Progressive familial heart block

Progressive familial heart block is a genetic condition that alters the normal beating of the heart. A normal heartbeat is controlled by electrical signals that move through the heart in a highly coordinated way. These signals begin in a specialized cluster of cells called the sinoatrial node (the heart's natural pacemaker) located in the heart's upper chambers (the atria). From there, a group of cells called the atroventricular node carries the electrical signals to another cluster of cells called the bundle of His. This bundle separates into multiple thin spindles called bundle branches, which carry electrical signals into the heart's lower chambers (the ventricles). Electrical impulses move from the sinoatrial node down to the bundle branches, stimulating a normal heartbeat in which the ventricles contract slightly later than the atria.

Heart block occurs when the electrical signaling is obstructed anywhere from the atria to the ventricles. In people with progressive familial heart block, the condition worsens over time: early in the disorder, the electrical signals are partially blocked, but the block eventually becomes complete, preventing any signals from passing through the heart. Partial heart block causes a slow or irregular heartbeat (bradycardia or arrhythmia, respectively), and can lead to the buildup of scar tissue (fibrosis) in the cells that carry electrical impulses. Fibrosis contributes to the development of complete heart block, resulting in uncoordinated electrical signaling between the atria and the ventricles and inefficient pumping of blood in the heart. Complete heart block can cause a sensation of fluttering or pounding in the chest (palpitations), shortness of breath, fainting (syncope), or sudden cardiac arrest and death.

Progressive familial heart block can be divided into type I and type II, with type I being further divided into types IA and IB. These types differ in where in the heart signaling is interrupted and the genetic cause. In types IA and IB, the heart block originates in the bundle branch, and in type II, the heart block originates in the atroventricular node. The different types of progressive familial heart block have similar signs and symptoms.

Most cases of heart block are not genetic and are not considered progressive familial heart block. The most common cause of heart block is fibrosis of the heart, which occurs as a normal process of aging. Other causes of heart block can include the use of certain medications or an infection of the heart tissue.

Frequency

The prevalence of progressive familial heart block is unknown. In the United States, about 1 in 5,000 individuals have complete heart block from any cause; worldwide, about 1 in 2,500 individuals have complete heart block.
Causes

Mutations in the SCN5A and TRPM4 genes cause most cases of progressive familial heart block types IA and IB, respectively. The proteins produced from these genes are channels that allow positively charged atoms (cations) into and out of cells. Both channels are abundant in heart (cardiac) cells and play key roles in these cells’ ability to generate and transmit electrical signals. These channels play a major role in signaling the start of each heartbeat, coordinating the contractions of the atria and ventricles, and maintaining a normal heart rhythm.

The SCN5A and TRPM4 gene mutations that cause progressive familial heart block alter the normal function of the channels. As a result of these channel alterations, cardiac cells have difficulty producing and transmitting the electrical signals that are necessary to coordinate normal heartbeats, leading to heart block. Death of these impaired cardiac cells over time can lead to fibrosis, worsening the heart block.

Mutations in other genes, some of which are unknown, account for the remaining cases of progressive familial heart block.

Inheritance Pattern

Progressive familial heart block types I and II are inherited in an autosomal dominant pattern, which means one copy of an altered gene in each cell is sufficient to cause the disorder. Some people with TRPM4 gene mutations never develop the condition, a situation known as reduced penetrance.

In most cases, an affected person has one parent with progressive familial heart block.

Other Names for This Condition

- bundle branch block
- HBBD
- hereditary bundle branch defect
- hereditary bundle branch system defect
- Lenegre Lev disease
- Lev-Lenègre disease
- Lev syndrome
- Lev's disease
- PCCD
- progressive cardiac conduction defect
Diagnosis & Management

Genetic Testing Information

- What is genetic testing?
  /primer/testing/genetictesting

- Genetic Testing Registry: Progressive familial heart block type 1A

- Genetic Testing Registry: Progressive familial heart block type 1B

- Genetic Testing Registry: Progressive familial heart block type 2

Research Studies from ClinicalTrials.gov

- ClinicalTrials.gov
  https://clinicaltrials.gov/ct2/results?cond=%22progressive+familial+heart+block%22+OR+%22Heart+Block%22+OR+%22bundle+branch+block%22

Other Diagnosis and Management Resources

- American Heart Association: Common Tests for Arrhythmia

- MedlinePlus Health Topic: Pacemakers and Implantable Defibrillators
  https://medlineplus.gov/pacemakersandimplantabledefibrillators.html

- National Heart, Lung, and Blood Institute: How Does a Pacemaker Work?
  https://www.nhlbi.nih.gov/health-topics/pacemakers

- National Heart, Lung, and Blood Institute: Sudden Cardiac Arrest Diagnosis
  https://www.nhlbi.nih.gov/health-topics/sudden-cardiac-arrest#Diagnosis

Additional Information & Resources

Health Information from MedlinePlus

- Health Topic: Arrhythmia
  https://medlineplus.gov/arrhythmia.html

- Health Topic: Cardiac Arrest
  https://medlineplus.gov/cardiacarrest.html

- Health Topic: Fainting
  https://medlineplus.gov/fainting.html

- Health Topic: Pacemakers and Implantable Defibrillators
  https://medlineplus.gov/pacemakersandimplantabledefibrillators.html
Genetic and Rare Diseases Information Center

- Familial progressive cardiac conduction defect

Additional NIH Resources

- National Heart, Lung, and Blood Institute: What is Heart Block?
  https://www.nhlbi.nih.gov/health-topics/heart-block

Educational Resources

- American College of Cardiology: Heart Block
  https://www.cardiosmart.org/Healthwise/te71/44ab/c/te7144abc

- American Heart Association: About Arrhythmia
  https://www.heart.org/en/health-topics/arrhythmia/about-arrhythmia

- American Heart Association: Syncope (Fainting)

- Heart Rhythm Society: Heart Block
  https://www.hrsonline.org/heart-block

- MalaCards: progressive familial heart block, type ib
  https://www.malacards.org/card/progressive_familial_heart_block_type_ib

- MalaCards: progressive familial heart block, type ii
  https://www.malacards.org/card/progressive_familial_heart_block_type_ii

- Merck Manual Consumer Version: Heart Block

- National Health Service (UK): Heart Block
  https://www.nhs.uk/conditions/heart-block/

- Orphanet: Familial progressive cardiac conduction defect
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=871

- TeensHealth from Nemours: Arrhythmias

- Texas Heart Institute: Bundle Branch Block
  https://www.texasheart.org/heart-health/heart-information-center/topics/bundle-branch-block/
Patient Support and Advocacy Resources

- American Heart Association
  https://www.heart.org/en/
- National Organization for Rare Disorders (NORD): Congenital Heart Block
  https://rarediseases.org/rare-diseases/heart-block-congenital/
- Sudden Cardiac Arrest Foundation
  https://www.sca-aware.org/

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28progressive+familial+heart+block%5BTIAB%5D%29+OR+%28hereditary+bundle+branch+defect%5BTIAB%5D%29+OR+%28progressive+cardiac+conduction+defect%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- PROGRESSIVE FAMILIAL HEART BLOCK, TYPE IA
  http://omim.org/entry/113900
- PROGRESSIVE FAMILIAL HEART BLOCK, TYPE IB
  http://omim.org/entry/604559
- PROGRESSIVE FAMILIAL HEART BLOCK, TYPE II
  http://omim.org/entry/140400

Sources for This Summary

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Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services