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A STUDY ON COMPARISON OF ELECTROCARDIOGRAPHIC AND ECHOCARDIOGRAPHIC EVIDENCE OF LEFT VENTRICULAR HYPERTROPHY

General Medicine

Dr. Emmanuel Paul Assistant Professor, General Medicine, Acs Medical College And Hospital,chennai.

Dr. Shilpa A Assistant Professor, General Medicine, Acs Medical College And Hospital, Chennai.

Dr. Surampudi Sai Krishna Preetham Md General Medicine Post Graduate, Acs Medical College And Hospital, Chennai.

ABSTRACT

Background: Left ventricular hypertrophy (LVH) consists of an adaptive mechanism of the cardiac muscle due to an increased activity demand or functional overload. In fact, when LVH is evaluated simultaneously by ECG and echo, discrepancies between ECG-based LVH and echo-based LVH are observed in a certain proportion of patients. **Aims&objectives:** To study the evidence of LVH by electrocardiography and echocardiography in patients clinically suspected to have LVH. **Materials And Methods:** We conducted a prospective observational study among 25 patients admitted in general medicine ward and medical intensive care unit. Patients were selected on the basis of clinical suspicion of LVH.ECG and Echocardiography were done on these patients and LVH was detected after applying ECG criterias for LVH and Echocardiographic cut off for LVH. **Results:** Out of the 25 patients included in this study there was male predominance with majority of them belonging to the age group of 41-50 years. Hypertension was the most common etiology for LVH in this study. Among the ECG criteria for LVH, Cornell criteria was found to be most sensitive criteria. Echocardiography was superior to ECG in diagnosing LVH in this study. **Conclusion:** Left ventricular hypertrophy is a marker of volume/pressure overload which in turn is a marker of cardiovascular morbidity as well as mortality.ECG and Echocardiography are the most commonly used methods for detection for LVH. Among the ECG criteria for LVH, Cornell criteria was found to be most sensitive criteria in this study. Echocardiography was superior to ECG in diagnosing LVH in this study.

KEYWORDS

LVH, ECG, Echocardiography

INTRODUCTION

Left ventricular hypertrophy (LVH) consists of an adaptive mechanism of the cardiac muscle due to an increased activity demand or functional overload. In general, the situations that trigger this response are increased pressure or volume load, increased metabolic requirement or high-output conditions, and genetic inheritance. Hypertrophies can be characterized as concentric and eccentric, whereas in concentric, there is an increase in wall thickness with a reduction in cavity diameter, and in eccentric, there is an increase in thickness and cavity diameter.[1] The increased voltage is implicitly considered as a function of the LV, which is in agreement with the echocardiographic findings. ECG-based LVH patterns are also seen because the slowing of the conduction velocity changes the sequence of ventricular activation even in situations where the anatomy of the left ventricle is not changed. It has been shown that slowed conduction due to fibrosis could also lead to an increase in QRS voltage, not necessarily associated with increased LV mass. In fact, when LVH is evaluated simultaneously by ECG and echo, discrepancies between ECG-based LVH and echo-based LVH are observed in a certain proportion of patients.[2]

Researchers have proposed numerous ECG criteria to evaluate LVH, with a high specificity of 85%–90% but low sensitivity of less than 50%, and different criteria often have different sensitivity, specificity, and accuracy. Among the various criteria, Sokolow–Lyon and Cornell criteria were more commonly used in clinical practice.[3]

There are various echo-based methods to calculate LV mass from M-mode, 2D, and 3D echo. As per ASE recommendations all measurements should be performed at end diastole (frame before mitral valve closure or the frame in the cardiac cycle in which the ventricular dimension is largest).13All methods convert the volume to mass by multiplying the volume of myocardium by the myocardial density (1.05 g/mL).[4]

Aims&objectives

To study the evidence of LVH by electrocardiography and echocardiography in patients clinically suspected to have LVH.

MATERIALS AND METHODS

This study included 25 adult patients of either sex admitted in general medicine ward and MICU of a tertiary care center.Patients were selected on the basis of clinical suspicion of LVH. Detailed clinical history and clinical examination were carried out for all the patients. Then the patients were subjected to 12 lead standard ECG and transthoracic 2D ECHO.

