

QUICK LESSON

EKG Series: EKG Interpretation – Wolff-Parkinson-White Syndrome

Description/Etiology

Wolff-Parkinson-White syndrome (WPWS) (Figure 1), also called preexcitation syndrome, is a congenital abnormality that affects the electrical signal pathways of the heart, producing tachycardia or supraventricular tachycardia (SVT) with heart rates > 150 bpm, that can, in rare cases, lead to sudden cardiac death (SCD). Normally, the atrioventricular (AV) node acts as moderator, slowing delivery of electrical impulses that originate in the sinoatrial (SA) node to the ventricles. This allows for proper coordination of beat between upper (atria) and lower heart chambers (ventricles). Persons with WPWS experience a preexcitation condition in which the ventricular myocardium is activated early. This early activation can occur in any area of the heart through abnormal electrical pathways (bypass tracts or accessory pathways) that bypass the AV node and its moderating effect, most commonly through the bundle of Kent (Figure 2). Patients with WPWS can develop any arrhythmia, but AV reciprocating tachycardia (AVRT; i.e., conduction down the AV node followed by retrograde conduction up the bypass tract that re-excites the atria) (Figure 3) and atrial fibrillation (AF) (Figure 4) are most common.



Figure 1: Wolff-Parkinson-White (WPW) syndrome. Copyright© 2014, EBSCO Information Services.

ICD-9
426.7

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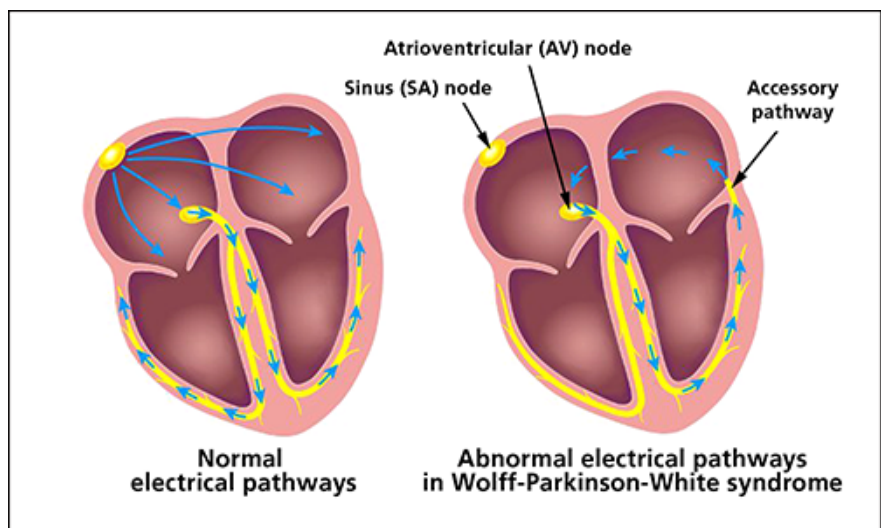


Figure 2: The Bundle of Kent. Copyright© Tom Lück, 2011. Licensed under Creative Commons Attribution-Share Alike 3.0 Unported License

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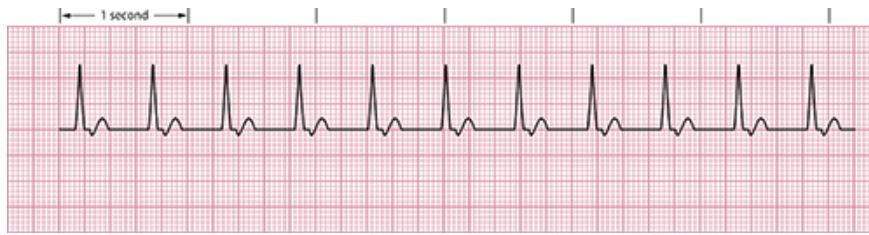


Figure 3: Atrioventricular reciprocating tachycardia (AVRT). Copyright© 2014, EBSCO Information Services.

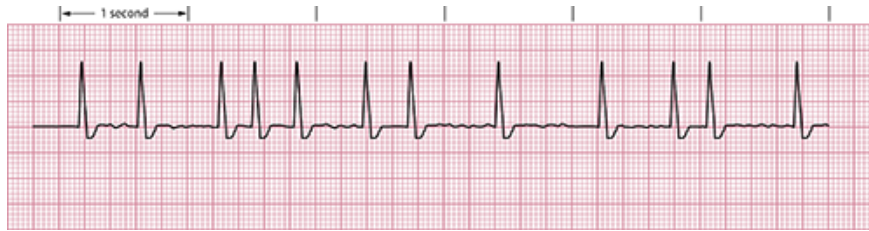


Figure 4: Atrial fibrillation. Copyright© 2014, EBSCO Information Services.

