

Wolff-Parkinson-White pattern in a young elite athlete: Algorithm to follow

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Este artículo también está disponible en español

ARTICLE INFORMATION

Received: April 18, 2019

Accepted: May 30, 2019

Competing interests

The authors declare no competing interests.

Figures

Images from complementary tests are shown with patient's consent.

Abreviaturas

ECG: electrocardiogram

EPS: electrophysiological study

SD: sudden death

WPW: Wolff-Parkinson-White

ABSTRACT

Wolff-Parkinson-White syndrome is a rare and non-structural heart disease, which belongs to the ventricular preexcitation syndromes. It is associated with the development of sudden death, as it can induce the appearance of malignant arrhythmias in the patient and its diagnosis can be established through electrocardiogram. If it takes place in people linked to sport, with the development of intense physical exercise, it can increase the risk of sudden death. The case of a high-performance athlete with a diagnosis of Wolff-Parkinson-White syndrome is described, and the guidelines to be followed according to international criteria for the interpretation of the electrocardiogram in sportsmen and women are presented.

Keywords: Wolff-Parkinson-White Syndrome, Athletes, Sudden death, Electrocardiogram

Patrón de Wolff-Parkinson-White en joven atleta de élite: Algoritmo a seguir

RESUMEN

El síndrome de Wolff-Parkinson-White es una cardiopatía no estructural poco frecuente que pertenece a los denominados síndromes de preexcitación ventricular. Está asociada al desarrollo de muerte súbita, pues puede inducir a la aparición de arritmias malignas y su diagnóstico puede establecerse a través de la realización de un electrocardiograma. En caso de presentarse en personas vinculadas a la práctica deportiva, con el desarrollo de ejercicio físico intenso, puede incrementar el riesgo de muerte súbita. Se describe el caso de un atleta de alto rendimiento con diagnóstico de síndrome de Wolf Parkinson White y se presentan las pautas a seguir, según los criterios internacionales para la interpretación del electrocardiograma en deportistas.

Palabras clave: Síndrome de Wolff-Parkinson-White, Atletas, Muerte súbita, Electrocardiograma

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INTRODUCTION

Sudden death (SD) is the natural death that takes place in an individual quickly and unexpectedly¹. It appears in most cases associated with cardio-

vascular disorders, and, in athletes, it is considered an event of rare presentation but with a devastating impact. Among its main causes are the structural heart diseases, which in people over 35 years of age are associated with ischemic heart disease, while it is because of other non-ischemic cardiomyopathies in younger ones². Also, non-structural heart diseases, such as electrical, can induce severe arrhythmias, mainly ventricular fibrillation, triggers for the individual's death within minutes. Among these diseases are the long and short QT syndrome, Wolff-Parkinson-White (WPW) syndrome and Brugada syndrome, among others³⁻⁵.

The overall risk of SD in the WPW syndrome in asymptomatic patients is low (0.1 % per year), but in symptomatic patients it increases to 0.3 %⁶. In the case of high-performance athletes, the practice of intense physical exercise could induce, with the course of time, the development of structural changes in the heart, such as: hypertrophy, fibrosis and dilation of cardiac cavities, which can lead to SD in the athlete during the performance of professional activities^{3,7}.

The electrocardiogram (ECG) at rest is a test that shows the electrical activity of the heart and it is considered an important tool from the point of view of its cost/effectiveness for the evaluation of athletes. In expert hands, the ECG presents a high sensitivity and specificity, with a higher positive probability index for the diagnosis of cardiovascular diseases^{8,9}.

In the case of the WPW syndrome in high-performance athletes, the presence of prior electrocardiographic abnormalities increases significantly the risk

of SD¹⁰.

CASE REPORT

Here is presented the case of a 17-year-old man, mestizo, with pathological family history, in both parents, of high blood pressure, and personal history of migraine events and occasional palpitations.

The patient was involved in sport practice since 8 years old and he has been high-performance athlete for two years, in football teams in the city, with a sports training rate of approximately 12 hours per week.

He came to the specialized cardiology department for having a routine check, for the first time, as part of the medical examination required for athletes that make up the sports club to which he belongs now. On the cardiovascular physical examination, no alterations were detected.

In the ECG was confirmed sinus rhythm with right bundle branch block pattern, partial or incomplete, (rR' in V₁ and V₂) and WPW pattern with shortening of PR interval (80-100 ms) and wide QRS (≥ 120 ms) due to the presence of delta waves, which was negative in D_{III} (**Figure 1**); furthermore, there was a sudden voltage drop of the R from V₁ to V₂, all of which remembers the right posterior septal pathways.

