Original Research Paper

General Medicine

STUDY OF ECG PARAMETERS FOR THE DIAGNOSIS OF LEFT VENTRICULAR HYPERTROPHY IN GERIATRICS PATIENTS

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ABSTRACT **AIMS AND OBJECTIVES:** 1. To correlate the relationship of ECG and Echocardiography for the diagnosis of left ventricular hypertrophy 2. To find out sensitivity and specificity of various electrocardiographic criteria. **MATERIALS AND METHODS:** A hospital based cross sectional study, conducted in Anantapur Government Hospital over a time period of November 2021 to June 2022. A total of 100 cases were studied. Relevant history and blood pressure readings were taken . All patients underwent 12 lead Electocardiogram and echocardiogram. Eight ECG criteria were compared with echocardiogram for diagnosis of left ventricular hypertrophy. **RESULTS:** Out of 100 patients, 54 (54%) had LVH on Echocardiogram. Sokolow Lyon criteria showed sensitivity of 77.78%, specificity of 60.87%, PPV of 70%, NPV of 70% and accuracy of 70%. Comparison of Combined or either one of Sokolow Lyon and Romhilt Estes point score system on ECG with Echo for LVH showed sensitivity of 100%, specificity 60.87%, PPV 75%, NPV 100% and diagnostic accuracy of 82%.**CONCLUSION:** Combination or either one of the Sokolow Lyon and Romhilt Estes point score system for ECG diagnosis of LVH has a very high sensitivity. Absence of either any of these criteria can be very well used to rule out the diagnosis LVH in resource limited settings.

KEYWORDS : left ventricular hypertrophy, Sokolow Lyon criteria, Romhilt Estes point score system.

INTRODUCTION:

Left ventricular hypertrophy (LVH) is an adaptative state of the heart to increase in the wall stress. The most common cause of LVH is hypertension. The prevalence of LVH increases with age and based on ECG criteria is ten times more common in patients with blood pressure more than 160/90 mm of Hg.

AIM OF THE STUDY:

1. To correlate the relationship of ECG and Echocardiography for the diagnosis of left ventricular hypertrophy
2. To find out sensitivity and specificity of various electrocardiographic criteria.

MATERIALS AND METHODS:

- A hospital based cross sectional study conducted in Anantapur Government Hospital over a time period of November 2021 to June 2022 .
- SAMPLE SIZE: 100 patients.
- INCLUSION CRITERIA: All geriatric patients with systemic hypertension
- EXCLUSION CRITERIA:
- Congenital heart disease
- Ischemic heart disease
- Valvular heart disease
- Regional wall motion abnormalities in ECHO
- Pregnancy Induced Hypertension

METHODOLOGY:

- Blood pressure was recorded with patient seated quietly for at least 5 min, back supported, and with the arm supported at the level of the heart.
- Patient should not have ingested caffeine during the preceding one hour and should not have smoked or indulged in strenuous exercise during 30 minutes prior to the measurement.
- The blood pressure was determined as the mean of 3 or more readings taken at least 5 min apart at 2 more visits, following an initial screening.
- Data collected from the patients attenders included age, sex, occupation and hospitalization, patients past history, family history, and personal history.
- 12-lead Electrocardiography was performed by using BPL Cardiolinear 2100 view electrocardiography machine.

- Electrocardiographs were recorded after a supine resting period of at least 20 minutes.
- Echocardiography was performed by using Philips HD 11 XE echocardiography machine with multi-frequency 2-4 megahertz probe.
- Eight ECG criteria (Sokolow Lyon index, Romhilt Estes point score system, Talbot Criteria, Roberts's criteria, Cornell Criteria, McPhie criteria, Casale criteria and Criteria of Koitos & Spodick) were considered for the diagnosis.

ECG CRITERIA-

In Romhilt-Estes point score criteria, there are multiple ECG criteria.

