Wolff-Parkinson-White syndrome

Description

Wolff-Parkinson-White syndrome is a condition characterized by abnormal electrical pathways in the heart that cause a disruption of the heart's normal rhythm (arrhythmia).

The heartbeat is controlled by electrical signals that move through the heart in a highly coordinated way. A specialized cluster of cells called the atrioventricular node conducts electrical impulses from the heart's upper chambers (the atria) to the lower chambers (the ventricles). Impulses move through the atrioventricular node during each heartbeat, stimulating the ventricles to contract slightly later than the atria.

People with Wolff-Parkinson-White syndrome are born with an extra connection in the heart, called an accessory pathway, that allows electrical signals to bypass the atrioventricular node and move from the atria to the ventricles faster than usual. The accessory pathway may also transmit electrical impulses abnormally from the ventricles back to the atria. This extra connection can disrupt the coordinated movement of electrical signals through the heart, leading to an abnormally fast heartbeat (tachycardia) and other changes in heart rhythm. Resulting symptoms include dizziness, a sensation of fluttering or pounding in the chest (palpitations), shortness of breath, and fainting (syncope). In rare cases, arrhythmias associated with Wolff-Parkinson-White syndrome can lead to cardiac arrest and sudden death. The most common arrhythmia associated with Wolff-Parkinson-White syndrome is called paroxysmal supraventricular tachycardia.

Complications of Wolff-Parkinson-White syndrome can occur at any age, although some individuals born with an accessory pathway in the heart never experience any health problems associated with the condition.

Wolff-Parkinson-White syndrome often occurs with other structural abnormalities of the heart or underlying heart disease. The most common heart defect associated with the condition is Ebstein anomaly, which affects the valve that allows blood to flow from the right atrium to the right ventricle (the tricuspid valve). Additionally, the heart rhythm problems associated with Wolff-Parkinson-White syndrome can be a component of several other genetic syndromes, including hypokalemic periodic paralysis (a condition that causes episodes of extreme muscle weakness), Pompe disease (a disorder characterized by the storage of excess glycogen), Danon disease (a condition that weakens the heart and skeletal muscles and causes intellectual disability), and tuberous sclerosis complex (a condition that results in the growth of noncancerous tumors in

many parts of the body).

Frequency

Wolff-Parkinson-White syndrome affects 1 to 3 in 1,000 people worldwide.

Wolff-Parkinson-White syndrome is a common cause of an arrhythmia known as paroxysmal supraventricular tachycardia. Wolff-Parkinson-White syndrome is the most frequent cause of this abnormal heart rhythm in the Chinese population, where it is responsible for more than 70 percent of cases.

Causes

In most cases, the cause of Wolff-Parkinson-White syndrome is unknown. A small percentage of all cases are caused by variants (also known as mutations) in the *PRKAG2* gene. Some people with these variants also have features of hypertrophic cardiomyopathy, a form of heart disease that enlarges and weakens the heart (cardiac) muscle. The *PRKAG2* gene provides instructions for making a protein that is part of an enzyme called AMP-activated protein kinase (AMPK). This enzyme helps sense and respond to energy demands within cells. It is likely involved in the development of the heart before birth, although its role in this process is unclear.

Researchers are uncertain how *PRKAG2* gene variants lead to the development of Wolff-Parkinson-White syndrome and related heart abnormalities. Research suggests that these variants alter the activity of AMP-activated protein kinase in the heart, although it is unclear whether the genetic changes overactivate the enzyme or reduce its activity. Studies indicate that changes in AMP-activated protein kinase activity allow a complex sugar called glycogen to build up abnormally within cardiac muscle cells. Other studies have found that altered AMP-activated protein kinase activity is related to changes in the regulation of certain ion channels in the heart. These channels, which transport positively charged atoms (ions) into and out of cardiac muscle cells, play critical roles in maintaining the heart's normal rhythm.

Learn more about the gene associated with Wolff-Parkinson-White syndrome

- PRKAG2

Inheritance

Most cases of Wolff-Parkinson-White syndrome occur in people with no apparent family history of the condition. These cases are described as sporadic and are not inherited.