Complementary studies (echocardiogram and ergometry) were recommended as well as reassessment from his club's sports committee, for the association of the findings with the clinical symptoms of the patient and consideration of suspension or exercise practice, facing the possibility of triggering SD

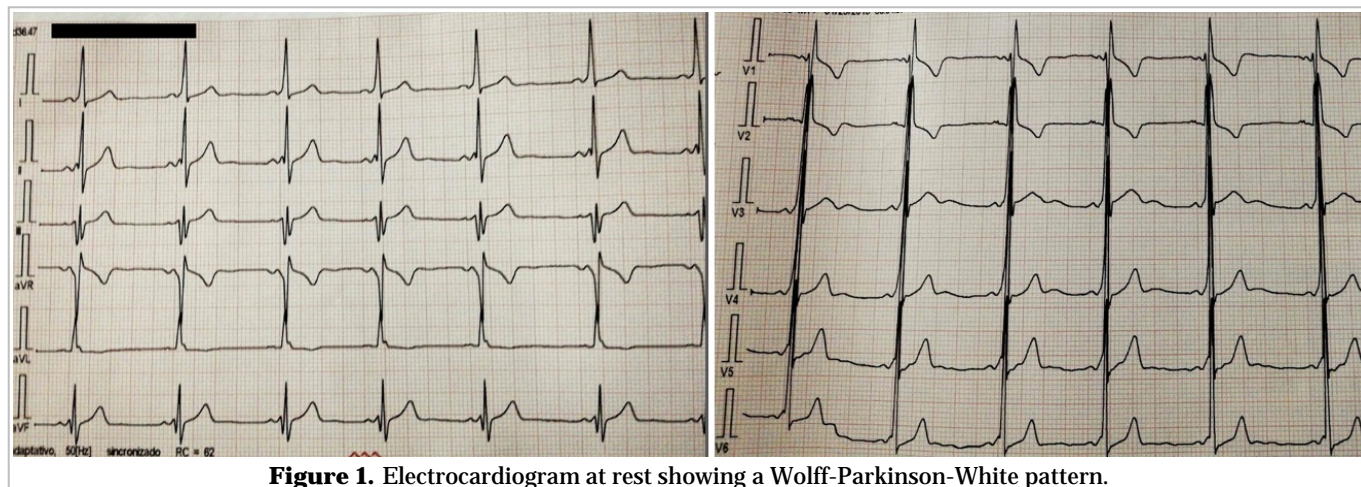


Figure 1. Electrocardiogram at rest showing a Wolff-Parkinson-White pattern.

during physical exertion.

Finally, the athlete's training was temporarily suspended and he is awaiting electrophysiological study (EPS) in order to define the conduct to be followed.

COMMENT

The WPW syndrome is a cardiovascular congenital disease that is found in the so-called preexcitation syndromes, which can trigger malignant arrhythmias. It is more frequent in males, with 2:1 ratio, and its prevalence varies between 0.1-0.3% in the general population¹¹. In some cases, its autosomal dominant hereditary character, associated with mutations in the PRKAG2 gene, has been demonstrated, and it is called "familial WPW syndrome"¹².

In patients with WPW syndrome, there is an anomalous or accessory pathway which directly connects the atrium and the ventricle, what alters the normal conduction and creates a chaotic electrical activity, with anterograde direction in approximately 3% of patients, producing the most dangerous arrhythmias and triggering ventricular fibrillation; or retrograde, called orthodromic tachycardias^{12,13}.

Electrocardiographically, the most common alterations presented are: short PR interval (range <120 ms) and a delta wave with delayed rise or fall at the beginning of QRS, according to the anatomical location of the accessory pathway. When these alterations are associated with symptoms, such as events of dizziness, palpitations, syncope or cardiorespiratory arrest, it is called WPW syndrome; but if the abnormalities are only present in the ECG of asymptomatic patients, it is referred as WPW pattern^{13,14}. These cases must be studied in depth, for which different studies are recommended, such as the echocardiogram, the Holter, the ergometry and the EPS^{6,10}.

Asymptomatic patients generally do not require treatment, but there are drugs that can be used such as: propafenone, flecainide, or amioda-

rone, and others that should be avoided –especially in acute events of tachyarrhythmias– such as: adenosine, digoxin, verapamil, and beta-blockers, because they block or slow down the passage of the stimulus through the atrioventricular node and favor conduction through the accessory pathway. Currently, the percutaneous airway ablation is considered the treatment of choice in symptomatic patients, and there are special situations in which it is recommended to perform EPS with ablation for the treatment of WPW syndrome, such as certain professions: drivers, pilots and high-performance athletes^{15,16}.

