Sensitivity of Electrocardiography in Detecting Left Ventricular Hypertrophy in Pakistani Population.

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To find out the sensitivity of electrocardiography in diagnosing left ventricular hypertrophy as diagnosed by echocardiography in local Pakistani Population. Case series with prospective data collection. Fifty adult patients diagnosed to be having left ventricular hypertrophy on echocardiography were enrolled and their ECGs were done. Romhilt and Estes point score system was used to diagnose left ventricular hypertrophy. Fifty patient with mean age 53.4 year ranging from 21-75 years having left ventricular hypertrophy on echocardiography were included, 36(72%) were males 14 (28%) were females. Out of fifty patients with LVH 22 (44%) were having Romhilt and Estes score more than 5 i.e. positive for LVH, giving overall sensitivity of 44%. Of those with positive ECG evidence sensitivity is 50% in males (18 out of 36) and 35% in females (4 out of 14 patient) ECG has lower sensitivity in diagnosing Left ventricular hypertrophy. Sensitivity is more in males compared to females ST-T criteria has highest sensitivity. Considering easy availability and cost effectiveness, ECG should be kept as routine investigation for diagnosing Left ventricular hypertrophy, however electrocardiographic criteria needs to be modified to make it more reliable.

Key words: Left ventricular hypertrophy ECG. Sensitivity.

Hypertension is a silent killer. Hypertension leads to end organ damage even before patient develops symptoms.

Hypertrophy of left ventricle is one of the common sequel of hypertension and independent predictor of morbidity and mortality. Effective management of hypertension leads to regression of Left ventricular hypertrophy and improve cardiovascular outcome[1]

In addition to clinical examination reliable test to detect left ventricular hypertrophy is echocardiography[2], However echocardiography is available only in tertiary care centres in Pakistan and is not cost effective, on the other hand electrocardiography is available even in small towns and is highly cost effective, but the sensitivity of electrocardiography in diagnosing LVH is highly variable among different age groups and it also depends upon gender, weight, race etc[3].

This study is mainly done to find out the sensitivity of electrocardiogram in detecting LVH in local Pakistani population.

Material and Methods

This was prospective data collection done at Mayo Hospital, Lahore done from September 1999 to December 1999. Fifty adults patient having left ventricular hypertrophy diagnosed by echocardiography were included. These patients either presented to echo department of cardiology or medical units of Mayo Hospital or presented in out patient department.

Patient having LVH on echo and were admitted in cardiology or medical ward were also included.

The diagnosis of left ventricular hypertrophy was made on the basis of the thickness of posterior left ventricular wall whose upper normal limit is 1.1 cm and thickness of interventricular septum whose upper normal limit is also 1.1 cm.

In all these fifty patients fresh ECG were done and LVH was diagnosed by using Romhilt and Estes point score system which is as under.

1. Amplitude of QRS complex 3 points.
   R or S wave in limb leads 20 mm or more
   Or S wave in V1 or V2 30 mm or more
   Or R wave in V5 or V6 30 mm or more
2. ST-T abnormalities
   3 points
   ST-T segment vector opposite to QRS vector (Reduced to one point if patient on digitalis
3. Left atrial enlargement
   3 points.
   Terminal negativity of the p wave in V1 of 1 mm or more in depth and .04 sec or more in duration.
4. Left axis deviation
   2 points.
   QRS axis of -30 or more.
5. Increased ventricular activation time
   1 point
   .05 sec or more in V5, V6.

If the sum of these points is 5 or more it fulfills the electrocardiographic criteria for diagnosing LVH[4].

Inclusion Criteria: All those patients having left ventricular hypertrophy regardless of the cause were included in the study.

Exclusion Criteria: Patient having LVH on echocardiography but also having conduction abnormalities on ECG e.g. LBBB or RBBB were excluded.

