

**Title:** Correlation of Precordial Voltages to Left Ventricular Mass: Effectiveness of Differentiating the Athletic Heart from Hypertrophic Cardiomyopathy in Adolescent Patients

**Authors:** Karine Guerrier, D.O., M.P.H., Jeffrey B. Anderson, M.D., M.P.H., Jesse Pratt, M.S., David S. Spar, M.D., Timothy K. Knilans, M.D., Richard J. Czosek, M.D.

**Purpose:** Electrocardiograms (ECG) continue to be part of athletic screening programs, as well as family screening for hypertrophic cardiomyopathy (HCM), although whether ECG findings of left ventricular hypertrophy (LVH) can be used to distinguish between healthy populations and those with HCM remains unclear. The purpose of this study was to 1) analyze the relationship between ECG voltage and LV mass (LVM) in HCM patients and compare to healthy adolescents and 2) evaluate ECG testing characteristics of patients with phenotypical HCM.

**Methods:** Retrospective cohort analysis of HCM patients aged 13 – 18 years. Relationship between ECG voltages (R wave V6, S wave V1, and R wave V6 + S wave V1) and echocardiogram measurements of mass including LVM, LVM/m<sup>2</sup>, and LVM/height<sup>2.7</sup> were investigated. These were then compared to those in a prospectively obtained population of adolescent athletes who underwent sports screening. The frequency of abnormal LV voltages, as well as non-voltage ECG changes (pathological q-waves, t-wave changes, and ST segment changes), were analyzed for association with HCM.

**Results:** The study included 53 patients with HCM (72% male; 64% gene positive; 78% phenotype positive). Mean age was 16 years (13 – 18). Significant relationships existed between LVM and SV1 (p=0.002), RV6 (p=0.0002), and RV6 + SV1 (p=0.04). These relationships were parabolic rather than linear, which was not seen in the healthy cohort. LVH by ECG voltage criteria was present in 34% of patients with phenotypic HCM, but only 8% of phenotype negative. Of phenotypic HCM patients, 56% demonstrated non-voltage ECG abnormalities: q-wave (12%), t-wave (44%), ST segment (20%). Only two (16.7%) patients with phenotype negative HCM demonstrated these ECG changes. In total, 59% of phenotypic HCM patients demonstrated either abnormal voltages or non-voltage abnormalities.

**Conclusion:** There is a parabolic relationship between LV voltages and LVM in HCM adolescents not expressed in healthy athletes that may lead to “pseudonormalization” in some HCM patients. Voltage abnormalities were seen in 34% of phenotype positive patients. Non-voltage abnormalities were more common, but combined for only 59% sensitivity.

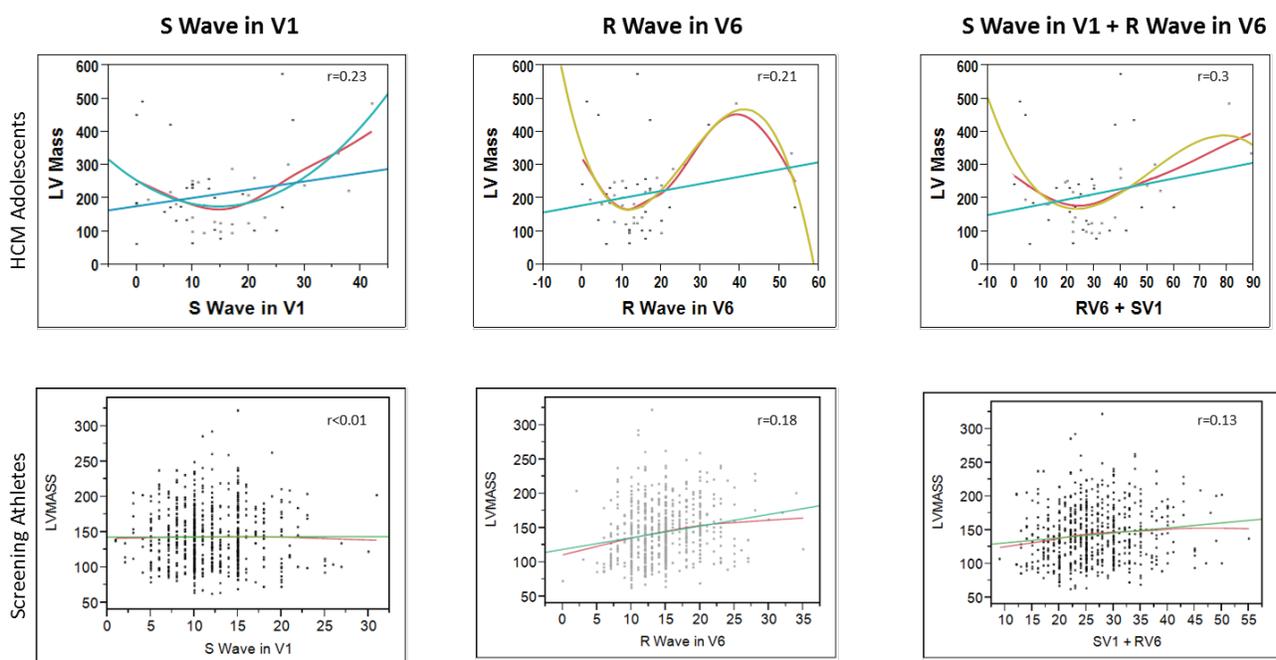


Figure 1. Relationship between ECG Precordial Voltages and LV mass in HCM adolescent patients compared to adolescent athletes