

PSEUDO LEFT VENTRICULAR HYPERTROPHY (PSEUDO LVH): A PHENOMENON OF “HIGH PRECORDIAL VOLTAGE IN THE YOUNG”

¹Debasish Das*, ²Debasis Acharya, ³Tutan Das and ⁴Subhas Pramanik

¹Department of Cardiology, All India Institute of Medical Sciences (AIIMS), Sijua, Patrapada Bhubaneswar. 751019, India

²Department of Cardiology, All India Institute of Medical Sciences (AIIMS), Bhubaneswar

^{3,4}Department of Cardiology, All India Institute of Medical Sciences (AIIMS), Bhubaneswar

*Author for Correspondence

ABSTRACT

Left ventricular hypertrophy (LVH) occurs when there is cardiac muscle hypertrophy due to various reasons like hypertension, aortic stenosis and hypertrophic cardiomyopathy etc. Various criteria are there to confirm LVH in electrocardiogram. High QRS voltage in infants, adolescents and adults has been shown to occur in the absence of left ventricular hypertrophy on clinical study and in post-mortem studies. We report a case of pseudo left ventricular hypertrophy in a young male presenting with Follicular carcinoma of thyroid for routine presurgical evaluation.

Keywords: Pseudo Left Ventricular Hypertrophy, Follicular Carcinoma of Thyroid

INTRODUCTION

Left ventricular hypertrophy frequently demonstrate increased voltage in the left precordial leads of the Electrocardiogram (Sodeman *et al.*, 1944). Scott and associates compared necropsy data from various cases of left ventricular hypertrophy with various electrocardiographic criteria, and concluded that Sokolow- Lyon criteria were the most inclusive of all, diagnosing abnormally high left ventricular mass in 80 per cent of cases (Scott *et al.*, 1955). The Sokolow-Lyon voltage criterion for LVH was defined as a composite of amplitudes (SV_1 or $V_2 + RV_5$ or V_6) ≥ 35 mm (Sokolow *et al.*, 1949) and the Cornell voltage criterion for LVH was defined as $R_{aVL} + SV_3 \geq 28$ mm for men (Devereux *et al.*, 1984). Goldberger described the association of high QRS voltage in precordial leads with left ventricular hypertrophy. Difference of opinion is reported in regard to the value of these criteria of QRS voltage in diagnosis of left ventricular hypertrophy (Parkin, 1962). The so-called "classical" pattern of left ventricular hypertrophy includes S-T and T changes, increased QRS voltage, and prolonged ventricular activation time in a high percentage of cases. However, high QRS voltage in infants, adolescents and adults has been shown to occur in the absence of left ventricular hypertrophy on clinical study and in post-mortem studies (Grubschmidt *et al.*, 1957). We report a case of pseudo left ventricular hypertrophy in a young male presenting with Follicular carcinoma of thyroid for routine presurgical evaluation with thin chest wall which is due to the phenomenon of “High Precordial Voltage in the Young”

CASE

A 30 year old cachectic male, being a diagnosed case of Follicular carcinoma of thyroid from biopsy of a solitary thyroid nodule in lower neck (Fig.1) since last 6 months with no distant metastasis visited the cardiology out patient department (OPD) for routine presurgical evaluation. He was non diabetic, non hypertensive and non smoker with normal renal and lipid parameters. ECG revealed large QRS complexes in V_2 and V_6 which satisfied the Sokolow-Lyon voltage criteria for Left ventricular hypertrophy($(SV_1$ or $V_2 + RV_5$ or $V_6 = 75$ mm) (Fig.2).S wave in V_2 was 50 mm and R wave in V_6 was 25 mm. In view of left ventricular hypertrophy, patient was subjected for echocardiography which revealed

normal left ventricular wall thickness with thickness of inter ventricular septum (IVS) being 6 mm and posterior wall thickness being 8 mm (Fig.3) with normal left ventricular mass and normal left ventricular systolic function without any evidence of Coarctation. High precordial voltage commonly encountered in children, adolescence and young adults due to presence of thin chest wall for which precordial ECG electrodes come relatively closer to the cardiac muscle, pick up relatively high voltage from underneath myocardium due to “Proximity Effect” and this phenomenon is known as “High Precordial Voltage in the Young” which should not be diagnosed as LVH although it meets the classical Sokolow- Lyon Criteria for LVH. Our case is a simple teaching to the young cardiologists that high precordial voltage in the young population manifests commonly as pseudo LVH in the ECG although it meets the standard Sokolow- Lyon Criteria.

