

WOLFF-PARKINSON-WHITE SYNDROME IN ATHLETES

DOI:https://doi.org/10.46733/PESH23121043f
(Original scientific paper)

Furnadjiski Atanas¹, Georgiev Antonio^{1,2}

¹University Clinic for Cardiology, 1000 Skopje, Republic of North Macedonia

²Faculty of Medicine, Ss. Cyril and Methodius University University, Skopje, Republic of North Macedonia

Abstract

A clinical syndrome named after the cardiologists Louis Wolff, Sir John Parkinson, and Paul Dudley White in 1930, when this heart rhythm disorder was first described, became an important condition in the athlete population because of its possible fatal and unexpected consequences. In the very essence of this pathological condition is an anatomic substrate called an aberrant pathway of Kent- an interposed connective tissue bond between the normal conductive system of the heart. This accessory pathway in circumstances of fast heart rhythm can and will become a fast gate for normal impulse conduction which will result in arrhythmia such as “reentrant” supraventricular tachycardia (AVRT) or atrial flutter (AF) which might degenerate in lethal ventricular fibrillation leading to a sudden cardiac death (SCD) in the athletes. This occurs when the normal impulse of the sinoatrial node travels down the AV node and His Purkinje system and returns in a retrograde manner to the atrium via the accessory pathway. AVRT can be orthodromic, following the normal physiological route, or antidromic when the depolarization wave follows the opposite route of physiologic conduction

Key words:

Definition and Types of WPW syndrome

Wolf Parkinson White Syndrome (WPW) is a congenital cardiac preexcitation syndrome that arises from abnormal cardiac electric conduction through an accessory pathway that can result in symptomatic and life threatening arrhythmias. Congenital condition with hereditary character associated with mutations in the PRKAG2 gene, also called “familial WPW syndrome”(1). WPW as a cause of sudden cardiac death has a prevalence between 1 to 4,5 per 1000 children and adults. There are two electrocardiographic types of the WPW syndrome: type A, where the QRS complex is upright with a typical negative delta wave in lead I, the accessory pathway is on the left side and it might be confused with right atrium hypertrophy, RBBB or right ventricle infarction (Figure 1) and type B also called a right sided bypass which might be confused with LBBB, and Type B where the QRS complex and delta wave are typically negative in lead V1 while lead I shows a positive delta wave (Figure 2). Occasionally, patients may not present with this hallmark ECG pattern because some accessory pathway activity may be concealed (2).



Figure 1. WPW type 1 pattern (From St. Emlyn’s emergency medicine).

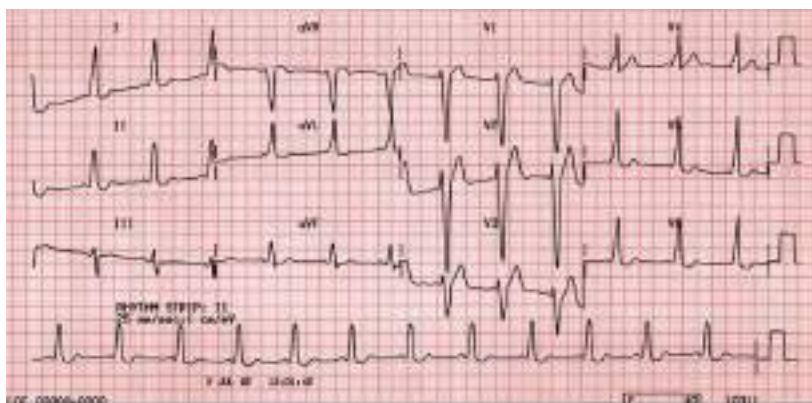


Figure 2. WPW type 2 pattern (From St. Emelyn's emergency medicine).

As mentioned above, the delta wave, a slurred upstroke in the QRS complex, is a hallmark of this condition and additional characteristic of the ECG finding is the short PR interval less than 120 ms.-a pathognomonic ECG finding and also a diagnostic criteria for WPW pattern of ECG.

The importance of this heart condition is even more emphasized in the athletic population which is normally exposed to high endurance training and long periods of high frequency heart action. As a cause of sudden cardiac death and often as a first clinical presentation of the syndrome, it is self-evident that preparticipation, physical evaluation and detection of the condition must be a routine priority in the sportsmen.

Prognosis

Most of the persons with WPW syndrome are asymptomatic and around 40% of them will lose the power of the accessory pathway for anterograde conduction within the first year of life which will decrease the rate of SVT and as such they will never be able to develop the clinical appearance of the syndrome i.e they will stay "presymptomatic". The WPW induced sudden death prevalence accounts approximately 1% and this number is higher in asymptomatic children and adults- between 10% to 48% (3). According to many retrograde studies, the annual risk of SCD goes between 0,2% to 0,45%. The sneaky nature of this congenital condition is even more prominent when the ECG findings are not concise and notable in situations such as subtle WPW pattern with left axis deviation, abnormal Q waves in leads V5 and V6, ST-segment depression, and T wave changes or intermittent WPW pattern i.e. delta wave present on every other QRS complex.

From all above said one can conclude that an early recognizing of the syndrome and the preparticipation physical evaluation of the athletes are paramount in the management of the persons with WPW syndrome.

