EDITORIAL COMMENT

Can Right Precordial T-Wave Inversion in Healthy Endurance Athletes Be Explained?*

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T-wave inversion in the right precordial leads is present in most children and adolescents below the ages of 14 to 19 years (1). Therefore, T-wave inversion in leads V1-V2 or V1-V3 has been termed “juvenile T-wave pattern.” These negative T waves then become upright, so that above this age range, T-wave inversion beyond V1 is found in <1% to 3% of otherwise healthy older children and adults (1,2). The observation that T-wave inversion beyond V1 is present in 54% to 84% of patients with right ventricular cardiomyopathy (ARVC) has made this finding valuable to alert the physician to the possible presence of ARVC (3,4). It also assists in the differentiation of ARVC from patients with idiopathic right ventricular (RV) outflow tract premature ventricular beats or ventricular tachycardia because T-wave inversion in the anterior precordial leads (V1-V3 or beyond) is present in only 0% to 4% of these patients (5,6). These observations have led to the inclusion of T-wave inversion beyond V1 as a major criterion in the modified Task Force Criteria for the diagnosis of ARVC because both the sensitivity and specificity of this finding in older children and adults is highly specific for ARVC (7).

Papadakis et al. (8) recently reported that T-wave inversion is relatively common in black athletes and was present in 12.7%. The clue that these ECG changes are not caused by ARVC is that they are accompanied by ST-segment elevation in the same precordial leads in which there are T-wave inversions. This is in contrast to the ECGs in patients with ARVC who had no ST-segment elevation in the right precordial leads. In patients with ARVC, the anterior T-wave inversion may be due to RV enlargement. Nava et al. (9) observed that there was a progression of the extent of anterior precordial T-wave inversion with time in ARVC, and this correlated with an increase in the RV volume.

In this issue of JACC: Clinical Electrophysiology, Brosnan et al. (10) performed a study in endurance athletes who had T-wave inversion in leads V2 and V3. They compared this pattern with endurance athletes and non-athletes who had upright T waves beyond V1. Previously Brosnan et al. (11) reported that T-wave inversion on V1-V3 was found in 4% of endurance athletes and 1.1% of non-athletes. They devised innovative measurements from MRI imaging to determine the extent of the projection of the RV under the anterior precordial leads. They found that in endurance athletes with T-wave inversion beyond V1, the RV and RV apex were displaced toward the axilla. Because the RV is activated after the left ventricle and repolarization of the RV is associated with negative T waves, they concluded that lateral displacement of the RV and RV apex is the cause of the observed T-wave inversion in these athletes. They found that this was not due to an increase in RV volume because athletes with no anterior precordial T-wave inversion had RV volumes similar to those who did have the inversion. Although the cardiac volumes were similar in athletes with no anterior T-wave inversion, the septal angle was more horizontal and the percent with lateral displacement was greater in the athletes with anterior T-wave inversion. However, one must be careful not to extrapolate this information to the cause of anterior T-wave inversion in ARVC because there is an increase in RV volume as well as pathological damage.

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to the RV in this condition. It is not known why a relatively small percent of athletes have cardiac alterations that displace the RV laterally. Nevertheless, the careful study by Brosnan et al. (10) helps us to understand the anatomic changes that appear to explain anterior T-wave inversion in athletes.

REFERENCES


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