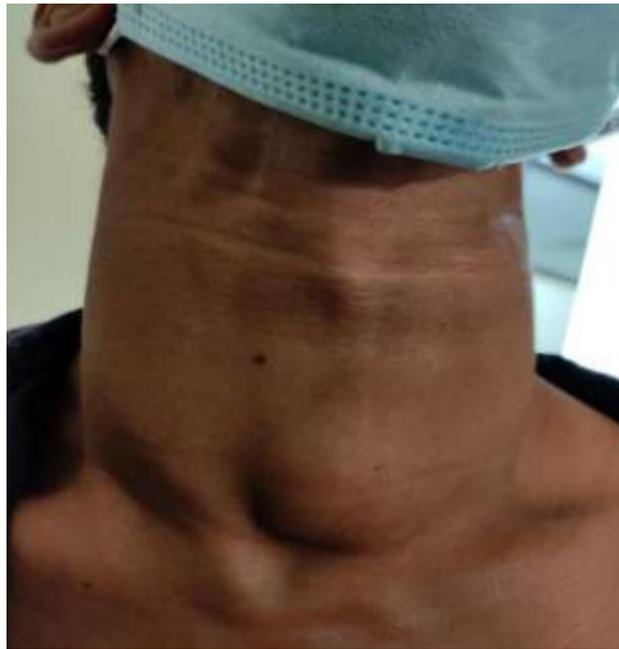


Figure 1: Patient with Solitary thyroid nodule (Follicular Carcinoma of Thyroid)