Results

Fifty adult patients were included mean age was 53.4 years ranging from 21-75 years. Out of 50 patients 36(72%)

were male and 14 (28%) were female. Thirty four (68%) were collected at echo department 12(24%) presented in out patient department and 4 (8%) presented in emergency department.

Out of 50 patients 22(44%) were having ECG evidence of LVH (Rombilt and Estes pointg score >5)

Table I Gender wise distribution of patients having ECG evidence of LVH score > 5.

		Positive for LVH on ECG	Negative for LVH on ECG	Overall positivity in percentage
Male	36(72%)	18(36%)	18(36%)	50%
Female	14(28%)	4(8%)	10(20%)	35%
Total	50	22(44%)	28(56%)	

Table II Separate analysis of Romhilt and Estes criteria in ECG positive patients N=22

Criteria	+ve	%age
QRS amplitude	14	64%
ST.T abnormalities	18	82%
Left atrial enlargement	10	45%
Left axis deviation	8	36%
Prolonged ventricular activation time.	6	27%

Table III Systolic and diastolic dysfunction on Echo in patients with LVH

	Total patients N=50	ECG +ve for LVH patient N=22
Systolic dysfunction	8(16%)	6(27%)
Diastolic dysfunction	28(56%)	22(100%)

Discussion

Overall sensitivity of ECG in diagnosing LVH in our study in 44%. In our study LVH is more common in male (72%) as compared to females 28%. Majority of the patients were from older age group, 42(84%) were above the fifty years of age 18(36%) were above the of 60. This is in accordance with Lindroos-M study which conclude that prevalence of LVH increases with advancing age[5]. This is partly due to age related diseases predisposing of LVH e.g. hypertension, athrosclerosis but also partly due to an independent effect of age.

In our study 18 patient were above the age of 60 out of them 6 (33%) had positive evidence of Left ventricular hypertrophy on ECG where as overall sensitivity is 44% showing that sensitivity of ECG in diagnosing LVH decreases in elderly population same result quoted by Sasiglia E et al [6].

ECG is less accurate in diagnosing LVH in females than male[7] this stands true in our study also, as 4 females out of 14 (35%) fulfilled ECG criteria of LVH in contrast to 18 males out of 36 (50%), had score more than 5. Vanden Hoogen JP et al in 1993 found that LVH based on high voltage was found more often in men[8].

In our study sensitivity of ECG in diagnosing LVH is 44%.

Many studies suggest sensitivity of 50% for Romhilt Estes point score system though we have not determined specificity of ECG for LVH but most of the studies suggest upto 95% sensitivity, on the other hand M.A. Azim et al. found that ECG is neither sensitive nor specific enough to be used as screening test for LVH[9].

Comparing Echocardiography with ECG, Echo is for more sensitive[2]. Moreover echocardiography give additional information about geometric pattern of hypertrophy, its possible etiology which make echocardiography much superior to ECG[10]. On the other hand general availability and cost effectiveness of ECG still make ECG to be used to follow the progression or regression of LVH in hypertensive patients[11].

Okin PM et al also pointed out that 12 lead ECG has limited sensitivity and acceptable specificity for detecting LVH [12], they also suggested that use of time voltage integeral of the QRS can improve the accuracy of ECG.

Crow-RS et al suggested that combining ECG with other non ECG variable like obesity, age and gender offer best strategy for improving ECG sensitivity.

We also observed that 28(56%) patient out of 50 with LVH had diastolic dysfunction but all i.e. 22(100%) having ECG criteria of LVH were having diastolic dysfunction (Table III)

In our study ST.T abnormality has highest sensitivity 82% (Table II) followed by QRS amplitude 62% then left atrial enlargement 45%

Conclusion

This data proves that ECG has lower sensitivity for diagnosing LVH as compared to echocardiography. Prevalence of LVH is higher in males and sensitivity of ECG diagnosing LVH is lower in female than in males. However easy availability and cost effectiveness of ECG keeps its place as routine investigation but there is a need to modify the ECG criteria for diagnosing LVH to make it more sensitivity

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