The risk stratification must be done early as the syndrome is determined by routine ECG check-ups. In 1979 Klein et al. proposed the term high risk pathway where several characteristics of the ECG pattern are considered such as the shortest preexcited RR interval (SPERRI) as a marker of high risk pathway or other parameter like accessory pathway effective refractory period (APERP) or shortest paced cycle length with preexcitation (SPPCL), were proposed as useful (4). In 2016, Mambro et al. proposed three risk categories: low, borderline and high, using 24h ECG and exercise test that was followed by transesophageal EPS at rest and during exercise test and /or isoproterenol infusion. High risk was defined as SPERRI <250ms. At rest or < 220 m.s. during physical stress or sustained atrio-ventricular reentry tachycardia (AVRT) inducibility (4). Borderline risk was defined as inducibility of non-sustained AVRT and/or an accessory pathway effective refractory period APERP of 250ms +/- 5ms. at rest, and/or an APERP of 220+/- 5ms. during physical stress or isoproterenol infusion. Those at high risk were referred for catheter ablation and were allowed to participate in sports after the procedure, while those with unsuccessful intervention or those refusing to get the procedure were considered non-eligible for competitive sports.

Diagnostic tools and risk stratification

These can be noninvasive and invasive. The noninvasive methods include a) ECG at rest b) Holter monitoring, c) exercise treadmill testing and d) echocardiography. All these tests can provide information about the possibility of antegrade conduction of the aberrant pathway and the risk of ventricular fibrillation.

The ECG at rest as a basic screening test should always be done as a routine test in preparticipation examination of the athletes and nonathletic population. Although it is the cheapest and easiest test for determining the WPW pattern of conduction, it has some pitfalls which should be considered while interpreting it. These are: the impossibility to identify congenital coronary anomalies or acquired conduction defects that might happen after the screening, for example myocarditis, premature coronary heart disease, different ECG in children which matures until adulthood, sport heart which mimics pathological conditions, absence of skilled interpretation of an athletic electrocardiogram, late phenotypic expression of some genetic diseases which may cause SCD and so on (5,6).

Asymptomatic athletes who demonstrate an abrupt loss of pre-excitation in normal heart rate on 24 hour Holter ECG, have slower conducting accessory pathways and may be considered at lower risk of ventricular arrhythmia. The Holter monitoring may raise suspicion of the presence of multiple accessory pathways as an independent risk factor for VF.

Exercise stress test (EST) is a very useful dynamic indicator of pre-excitation. If there is evidence of loss of the delta wave during this test a long anterograde pathway refractory period is present and hence a low risk profile.

The echocardiography is standard investigation for ruling out some structural heart diseases such as hypertrophic cardiomyopathy as well as Ebstein anomaly which can be associated with WPW syndrome.

The second line of tests is more invasive such as the electrophysiologic study with ablation of the aberrant pathway always when the athlete is characterized as high risk for VF and thus SCD. In this group all athletes with SPERI <250ms. exhibiting symptoms of WPW such as dizziness, palpitations, syncope or cardiorespiratory arrest are considered for EPS including intracardiac catheterization and transesophageal studies.

According to the major cardiology societies (ESC, AHA/ACC, PACES/HRS) all athletes in the low risk group can do further sport activities after appropriate symptom follow-up, while high risk and symptomatic persons should undergo EPS and catheter ablation therapy after which they can return to sport within 1 week.

Conclusion

WPW syndrome is one of the pre-excitation syndromes of the heart which has a special place in the pathology of the athletic population due to its dangerous consequences including sudden cardiac death during a sport activity. Prompt recognition, adequate risk stratification and further treatment measures are crucial for prevention of possible life threatening events and unnecessary detraining of the athletes. Routine ECG, 24 hours ambulatory rhythm monitoring and echocardiography are fast and cheap diagnostic tools that should be widely used in preparticipation testing. Involvement of skilled healthcare professionals such as cardiologists, electrophysiologists, pediatricians and selected general practitioners in the physical examination and interpretation of the ECG findings is mandatory in the regular checkups of the athletes before they take part in any sport activity.

References

1. Ashwin L. Rao, Jack C. Salerno, Irfan M. Asif, and Jonathan A. Drezner, MD. Evaluation and management of Wolff-Parkinson-White in Athletes. *Sports Health*. 2014;6(4):326-332.
2. Saunders B, Matthews M, Mazur L, El Kadri M. Wolff-Parkinson-White syndrome in a young athlete. *Consultant*. 2022;62(10):e8-e12. doi:10.25270/con.2021.11.00011.
3. Thomas J. Sawyer, Melinda Cianci. Wolff-Parkinson-White in a College Athlete. *JACC Case Rep*. 2023; 9: 101531. doi: 10.1016/j.jaccas.2022.05.036.
4. Tomasz M. Ksiazczyk, Radoslaw Pietrzak, Bozena Verner. Management of Young Athletes with Asymptomatic Preexcitation-A Review of the Literature. *Diagnostics*. 2020;10(10):824. doi:10.3390/diagnostics10100824.
5. Yuri Medrano Plana, Angel R. Castillo Marcillo and Elibert Chavez Gonzalez. Wolff-Parkinson-White pattern in young elite athlete: Algorithm to follow. *CorSalud*. 2020;12(1):99-103.
6. Anja Desomer, Sophie Gerkens, Ingrid Vinck, Christian Leonard, Mattias Neyt, Dominique Paulus, Hans Van Brabant. Clinical effectiveness of cardiovascular pre-participation screening. Evaluation of the efficacy of a cardiovascular pre-participation screening program in young athletes (14-34 years). *KCE report 241Cs*; 2015.

