Antihypertensive agents. *J Am Coll Cardiol.* 1994;24:1492-1498.
8. Carr AA, Prisant LM, Watkins LO. Detection of hypertensive left ventricular hypertrophy *Hypertension* 1985;7:948-954.
9. Devereux RB, Pini R, Aurigemma GP, Roman MJ, et al .Measurement of left ventricular mass: methodology and expertise. *J Hypertens* 1997;15:801-809.
10. Gosse P, Sheridan DJ, Doubourg O. Diuretics versus angiotensin - converting enzyme inhibitors in the regression of left ventricular hypertrophy in hypertensive patients: the LIVE study. *J Hypertens.* 1999;17(suppl 3):S73.
11. Trends in the prevalence of hypertension, antihypertensive therapy, and left ventricular hypertrophy from 1950 to 1989. Mosterd A, D'Agostino RB, Silbershatz H, et al. *N Engl J Med.* 1999;340:1221-1227.