According to the latest consensus of international criteria for the interpretation of ECG in athletes¹⁷, the joint presence of PR interval <120 ms, delta wave and QRS duration ≥120 ms with, is considered as "abnormal finding" or that is not related to regular training or to the expected physiological adaptation to exercise, in athletes. These alterations, referred to as WPW pattern, require research in the athletes; although they are not associated with a precise symptomatology (**Figure 2**):

- Asymptomatic athlete with WPW pattern intermittently during sinus rhythm at rest: it is considered that the patient has an accessory pathway of low risk and the need to perform other studies can obviate, thus, follow-up and observation is rec-

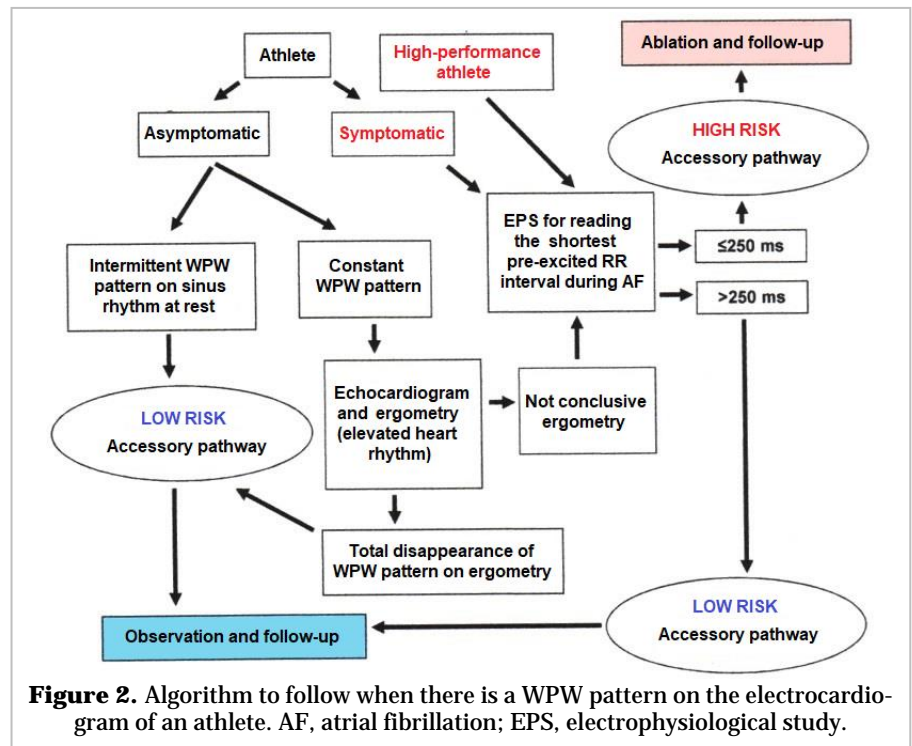


Figure 2. Algorithm to follow when there is a WPW pattern on the electrocardiogram of an athlete. AF, atrial fibrillation; EPS, electrophysiological study.

ommended.

- Asymptomatic athlete with constant WPW pattern: complementary studies are recommended: echocardiogram to assess the presence of cardiomyopathies or Ebstein disease, and ergometry at high heart rates, in order to stratify the risk of the accessory pathway. If there is complete and abrupt loss of the WPW pattern in the ergometry, it is considered that the patient has a low risk accessory pathway, therefore –just as mentioned before– follow-up and observation are recommended. But if the ergometry is not conclusive or does not confirm a low risk pathway, the EPS is recommended.
- Symptomatic athlete, or high performance, with WPW pattern: always to perform EPS and if the preexcited RR shorter interval is ≤ 250 ms, then, the accessory pathway is considered high risk and the ablation must be performed.

Treatment by ablation, either by radiofrequency or cryoablation, has a high success rate, although it is a therapy that may fail or cause complications such as bundle branch block or atrioventricular block. Generally, the sports disabling in athletes takes between three and six months after this therapeutic procedure. Despite the good results of ablation, the electrocardiographic monitoring in these patients is recommended because of the possibility of recurrence or new pathways' appearance¹⁸⁻²⁰.

The pre-participatory and periodic ECG should be considered as a fundamental tool in the evaluation of high-performance athletes, since, thanks to this study, electrical manifestations related to the physiological changes associated with the athlete's heart, considered normal, can be found, and whose presence does not require additional diagnostic tests. But it is also possible to detect abnormal alterations, such as the WPW pattern, which indicates the presence of cardiovascular disease, that must be properly treated and followed, as it has been shown that it can trigger SD in athletes. The correct approach in these cases allows us to define whether or not the athlete stays in active sport, which is essential for the preservation of her/his life. For these reasons, current knowledge about the alterations that can appear in the ECG of athletes is essential.

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