False-positive Exercise Test Secondary to Wolff-Parkinson-White Syndrome in the Absence of Manifest Preexcitation and Disappearance of ST Depressions After Accessory Pathway Ablation

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SUMMARY

Wolff-Parkinson-White syndrome with manifest preexcitation is a common cause of false-positive exercise test results. However, false-positive results are extremely rare without manifest preexcitation. We report a case with intermittent Wolff-Parkinson-White syndrome and exercise-induced marked ST depressions in the absence of preexcitation of the QRS complexes. His coronary arteries were normal on angiography and no ST changes were observed in the control exercise test after ablation of the accessory pathway. (Jpn Heart J 2004; 45: 1043-1047)

Key words: Preexcitation syndrome, Exercise test, False-positivity, Ablation

EXERCISE testing can not be used for the diagnosis of coronary artery disease (CAD) in patients with Wolff-Parkinson White (WPW) syndrome and manifest preexcitation since it commonly causes false-positive results.1) However, without preexcitation of the QRS complexes, WPW syndrome very rarely may result in false-positive exercise test results. The case presented here had intermittent WPW syndrome, normal coronary arteries, and exercise-induced marked ST segment depressions in the absence of manifest preexcitation. No ST changes were observed in the repeated exercise test performed after ablation of the accessory pathway.

CASE REPORT

A 30-year-old male was admitted to hospital with exercise-induced retrosternal chest pain and palpitations that had persisted for 2 years. He reported that he had 2-3 presyncope. There were no risk factors for coronary artery disease.
except for smoking. Upon physical examination, his blood pressure was 120/70 mmHg and his pulse rate was 70/bpm and regular. A 1/6 systolic murmur was heard at the mitral area. Examination of the other systems was noncontributory. No preexcitation was detected on the ECG obtained on the day of examination. However, a previous ECG taken 3 months earlier showed that the patient had intermittent preexcitation syndrome (Figure 1).

Chest X-rays, whole blood count, and biochemical markers were normal. Echocardiography showed mild mitral regurgitation. Because of the chest pain, an exercise test was performed in order to exclude CAD.

No preexcitation was detected throughout the exercise test; there was no delta wave, the QRS width was 80 ms, and the shortest PR interval during the test was 140 ms. In the absence of preexcitation, downsloping 1.0 mm ST depressions appeared in V4-6 derivations at the first stage of the test. The test was terminated at the second stage since the ST depressions reached to 4-5 mm. The ST changes had disappeared by the first minute of the recovery. Analysis of the rhythm during the ST depressions revealed that it was most probably sinus tachycardia since the QRS was narrow, RP>PR, and the P wave was positive in the inferior leads and its morphology was similar to that of baseline sinus rhythm (Figure 2).

Figure 1. ECG showing manifest preexcitation.
Figure 2. Second stage of the exercise test before ablation. Heart rate is 150 bpm. ST depressions at V4-6 are seen in the absence of manifest preexcitation.

Figure 3. Third stage of the exercise test after ablation. Heart rate is 168 bpm. No ST depressions are seen.
Since the exercise test was positive, coronary angiography was performed. His epicardial coronary arteries and left ventricle were normal on angiography.

His palpitations went on despite medical therapy, therefore, we performed an electrophysiologic study with the aim of ablation. The accessory pathway was localized to the right posteroseptal region and was ablated successfully. The exercise test was repeated one month after the ablation, which showed no ST depression (Figure 3).

**DISCUSSION**

Wolff-Parkinson-White syndrome with manifest preexcitation commonly causes false-positive exercise test results,\(^1\) and even false-positive thallium study results.\(^2,3\) However, in the absence of manifest preexcitation, false-positive results are extremely rare.\(^4\)

In normal men, the action potential duration of the endocardium is longer than that of the epicardium and the direction of repolarisation is from the epicardium to the endocardium. In the presence of myocardial ischemia, action potential duration becomes shorter and an electrical gradient occurs, causing ST changes.\(^5\)

The ST changes during exercise testing in patients with intermittent preexcitation are only seen in those complexes with preexcitation and not in those without preexcitation.\(^6\) Since our case had intermittent preexcitation, it is possible that ST changes might be secondary to preexcited QRSs during the exercise test. However, no preexcitation was detected throughout the test; there was no delta wave, the QRS was 80 ms, and the shortest PR interval during the test was 140 ms. To the best of our knowledge, our patient is only the second case in the literature showing the occurrence of exercise-induced ST depressions in non-preexcited complexes.\(^4\)

Exercise-induced ST depression occurring in patients with manifest preexcitation is thought to result from repolarisation changes secondary to abnormal depolarisation of the myocardium via the accessory pathway.\(^4\) The appearance of exercise-induced ST changes in the absence of manifest preexcitation leads one to speculate that not only repolarisation abnormalities but also other factors may have a role in the ST changes occurring in patients with WPW syndrome.\(^4\) Intraventricular conduction defects and neurogenic factors accompanying tachycardia may be responsible for these changes.\(^7\)

Cardiac memory, which is an altered T wave during sinus rhythm that is induced by a period of arrhythmia, can cause false positive ST-T changes during an exercise test in a patient with preexcitation. The T wave is characterized by a vector that tracts that of the previously arrhythmic QRS complex.\(^8\) However, in
analysing the exercise test of the present case, no ST-T changes were attributable to memorial T changes; the vector of the T wave during preexcitation was completely different from that of the T wave during the exercise test, including the T waves when there were ST-T changes.

It has been reported that manifest preexcitation can cause ST depressions of 1-4 mm.9) In our case, 4-5 mm ST depressions were observed during the exercise although there was no conduction over the accessory pathway.

Exercise has different effects on preexcitation; it may cause the disappearance of preexcitation by blocking conduction in the accessory pathway if there is conduction over the accessory pathway before the exercise; or it may cause the appearance of preexcitation if there is conduction over the atrioventricular (AV) node before the exercise; or finally it may have no effect.10) The last condition was the case in our patient who had severe ST depressions during AV nodal conduction.

As was the case in our patient, if WPW syndrome causes severe ST depression during exercise in the absence of manifest preexcitation, coronary angiography should be performed in order to exclude CAD. If the coronary arteries are normal on angiography, the exercise test should be repeated after the ablation.4) In our case, the coronary arteries were normal and exercise testing performed after the ablation showed no ST depressions, confirming that ST changes are secondary to accessory pathway.4)

REFERENCES