- RE1: Amplitude: any of these three=3 points. (Largest R or S in the limb leads ≥ 20mm; S wave inV1or V2 ≥ 30mm; R wave in V5 or V6 ≥30 mm).
- RE2: ST-T change of typical LV strain=3 points.
- RE3: Left atrial involvement (Terminal negativity of P in V1 >1 mm and longer than 40 milliseconds)=3 points.
- RE4: Left axis deviation -30 or more=2 points.
- RE5: QRS duration ≥ 90 milliseconds=1 point.
- RE6: Intrinsicoid deflection in V5, V6 ≥50 ms=1 point).
- Total 13 points are there out of which 4 points are suggestive of probable and 5 or more points are diagnostic of LVH.

- In Sokolow Lyon index, LVH is calculated by the amplitude of S wave in lead V1 plus amplitude of R wave in lead V5 or V6 and if it is more than 35 mm it is significant for the diagnosis of LVH.
- In Talbot criteria, R wave in lead aVL equal to or more than 11 mm or R in aVL equal to or more than 13 mm with left axis deviation is suggestive of LVH
- Cornell criteria are voltage criteria for the diagnosis for LVH, which is different for male and females. S wave in V3 plus R wave in aVL should be more than 24 mm in male, and for females S wave in V3 and R wave in aVL should be more than 20 mm.
- Robert criteria are also called as total 12 lead voltage criteria, in this total amplitude of all the leads is greater than 175 mm then it is significant for the diagnosis of LVH
- McPhie criterion considers tallest R wave amplitude plus deepest S wave amplitude in any precordial lead. If the total exceeds 4.5 mV i.e. 45 mm LVH should be considered
- The Casale criterion is different for male and female. For the diagnosis of LVH if R wave in aVL plus S wave in V3 is greater

than 2.8 mV or 28 mm in male, and in female if it is 2.0 mV or 20 mm. This criterion is also called as modified Romhilt criteria

- Koitos and Spodick criteria states that if R wave amplitude in lead V6 is greater than R wave amplitude in lead V5 then it is significant for LVH.

RESULTS AND DISCUSSION

- The study group patients had Echocardiographic evidenced of left ventricular hypertrophy.
- Out of 100 patients, 54 (54%) had LVH on Echo which was the gold standard investigation for the diagnosis of LVH in this study.
- Sokolow Lyon criteria showed sensitivity of 77.78%, specificity of 60.87%, PPV of 70%, NPV of 70% and accuracy of 70%.
- Comparison of Combined or either one of Sokolow Lyon and Romhilt Estes point score system on ECG with Echo for LVH showed sensitivity of 100%, specificity 60.87%, PPV 75%, NPV 100% and diagnostic accuracy of 82%.

Table 1: COMPARISION OF SENSITIVITY & SPECIFICITY OF ALL ECG CRITERIA

Criteria	Sensitivity	Specificity	PPV	NPV	Accuracy
Sokolow Lyon	77.88	60.87	70.00	70.00	70.00
Romhilt-Estes point score	81.48	69.57	75.86	76.19	76.00
Talbot criteria	51.85	60.87	60.87	51.85	56.00
Cornell voltage	55.56	60.87	62.50	53.85	58.00
Robert criteria	81.48	39.13	61.11	64.29	62.00
McPhies criteria	51.85	65.22	63.64	53.57	58.00
Casale criteria	48.15	73.91	68.42	54.84	60.00
Koitos and Spodick	44.44	56.09	54.30	46.24	49.80

Table 2: Comparison of Combined or either one of Sokolow Lyon and Romhilt Estes point score system on ECG with Echo for LVH.

Sokolow Lyon and/or Romhilt estes point score	ECHO		TOTAL
	LVH on echo positive	No LVH on echo negative	
ECG positive	54	18	72
ECG negative	0	28	28
Total	54	46	100

for left ventricular hypertrophy.

- Combination or either one of the Sokolow Lyon and Romhilt Estes point score system for ECG diagnosis of LVH has a very high sensitivity. Absence of either any of these criteria can be very well used to rule out the diagnosis LVH in resource limited setting like in the present study.
- However, because of low specificity of combination or either of these two criteria, presence of LVH by either of these two criteria on ECG should be confirmed by Echo.

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