ECG diagnosis of LVH were made using Sokolow Lyon criterion, Cornell criteria and Romhilt and Estes criteria.[5]

Sokolow Lyon Criteria

S in VI and R in V5 and V6 (whichever is larger) > 35 mm R in aVL > 11 mm

Cornell criteria:

S in V3 and R in aVL > 28 mm (men)
S in V3 and R in aVL > 20 mm (women)
Romhilt–Estes score: diagnostic > 5, probable > 4 Voltage criteria: 3 R or S in limb leads: 20 mm S in V1 or V2 > 30 mm R in V5/V6 > 30 mm ST/T wave abnormality: ST/T wave vector opposite to QRS without DIGITALIS:3

ST/T wave vector opposite to QRS with digitalis: 1 Negative terminal P wave in V1 of 1 mm in depth and 0.04 seconds in duration indicate left atrial enlargement: 3 Left axis deviation of QRS of –30 or more: 2 QRS duration > 0.09 seconds: 1 Delayed intrinsicoid deflection in V5/V6 > 0.05 seconds: 1

Echocardiography was done with the help of GE echocardiogram machine using M-mode. End.diastolic interventricular septum (IVSd), posterior wall thickness (PWTd), and left ventricular internal diameter (LVIDd) were obtained by two.dimensional echocardiography.guided M.mode tracings. Left ventricular mass (LVM) was estimated by cube formula $0.8 \times 1.04 \times [(IVSd + LVIDd + PWTd)^3 . LVIDd^3] + 0.6$ g,.All measurements were made at the end of diastole in centimeters and LVH were defined according to cutoff points. according to American Society of Echocardiography.

RESULTS

In our study majority of patients (48%) belonged to the age group of 41-50 years. Male predominance (60%) was noted in our study. According to the etiology wise for LVH,hypertension was the most common cause(60%) followed by coronary heart disease (24%),followed by valvular heart disease(16%).

Out of the 25 patients,76% of patients satisfied ECG criteria for LVH. Out of the patients fulfilling ecg criteria for LVH, Cornell criteria was the most observed criteria (68.42%) followed by Romhill (21.05%),

followed by Sokolow Lyon criteria (10.52%).

Echocardiography demonstrated evidence of LVH in all the patients. Among the 25 patients 76% had mild LVH and 24 % had moderate LVH according to echocardiographic cutoff.

Table 1: LVH detected by ECG and Echocardiography

	ECG	ECHOCARDIGRAPHY
LVH PRESENT	19(76%)	25(100%)
LVH ABSENT	6(24%)	0

DISCUSSION

Left ventricular hypertrophy (LVH) is a condition in which there is an increase in LV mass (LVM) secondary to an increase in wall thickness, an increase in LV cavity enlargement, or both. The left ventricle may undergo geometric changes in response to pathophysiological stressors such as long-term pressure or volume overload that increase the size of myocardial fibers . LVH is recognized as an independent risk factor for premature cardiovascular morbidity and mortality, including chronic heart failure, cardiac arrhythmias, and sudden cardiac death.[6]

Electrocardiographic evidence of left ventricular hypertrophy (LVH) is a major marker of cardiovascular morbidity and mortality.Several criteria for the electrocardiographic diagnosis of LVH have been proposed. Though the specificities of these criteria are typically high, the sensitivities are lower. The advent of echocardiography has provided a non-invasive means of estimating left ventricular mass .Accurate diagnosis of LVH is important for clinical decision making.[7] The cheap and readily available ECG has traditionally been the mainstay screening tool, however there are increasing concerns that the ECG is problematic in detecting true LVH.[8]

In this study majority of the patients belonged to the age group of 41-50 years with male predominance. Hypertension was the most common cause of LVH among the patients. .Among the ECG criteria Cornell criteria was the most sensitive criteria which is comparable to the study conducted by Julio G Peguero, Saberio Lo Presti[9]

Echocardiography was superior to ECG in diagnosing LVH in this study. This was comparable with the study conducted by Bo Eun Park MD, Jang Hoon Lee MD [10].

CONCLUSION

Left ventricular hypertrophy is a marker of volume/pressure overload which in turn is a marker of cardiovascular morbidity as well as mortality.ECG and Echocardiography are the most commonly used methods for detection for LVH.

