The Wolff-Parkinson-White (WPW) pattern is the well-defined electrocardiographic finding that demonstrates a shortened PR interval of less than 0.12 seconds and a delta wave with a slightly widened QRS complex that exhibits fusion. This ECG finding is the result of electrical conduction through an accessory pathway that circumvents the atrioventricular node. WPW pattern has an estimated prevalence of between 0.13% and 0.25% in the general population, although the actual prevalence is unknown. The WPW pattern on ECG may not be a permanent finding, and WPW pattern is asymptomatic by definition, which likely results in significant under-diagnosis of this finding. If a patient presents with cardiac symptoms relating to tachydysrhythmia and an ECG identifies WPW, the patient has WPW syndrome, which requires further evaluation and appropriate treatment—usually radiofrequency ablation of the bypass tract or tracts. This article presents the case of a first-class professional pilot who presented with WPW pattern identified incidentally, and reviews the aeromedical concerns and current practice consensus for special issuance.

### WPW Etiology

The Protein Kinase, AMP-activated, Gamma 2 non-catalytic subunit (PRKAG2) gene appears to play a significant role in the development of cardiac tissue. A missense mutation identified on the PRKAG2 gene is responsible for the inherited form of WPW, which is more frequently associated with WPW syndrome and other cardiac conduction diseases. This mutation, labeled Arg531Gly, substitutes glutamine for arginine at residue 302 on the gene at 7q34-q36. Because of this mutation, the adenosine monophosphate-activated protein kinase does not correctly regulate the ion channels in cardiac tissue.

This genetic anomaly is responsible for errant tracts of cardiac tissue that conduct electrical stimuli around the atrioventricular node, resulting in ventricular pre-excitation, and potentially provide a pathway for other abnormal electrical stimulus, including reentrant tachycardia. Not all cases of WPW syndrome or pattern demonstrate this genetic mutation, but it remains useful in characterizing one potential underlying mechanism for the disease process.

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**History**

A 35-year-old male professional pilot presented to his aviation medical examiner (AME) for his scheduled first-class aviation examination. He reported continued excellent physical and mental health, and denied any medical difficulties performing his aviation duties. He is a rated air transport pilot and instructor pilot with 3,050 total flying hours, including approximately 300 hours in the last six months.

As he was 35 years of age and applying for a first-class airman medical certificate, the Federal Aviation Administration (FAA) required a routine screening ECG to evaluate for cardiac abnormalities or evidence of significant coronary artery disease under Title 14 CFR 67.111(b). He denied taking any medications or supplements, and he denied any chronic medical conditions. The pilot specifically denied any cardiac symptoms, including palpitations, irregular or skipping heartbeats, chest pain, decreased exercise tolerance, or shortness of breath. He also denied any recent cardiac evaluations by his primary physician other than his annual physical. Figure 1 shows his ECG from March 2008.

![Figure 1. ECG from March 2008.](image)

This ECG demonstrated a shortened PR interval of 0.088 seconds, prolonged QRS complex of 0.132 seconds and fusion or delta waves in all leads consistent with Wolff-Parkinson-White pattern. As the patient denied ever having any cardiac symptoms, WPW pattern is the most appropriate diagnosis. According to the Guide for Aviation Examiners, all pre-excitation syndromes require further evaluation with the cardiovascular exam (CVE) protocol, maximal graded exercise stress test (GXT), and a 24-hour Holter monitor evaluation to allow for appropriate FAA decision-making.

**Aeromedical Concerns**

Wolff-Parkinson-White syndrome poses a risk of aberrant electrical flow such as sustained atrioventricular node reentrant tachycardia (AVNRT), atrial fibrillation or other dysrhythmia that may progress to fibrillation or sudden cardiac death (SCD). A previous study of aviators reported 15% of patients with WPW pattern developed new symptoms, including new tachydysrhythmias and one case of SCD in a patient with WPW syndrome over the study duration. The data demonstrate a 1% per patient-year risk of developing symptomatic tachycardia or dysrhythmia and 0.02% per patient-year risk of SCD. It remains critical to identify those aviators at increased risk for sudden cardiac death or incapacitation due to other underlying cardiac pathology so they may be appropriately risk-stratified prior to assuming aviation duties.
Outcome

The pilot in our case report completed a 24-hour Holter monitor, which demonstrated WPW pattern, as well as episodes of normal sinus rhythm with rare supraventricular ectopy and rare premature ventricular contractions. He completed a maximal graded exercise stress test following Bruce protocol for 12 minutes and 20 seconds without symptoms or aberrant conduction patterns on ECG. His Myoview™ imaging demonstrated no ischemia and an ejection fraction of 59%.

His echocardiogram was essentially normal with mild mitral regurgitation. His consulting cardiologist stated that his family and personal history, cardiovascular examination, and additional testing were essentially normal.

The FAA issued the pilot an unrestricted first-class medical certificate upon completion of his medical evaluation, one month after initial diagnosis of WPW pattern, as his evaluation placed him at very low risk for complications. The FAA warned the pilot of Title 14 of the Code of Federal Regulations Part 61.53, and the importance of notifying his AME should he develop any symptoms that may be cardiac-related so that he may receive an appropriate aeromedical disposition and further evaluation and treatment, if required.

The pilot acknowledged the reminder, and he continues to fly symptom-free without any complications. His ECG for 2012 is below and demonstrates a normalization of his PR interval at 0.142 seconds, normalization of the QRS complex, and an almost complete resolution of the delta wave. This ECG reinforces the intermittent nature of WPW pattern.6,9

Figure 2. Applicant’s 2012 ECG demonstrates a normalization of his PR interval at 0.142 seconds, normalization of the QRS complex, and an almost complete resolution of the delta wave.

References


About the Author

David C. Miller, DO, MPH, Major, MC, SFS, was a resident in aerospace medicine when he wrote this case report at the Civil Aerospace Medical Institute. Currently, he serves as the United States Air Force Chief of Physical Standards Development at the Defense Health Headquarters in Falls Church, Virginia.