

Wolff-Parkinson-White Syndrome versus Wolff-Parkinson-White Pattern: Risk Stratification and Treatment

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INTRODUCTION

Wolff-Parkinson-White (WPW) syndrome is a congenital cardiac pre-excitation syndrome presenting with an uninhibited electrical conduction between the atria and ventricles via an Accessory Pathway (AP) known as the bundle of Kent and is linked in developing into a life-threatening arrhythmia [1]. Although rare, Sudden Cardiac Death (SCD) can present as the first clinical manifestation in WPW syndrome [2].

DESCRIPTION

Characteristics of WPW can vary depending on the location and number of the APs, conduction speed, direction of conduction and length of the AP refractory period [3]. With WPW, the conduction between the atria to the ventricles is not delayed or inhibited since the impulses bypass the atrioventricular node. The pre-excitation pathway also bypasses the His-Purkinje system resulting in the telltale Electrocardiogram (ECG) morphology. This includes a short PR interval with a slurred upstroke of the QRS complex known as a delta wave causing a slight widening of the QRS complex (Figure 1) [4].

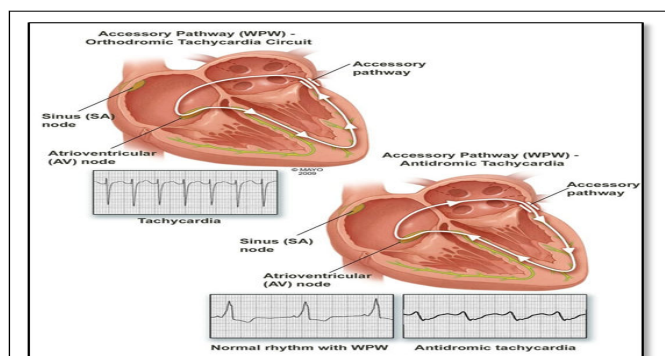


Figure 1: Illustration depicting the two types of atrioventricular reentry tachycardia arrhythmias related to WPW. OAVRT and AAVRT electrical pathways along with their respective ECG morphology. "Normal rhythm with WPW" reflects the ECG morphologic pattern without an associated arrhythmia.

AP location and AVN conduction velocity play a significant role in AP conduction. For example, APs are more commonly located between the left atria and ventricle (Type A) than the right atria and ventricle (Type B) [5]. In the case of a left sided AP, impulses may reach the AVN before the AP. The opposite may happen, however, if the AP is located on the right side where there would be a higher incidence of AP conduction. When there is conduction through the AP, repolarization morphology will appear abnormal and can be mistaken for cardiac pathology like ischemia, hypertrophy or pericarditis [6].

Life-threatening ventricular arrhythmias can occur from either a retrograde pathway which would initiate and maintain an Atrioventricular Reentrant Tachycardia (AVRT) or an uninhibited antegrade conduction of a supraventricular arrhythmia.

Because of variations in epidemiology, WPW can be broken down into two categories, WPW syndrome and WPW pattern. WPW syndrome encompasses patients with an associated arrhythmia where WPW pattern encompasses patients with associated WPW morphology without the presence of an arrhythmia. WPW pattern has been estimated to be between 1.0%-1.8% among the general population where WPW syndrome is much lower at 0.1%-0.3%. WPW pattern may be more prevalent than reported however, since it is not routine to acquire a 12-lead ECG for asymptomatic patients and is typically diagnosed during routine ECG monitoring.

Risk stratification testing and treatment of patients with asymptomatic WPW pattern characteristics can be challenging and controversial among experts. Recommended approaches to testing and treating asymptomatic WPW patients vary but begin with a thorough cardiac history assessing for symptomatology, non-invasive testing such as standard 12-lead ECG, ambulatory monitoring and exercise stress testing. Majority of patients with intermittent loss of ventricular preexcitation during non-invasive testing present with a long accessory pathway refractory period marking poor antegrade conduction through the AP. This signifies a lower risk of SCD. However, extensive testing, such as

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an electrophysiology study, is recommended for patients who exhibit a history of palpitation, syncope, dizziness, dyspnea or angina.

There are three main categorical arrhythmia types related to WPW pattern or syndrome that can be life-threatening. The most common is an atrioventricular reentry tachycardia which is divided into two types, Orthodromic (OAVRT) and Antidromic (AAVRT). The third is related to the presence of supraventricular arrhythmia. OAVRT has a normal antegrade conduction through the AV node with a retrograde conduction through the AP causing a continuous loop mimicking a narrow complex supraventricular tachycardia (Figure 1). Focused treatment for OAVRT is to slow conduction through the AV node using methods like Valsalva maneuver, carotid massage or medication like adenosine and calcium channel blockers. AAVRT has an antegrade conduction through the AP and a retrograde conduction through the AV node causing a continuous loop with a wide QRS complex mimicking ventricular tachycardia (Figure 1). AV nodal blocking agents, in this case, must be avoided. Instead, antiarrhythmics like procainamide or amiodarone should be used which will slow impulses through the AV node and AP by increasing its refractory period. The last arrhythmia type is with the presence of atrial fibrillation or flutter where the supraventricular impulse would be conducted unopposed through the AP with the potential of a 1:1 atrioventricular conduction. In this case, similar treatment is recommended as AAVRT to slow the impulse through the AP.

Risk stratification for patients with WPW syndrome is more straightforward where radiofrequency ablation is recommended as the best method for prevention therapy over antiarrhythmic drug therapy. Radiofrequency ablation therapy has a success rate of 90%-95% where surgical ablation has a nearly 100% success rate.

Patients require general anesthesia during Electrophysiology Studies (EPS) and ablation procedures and an anesthetic agent that has minimal effects on cardiac electrophysiology is preferred. Studies have shown that inhalation agents will likely

prolong the atrial, ventricular and AP refractory periods which may mask a complete ablation of the AP. Compared to inhalation anesthetic, propofol is considered most appropriate for use during EPS/ablations as it does not impede the generation of diagnostic supraventricular tachycardias.

CONCLUSION

Wolff-Parkinson-White may present itself as a life-threatening arrhythmia or as a subtle incidental finding on an electrocardiogram where patients are asymptomatic. In any case, cardiological consultation is recommended to establish a safe management plan for every patient. Treatment modalities vary between WPW pattern versus WPW syndrome from noninvasive testing to invasive electrophysiology studies and radiofrequency ablation techniques while under general anesthesia.

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