Among the ECG criteria for LVH, Cornell criteria was found to be most sensitive criteria in this study. Echocardiography was superior to ECG in diagnosing LVH in this study.

REFERENCES

1. Marcato JP, Senra Santos F, Gama Palone A, Lenci Marques G. Evaluation of Different Criteria in the Diagnosis of Left Ventricular Hypertrophy by Electrocardiogram in Comparison With Echocardiogram. Cureus. 2022 Jun 27;14(6):e26376. doi: 10.7759/cureus.26376. PMID: 35911263; PMCID: PMC9329598.
2. Seko Y, Kato T, Yamaji Y, et al. Discrepancy between left ventricular hypertrophy by echocardiography and electrocardiographic hypertrophy: clinical characteristics and outcomes. Open Heart. 2021 Sep;8(2):e001765. DOI: 10.1136/openhrt-2021-001765. PMID: 34556560; PMCID: PMC8461736.
3. Lv T, Yuan Y, Yang J, Wang G, Kong L, Li H, Li X, Sun Y, Li X, Zhang Z, Cheng X, Wu L, Tan X, Han B, Li H, Zhang Z, Wang J, Wu Y, Wang Y, Guo J, Zhang P. The association between ECG criteria and Echo criteria for left ventricular hypertrophy in a general Chinese population. Ann Noninvasive Electrocardiol. 2021 Sep;26(5):e12880. doi: 10.1111/anec.12880. Epub 2021 Jul 26. PMID: 34310813; PMCID: PMC8411759.
4. Mathur, R., Pawan Sarda, Anil Baroopal, Pankaj Kumar, & Abhishek Sakwaria. (2023). Comparison of electrocardiogram diagnostic criteria in diagnosis of left ventricular hypertrophy using 3D echocardiography as standard. International Journal of Research in Medical Sciences, 11(3), 857–862. https://doi.org/10.1820
5. Mohan, Gurinder & Kaur, Ranjeet & Kamra, Ankur & Aggarwal, Aakash. (2017). A Comparative Study of Electrocardiographic and Echocardiographic Evidence of Left ventricular Hypertrophy. Current Trends in diagnosis & Treatment. 1. 59-63. 10.5005/jp-journals-10055-0014.
6. Sayin BY, Oto A. Left Ventricular Hypertrophy: Etiology-Based Therapeutic Options. Cardiol Ther. 2022 Jun;11(2):203-230. doi: 10.1007/s40119-022-00260-y. Epub 2022 Mar 30. PMID: 35353354; PMCID: PMC9135932.
7. Levy D, Labib SB, Anderson KM, Christiansen JC, Kannel WB, Castelli WP. Determinants of sensitivity and specificity of electrocardiographic criteria for left ventricular hypertrophy. Circulation. 1990 Mar;81(3):815-20. doi: 10.1161/01.cir.81.3.815. PMID: 2137733.
8. Chillo P. Sensitivity and Specificity of an Electrocardiogram to Detect Echocardiographic Left Ventricular Hypertrophy in a Sample of 326 Tanzanian Adults: Differences in Men and Women. Research Reports in Clinical Cardiology. 2021;12:23-31
9. Peguero JG, Lo Presti S, Perez J, Issa O, Brenes JC, Tolentino A. Electrocardiographic Criteria for the Diagnosis of Left Ventricular Hypertrophy. J Am Coll Cardiol. 2017 Apr 4;69(13):1694-1703. doi: 10.1016/j.jacc.2017.01.037. PMID: 28359515.
10. Park BE, Lee JH, Jang SY, Lee HY, Lee JY, Shin HG, Park KI, Lee SP, Lee HS, Kim KI, Kang SH, Lee JH, Kim KH, Cho JY, Park JH, Park SK, Bak JK, Lee JY. Comparison of the efficiency between electrocardiogram and echocardiogram for left ventricular hypertrophy evaluation in patients with hypertension: Insight from the Korean Hypertension Cohort Study. J Clin Hypertens (Greenwich). 2022 Nov;24(11):1451-1460. doi: 10.1111/jch.14583. Epub 2022 Oct 21. PMID: 36268774; PMCID: PMC9659871.