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## T Wave Inversions in an Asymptomatic Patient: What Do You Expect and What Is the Next Step?

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# T wave Inversions in an Asymptomatic Patient. What do you expect and what is the next step?

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## CASE REPORT

A 55-year-old male of Asian descent presents for a first time appointment to a primary care office for an annual physical examination. He has no known medical history and is in his usual state of health. He denies any chest pain, dyspnea, syncope, lightheadedness, exercise intolerance, lower extremity edema or orthopnea. Vital signs are notable for a blood pressure of 142/92 mmHg and a heart rate of 86 beats per minute. Physical exam findings are notable for a soft 1/6 systolic murmur heard best in the bilateral upper sternal borders. Electrocardiogram is performed (*Figure 1*).

### Question:

- Describe the ECG?
- What is the likely cause of the electrocardiogram findings?
- What is the next step in management?
- Does the patient need an inpatient or a continued outpatient evaluation?

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## ELECTROCARDIOGRAM INTERPRETATION

Normal sinus rhythm with heart rate of 84 beats per minute. Normal axis deviation. Normal intervals. Voltage criteria for left ventricular hypertrophy with deep S wave in V1 and tall R waves in V5-V6. Significant T wave inversions in the anterior, lateral, and inferior leads (I, V3-V6, II, III, aVF) with maximal deflection of 4mm. There is no significant ST elevation. There are non-specific ST changes that are seen in LVH. No evidence of pathologic Q waves.

## CLINICAL COURSE

In an asymptomatic patient with an abnormal ECG, the most reasonable next step is to obtain a transthoracic echocardiogram as an outpatient to evaluate for structural changes of the myocardium. Transthoracic echocardiogram demonstrated normal left ventricular size and hyperdynamic systolic function with severe apical hypertrophy and wall thickness of 1.9 centimeters. The left ventricular ejection fraction was estimated at greater than 75% with mid cavitory obliteration. The mid cavitory gradient was 54 mmHg. The patient was referred for Holter monitor for risk stratification and hypertrophic cardiomyopathy clinic.

## DISCUSSION

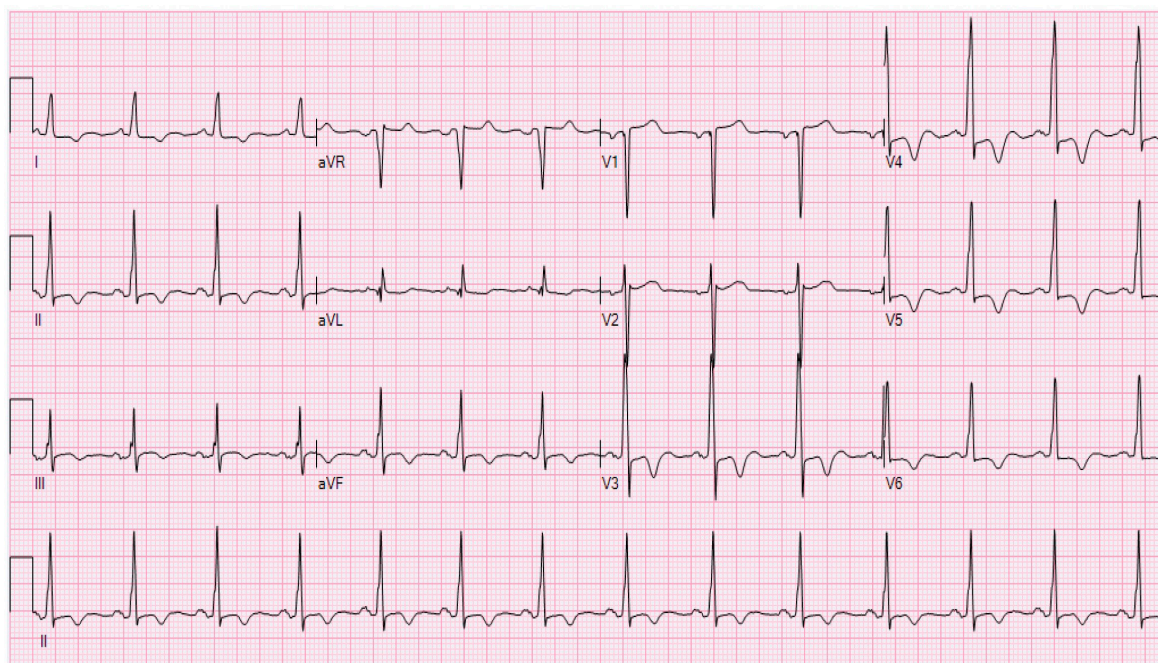
The electrocardiogram demonstrates negative T wave deflections in the precordial (V3-V6) and limb leads with evidence of LVH. The echocardiogram demonstrates evidence of Apical hypertrophic cardiomyopathy, which is a less known variant of hypertrophic cardiomyopathy<sup>1</sup>. This was initially first described by Sakamoto in Japan in 1976<sup>2</sup> and popularized by Yamaguchi in 1979<sup>3</sup>. Classically, the diagnosis was made with the presence of “giant” negative T-waves with high QRS voltage on ECG and accompanied by the appearance of “unique spade-like configuration and marked apical obliteration” on left ventriculography.<sup>1</sup> The ECG findings are often causally referred to as “Yamaguchi T waves”. Giant negative T waves, defined as negative voltage of  $\geq 1\text{mV}$  ( $\geq 10\text{mm}$ ), however, are not

mandatory and was only seen in 47% of patients in one study.<sup>4</sup> In our patient, the maximal T wave deflection was approximately 4mm and does not classically fit the definition of giant negative T wave. This variant is more common in the Asian population and accounts for up to 25% of hypertrophic cardiomyopathy in those of Asian descent.<sup>5</sup> Hypertrophic cardiomyopathy is a genetic condition which causes abnormal thickening of the myocardium and is histologically characterized by myocyte hypertrophy, disarray, and fibrosis. Treatment and management rely on early diagnosis and management of symptoms. Patients are often managed entirely in the outpatient setting if they are asymptomatic. Unexplained syncope, new onset chest pain, and shortness of breath are more concerning symptoms which would require urgent attention.

### TAKE- HOME POINTS

- Deep T wave inversions with signs of LVH can be seen in hypertrophic cardiomyopathy
- Echocardiogram is the next best step to evaluate for structural causes of an abnormal ECG
- Apical Hypertrophic cardiomyopathy, a variant of hypertrophic cardiomyopathy, will often have giant precordial T wave inversions
- For asymptomatic patients, an outpatient evaluation is appropriate. Although, patients with history of syncope, chest pain or shortness of breath should be seen in a more urgent manner.

**Figure 1:** 12 Lead ECG



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