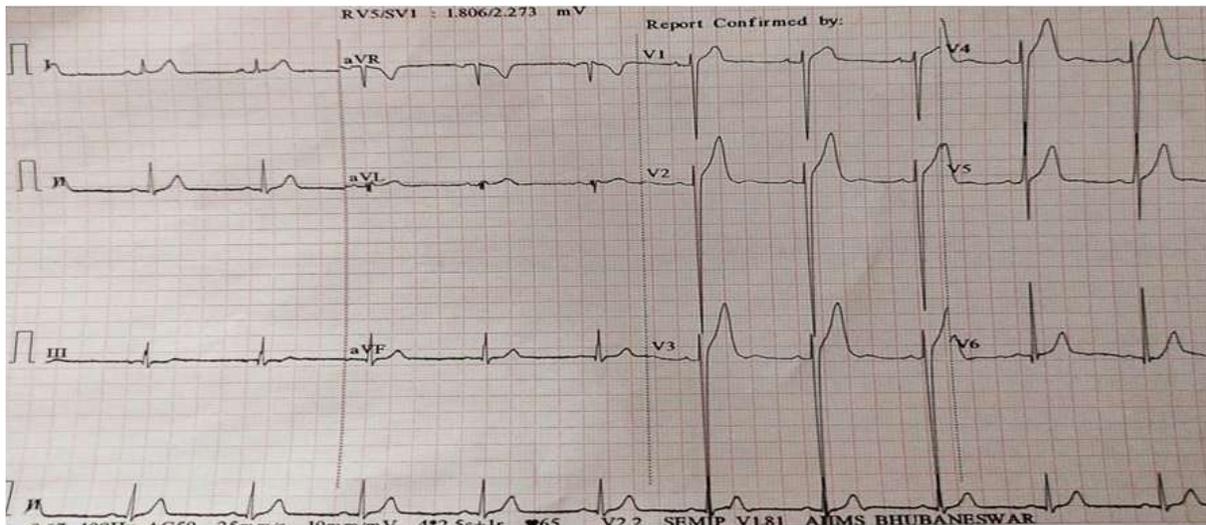


Figure 2: ECG showing deep S wave in V₂ and V₃ suggestive of LVH

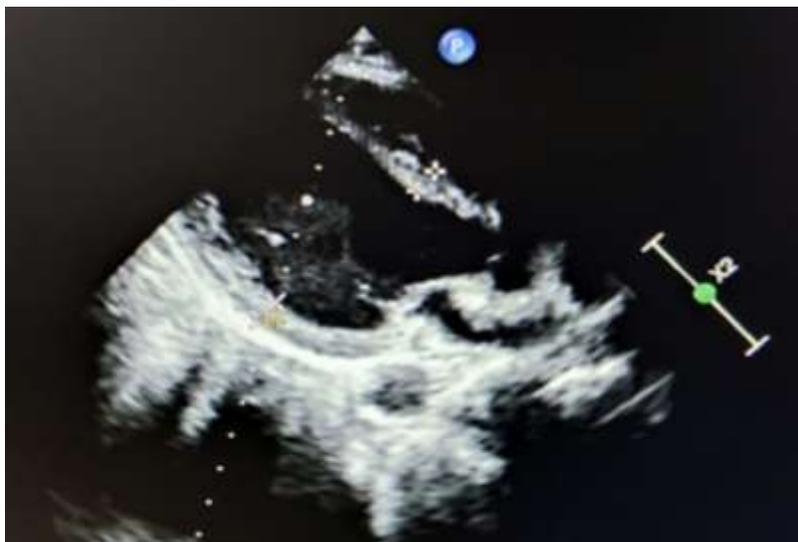


Figure 3: Echocardiography showing normal IVS and posterior wall thickness

DISCUSSION

Diagnosis of left ventricular hypertrophy by the electrocardiogram though important, poor correlation of ECG with echocardiography evidence of LVH has been described by large number of studies. Scott, from his observations on 100 cases concluded that left ventricular hypertrophy can be detected in 85 per cent of cases with conventionally accepted criteria, however 10 to 15 per cent of cases have a false-positive diagnosis of LVH or Pseudo LVH (Scott, 1960). Commonest cause of this pseudo LVH is the phenomenon of high precordial voltage in the young. In young population due to presence of thin chest wall, ECG electrodes across the precordium (V_{1-6}) come relatively closer to the cardiac muscle mass and picks of relatively large voltage which is also known as “Proximity Effect”. Most of the physicians misclassify those high precordial voltage in the young as left ventricular hypertrophy and subject them for unnecessary further cardiac evaluation. High QRS voltage can be observed transiently after injection of nor epinephrine and also after emotional strain which also pours non epinephrine into the blood stream. Besides thin chest wall, may be the pouring thyroxine from the Follicular carcinoma of thyroid into the blood stream resulting in vigorous left ventricular systolic force which was picked by the surface electrodes as high precordial voltage due to thin chest wall having proximity effect. Our take home message from this case is “high precordial voltage in the young” should not be unnecessarily diagnosed as LVH and patient should not be subjected for further cardiac evaluation. An age old saying can be remembered: “ All that glitters is not gold”; so all high precordial voltage is not necessarily LVH, it may be a simple benign phenomenon of “ High Precordial Voltage in the Young”.

REFERENCES

- Sodeman WA, Johnston FD, Wilson FN (1944).** The Q1 deflection of the electrocardiogram in bundle branch block and axis deviation. *American Heart Journal*, **28**(3) 271-86.
- Scott RC, Seiwert VJ, Simon DL, McGuire J (1955).** Left ventricular hypertrophy: A study of the accuracy of current electrocardiographic criteria when compared with autopsy findings in one hundred cases. *Circulation*. **11**(1) 89-96.
- Sokolow M, Lyon TP (1949).** The ventricular complex in left ventricular hypertrophy as obtained by unipolar precordial and limb leads. *American Heart Journal*, **37**(2) 161-86.
- Devereux RB, Casale PN, Eisenberg RR, et al., (1984).** Electrocardiographic detection of left ventricular hypertrophy using echocardiographic determination of left ventricular mass as the reference

standard. Comparison of standard criteria, computer diagnosis and physician interpretation. *Journal of American College Cardiology*, 82-7.

Parkin T W (1962). Problems in the electrocardiographic diagnosis of ventricular enlargement. *Circulation*, **26**(5) 946-57

Grubschmidt HA, Sokolow M(1957). The reliability of high voltage of the QRS complex as a diagnostic sign of left ventricular hypertrophy in adults. *American Heart Journal*, **54**(5) 689-94.

Scott RC (1960). The correlation between the electrocardiographic patterns of ventricular hypertrophy and the anatomic findings. *Circulation*, **21**(2) 256-91.