No specific test exists for diagnosing WPWS. Diagnosis is based on EKG monitoring in combination with patient history and physical examination. WPWS should be suspected when a patient's history and EKG do not correlate (e.g., a seemingly healthy young person with a wide complex tachycardia [\[Figure 5\]](#) or ventricular fibrillation [\[Figure 6\]](#)).

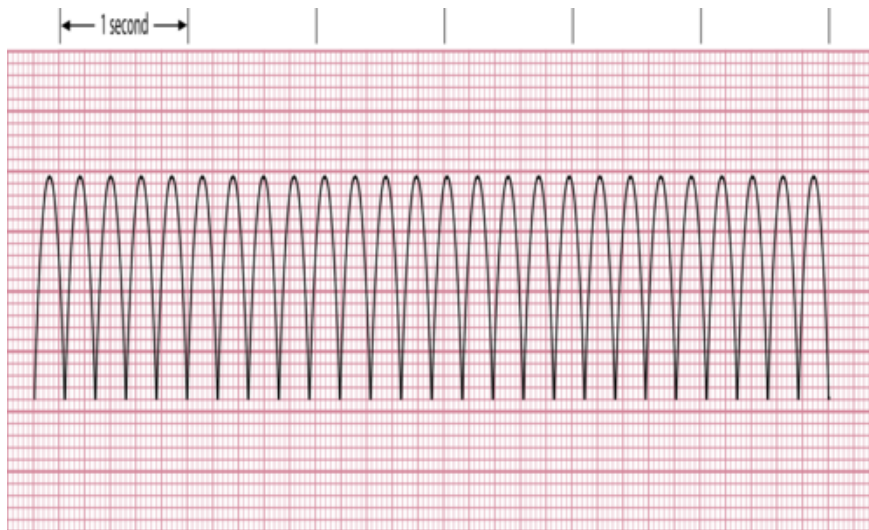


Figure 5: Ventricular Tachycardia. Copyright© 2014, EBSCO Information Services.

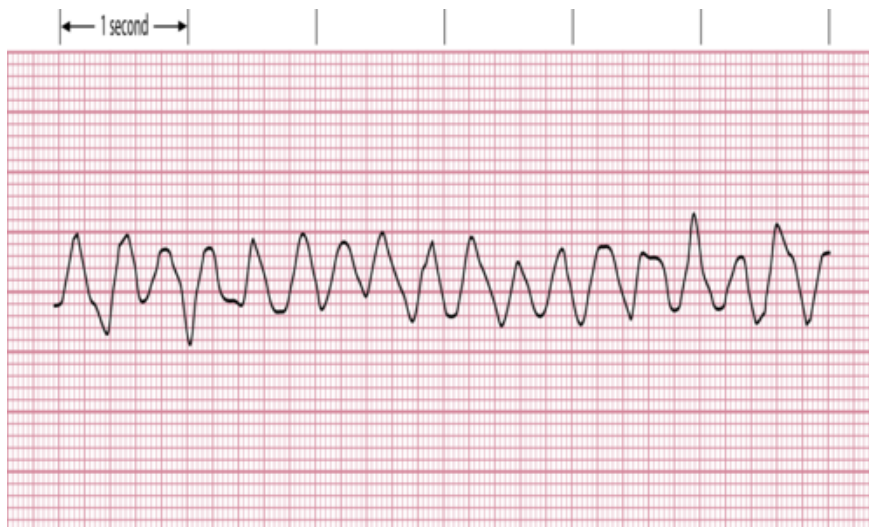


Figure 6: Ventricular Fibrillation. Copyright© 2014, EBSCO Information Services.

Whether treatment is required depends on the stability of the patient. No treatment is necessary in the absence of tachycardia. Acute tachycardia is treated with drugs that block or slow AV nodal conduction, while pharmacotherapy for AF is aimed at controlling ventricular rate and restoring sinus rhythm. Antiarrhythmic drugs, calcium channel blockers or β -blockers can be prescribed long-term to prevent tachycardia. Radiofrequency catheter ablation (i.e., destruction of the accessory pathway with heat produced with radiofrequency energy) is often used in older children, adolescents, and patients with drug-resistant tachycardia.