Familial Wolff-Parkinson-White syndrome accounts for only a small percentage of all cases of this condition. The familial form of the disorder typically has an autosomal dominant pattern of inheritance, which means one copy of the altered gene in each cell is sufficient to cause the condition. In most cases, a person with familial Wolff-Parkinson-White syndrome has inherited the condition from an affected parent.

Other Names for This Condition

- Ventricular pre-excitation with arrhythmia
- WPW Syndrome

Additional Information & Resources

Genetic Testing Information

- Genetic Testing Registry: Wolff-Parkinson-White pattern (https://www.ncbi.nlm.nih.gov/gtr/conditions/C0043202/)

Genetic and Rare Diseases Information Center

- Wolff-Parkinson-White syndrome (https://rarediseases.info.nih.gov/diseases/7897/index)

Patient Support and Advocacy Resources

- National Organization for Rare Disorders (NORD) (https://rarediseases.org/)

Clinical Trials

- ClinicalTrials.gov (https://clinicaltrials.gov/search?cond=%22Wolff-Parkinson-White syndrome%22)

Catalog of Genes and Diseases from OMIM

- WOLFF-PARKINSON-WHITE SYNDROME; WPW (https://omim.org/entry/194200)

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28Wolff-Parkinson-White+Syndrome%5BMAJR%5D%29+AND+%28Wolff-Parkinson-White+syndrome%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+720+days%22%5Bdp%5D)

References

- Al-Khatib SM, Pritchett EL. Clinical features of Wolff-Parkinson-Whitesyndrome. Am Heart J. 1999 Sep;138(3 Pt 1):403-13. doi:10.1016/s0002-8703(99)70140-7. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/10467188)

- Benson DW, Cohen MI. Wolff-Parkinson-White syndrome: lessons learnt andlessons remaining. Cardiol Young. 2017 Jan;27(S1):S62-S67. doi:10.1017/S1047951116002250. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/28084962)
- Gollob MH, Green MS, Tang AS, Gollob T, Karibe A, Ali Hassan AS, Ahmad F, Lozado R, Shah G, Fananapazir L, Bachinski LL, Roberts R. Identification of agene responsible for familial Wolff-Parkinson-White syndrome. N Engl J Med. 2001Jun 14; 344(24):1823-31. doi: 10.1056/NEJM200106143442403. Erratum In: N Engl JMed 2001 Aug 16;345(7):552. Hassan AS [corrected to Ali Hassan AS]. N Engl J Med2002 Jan 24;346(4):300. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/11407343)
- Light PE. Familial Wolff-Parkinson-White Syndrome: a disease of glycogenstorage or ion channel dysfunction? J Cardiovasc Electrophysiol. 2006 May;17Suppl 1:S158-S161. doi: 10.1111/j.1540-8167.2006.00399.x. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16686673)
- Pediatric and Congenital Electrophysiology Society (PACES); Heart RhythmSociety (HRS); American College of Cardiology Foundation (ACCF); American HeartAssociation (AHA); American Academy of Pediatrics (AAP); Canadian Heart RhythmSociety (CHRS); Cohen MI, Triedman JK, Cannon BC, Davis AM, Drago F, Janousek J,Klein GJ, Law IH, Morady FJ, Paul T, Perry JC, Sanatani S, Tanel RE. PACES/HRSexpert consensus statement on the management of the asymptomatic young patientwith a Wolff-Parkinson-White (WPW, ventricular preexcitation) electrocardiographic pattern: developed in partnership between the Pediatric andCongenital Electrophysiology Society (PACES) and the Heart Rhythm Society (HRS).Endorsed by the governing bodies of PACES, HRS, the American College ofCardiology Foundation (ACCF), the American Heart Association (AHA), the AmericanAcademy of Pediatrics (AAP), and the Canadian Heart Rhythm Society (CHRS). HeartRhythm. 2012 Jun;9(6):1006-24. doi: 10.1016/j.hrthm.2012.03.050. Epub 2012 May10. No abstract available. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/22579340)
- Valderrama AL. Wolff-Parkinson-White syndrome: essentials for the primary carenurse practitioner. J Am Acad Nurse Pract. 2004 Sep;16(9):378-83. doi:10.1111/j.1745-7599.2004.tb00387.x. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/15495691)

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