Precordial T wave Inversions on Electrocardiogram

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Abstract

T wave inversions on an electrocardiogram (EKG) can manifest from any process that result in a relative delay in regional ventricular repolarization. The differential diagnosis of right precordial T wave inversions, leads V1-V3, include myocardial ischemia, a normal athlete’s heart, arrhythmogenic right ventricular dysplasia, and pulmonary embolism amongst others. The case discussed below delineates the importance of recognizing this ECG pattern and, in the correct clinical setting, can facilitate in diagnosis and treatment of a relatively common medical condition.

Introduction

T wave inversions on an electrocardiogram (EKG) can manifest from any process that result in a relative delay in regional ventricular repolarization. The differential diagnosis of right precordial T wave inversions, leads V1-V3, include myocardial ischemia, a normal athlete’s heart, arrhythmogenic right ventricular dysplasia, and pulmonary embolism amongst others. The case discussed below delineates the importance of recognizing this ECG pattern and, in the correct clinical setting, can facilitate in diagnosis and treatment of a relatively common medical condition.

Case Presentation

A 73 year-old man with a past medical history of Crohn’s disease and hypertension, not currently taking any medications, presents to a cardiologist's office with a complaint of worsening shortness of breath for one month. The patient denied any associated chest pain, cough, fevers, chills, syncope, palpitations, or leg swelling. Prior to the onset of his symptoms, the patient was an avid jogger and had no other physical impairments. Of note, about one month prior, the patient recently drove back to New York from Florida. On physical examination, his temperature was 98.3 degrees Fahrenheit, blood pressure of 135/78 mmHg, heart rate of 100 beats per minute and oxygen saturation of 98% on room air. His cardiovascular and lung examination were normal. There was no lower extremity edema and dorsalis pedis pulses were intact bilaterally. Chest x-ray revealed no pathology. Electrocardiogram (Figure 1) showed a normal sinus rhythm with T wave inversions across the right precordial leads. The patient underwent a left heart cardiac catheterization which showed non-obstructive coronary artery disease. A transthoracic echocardiogram revealed normal left ventricular size and function, but a dilated right ventricle with reduced right ventricular function and mild-moderate tricuspid regurgitation with a pulmonary artery systolic pressure of 77 mm Hg. Subsequently, ventilation perfusion scan showed segmental perfusion/ventilation mismatched defects involving the lateral segments of the lower lobes, medial segment of the right middle lobe, and lingula, which suggested a high probability for pulmonary embolism. A lower extremity doppler also revealed a deep vein thrombosis. The patient was subsequently treated with coumadin, which resulted in an improvement in his clinical status.

Discussion

T wave inversions are a common ECG finding in clinical practice and can manifest from any process that results in a relative delay in regional ventricular repolarization [1]. While T wave inversions in the right precordial leads are a normal finding in children and are considered a juvenile ECG pattern, it is relatively rare to find them in healthy adults. However, when found in adults, T wave inversions isolated to the right precordial leads, as opposed to T wave inversions in other leads, were not associated with adverse outcomes [2]. Still, there is a broad differential diagnosis of various pathologies that one must consider when evaluating patients with this ECG pattern.

Anteroseptal myocardial ischemia is probably the most common cause of right precordial T wave inversions in this patient's age group. However, the patient's lack of chest pain, un-evolving ECGs, negative cardiac enzymes, and non obstructive coronary artery disease on cardiac catheterization suggest myocardial ischemia as an unlikely cause of the current ECG pattern.

Next, this ECG finding may simply be a result of the physiologic remodeling of an athlete’s heart. A recent review found that T wave inversions were more prevalent in black male athletes with structurally normal hearts and should be considered a normal variant [3]. To further support this finding, de-training among several athletes resulted in resolution of the T wave inversions. However, especially in the athlete population, it is important to distinguish normal variants from cardiomyopathies with an increased sudden cardiac death risk. Arrhythmogenic Right Ventricular Dysplasia (ARVD)
wave inversions on ECG, which can help facilitate in the diagnosis and treatment of a pulmonary embolus.

References

Conclusion
This case emphasizes the utility of recognizing right precordial T wave inversions on ECG, which can help facilitate in the diagnosis and treatment of a pulmonary embolus.