Facts and Figures

WPWS affects approximately 1 to 3 out of 1000 (0.1 to 0.3%) in the general population. Males account for 60–70% of cases. There is no other evidence of heart disease in up to 70% of patients. Among patients with WPWS, ~ 65% of adolescents, and ~ 40% of adults > 30 years are asymptomatic. The mean age of symptom onset is 20 to 24 years. Paroxysmal AF affects up to 50% of patients with WPWS. The most common cause of SCD in patients with WPWS is ventricular fibrillation triggered by AF. Radiofrequency ablation has high success rates in preventing recurrence of dysrhythmias.

Risk Factors

Most patients with WPWS have anatomically normal hearts; however, associations with cardiomyopathies and Ebstein's anomaly have been reported (for more information on Ebstein's anomaly, see *Quick Lesson About ... Ebstein's Anomaly*). In addition, genetic preexcitation disorders can be inherited. While diagnostic modalities are accurate in identifying patients with WPWS, risk for SCD cannot be quantified.

Signs and Symptoms/Clinical Presentation

Symptoms of dysrhythmias include dizziness, lightheadedness, shortness of breath, fainting, palpitations, chest tightness or pain, and shock or sudden death in severe cases.

Assessment

› Physical Findings of Particular Interest

- During an episode of tachycardia, physical exam will reveal a heart rate > 150 bpm and low or normal blood pressure

› Laboratory Tests That Might Be Ordered

- Genetic testing might reveal a mutation in the *PRKAG2* gene, which determines accessory pathway formation

› Other Diagnostic Tests/Studies

- Diagnosis of WPWS is made by detecting an EKG abnormality, as determined by four measurements:
 - A short PR interval (< 0.12 seconds)
 - Presence of an abnormal delta wave (QRS complex > 120 msec with slurred, slowly rising onset)
 - A widened QRS complex greater > 0.12 seconds (because of early ventricular depolarization)
 - The presence of ST-T wave changes
- Intracardiac or transesophageal electrophysiology study (ICEPS/TEEPS) can indicate abnormalities associated with WPWS
 - TEEPS is a safe and effective alternative to ICEPS in asymptomatic children with WPWS
- Holter monitoring can detect the short bursts of tachycardia or SVT prevalent with WPWS and baseline abnormalities
- Myocardial Doppler ultrasonography might be ordered for noninvasive assessment of cardiac structures

Treatment Goals

› Promote Optimum Physiologic Function and Reduce Risk for Complications

- Assist with resuscitation, as appropriate; monitor and report abnormalities of cardiovascular stability (e.g., vital signs; level of consciousness; skin color, temperature, moisture); immediately report abnormalities and provide prescribed treatment
- Assess **fall risk** caused by dizziness, fatigue, confusion, or syncope; maintain patient safety (i.e., airway, circulation, injury prevention)
- Administer prescribed medications, which can include
 - adenosine or diltiazem to terminate episodes of AVRT
 - procainamide to control ventricular rate and restore sinus rhythm in patients with AF
 - quinidine, propranolol, procainamide, amiodarone, metoprolol, or sotalol to prevent recurrence of dysrhythmias
- If radiofrequency catheter ablation or surgery is required, provide pre- and postprocedure education and supportive care
 - Verify completion of facility informed consent documents

–Assess patient and family member anxiety level and coping ability; provide emotional support and information to alleviate anxiety about the procedure

› **Provide Emotional Support and Educate**

- Discuss the challenge of living with a potentially life-threatening condition; assess for knowledge deficits related to the diagnosis; educate and encourage discussion about WPW etiology, potential complications, and treatment risks and benefits

Food for Thought

- › When patients with no history of heart disease present with a fast ventricular rate and fast, irregular QRS complexes, atrial fibrillation (AF) with WPW is the most likely diagnosis
- › Most persons with preexcitation will never experience an arrhythmia
- › Radiofrequency catheter ablation immediately reduces risk for AF

Red Flags

- › Potential complications of radiofrequency ablation include complete heart block, cardiac tamponade, cerebral or pulmonary embolism, and perforation
- › Digoxin and verapamil are usually **contraindicated** for patients with WPWS
- › AF and atrial flutter can resemble ventricular tachycardia (VT), except that they are irregular; VT is regular > 75% of the time

What Do I Need to Tell the Patient/Patient's Family?

- › Reassure patient and family members that WPWS is treatable
- › Educate about different arrhythmias and their effects, the necessity of notifying the primary care clinician or cardiologist if experiencing symptoms, further testing, and the risks and benefits of different treatment options
- › Educate about the prescribed drug regimen, including potential adverse effects
- › Educate when to activate the emergency response system (EMS); suggest that the patient carry a medical ID bracelet and a sample EKG reading of their heart in sinus rhythm and in WPW rhythm in the event of cardiac arrest

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