Jervell and Lange-Nielsen syndrome

Description

Jervell and Lange-Nielsen syndrome is a condition that causes profound hearing loss from birth and a disruption of the heart's normal rhythm (arrhythmia). This disorder is a form of long QT syndrome, which is a heart condition that causes the heart (cardiac) muscle to take longer than usual to recharge between beats. Beginning in early childhood, the irregular heartbeats increase the risk of fainting (syncope) and sudden death.

Frequency

Jervell and Lange-Nielsen syndrome is uncommon; it affects an estimated 1.6 to 6 per 1 million people worldwide. This condition has a higher prevalence in Denmark, Sweden, and Norway, where it affects at least 1 in 200,000 people.

Causes

Jervell and Lange-Nielsen syndrome is caused by mutations in the *KCNE1* and *KCNQ1* genes. These genes provide instructions for making proteins that work together to form a channel across cell membranes. These channels transport positively charged potassium atoms (ions) out of cells. The movement of potassium ions through these channels is critical for maintaining the normal functions of inner ear structures and cardiac muscle.

About 90 percent of cases of Jervell and Lange-Nielsen syndrome are caused by mutations in the *KCNQ1* gene; *KCNE1* mutations are responsible for the remaining cases. Mutations in these genes alter the usual structure and function of potassium channels or prevent the assembly of normal channels. These changes disrupt the flow of potassium ions in the inner ear and in cardiac muscle, leading to hearing loss and an irregular heart rhythm characteristic of Jervell and Lange-Nielsen syndrome.

Learn more about the genes associated with Jervell and Lange-Nielsen syndrome

- KCNE1
- KCNQ1

Inheritance

This condition is inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. Most often, the parents of a child with an autosomal recessive disorder are not affected but are carriers of one copy of the mutated gene. Some carriers of a *KCNQ1* or *KCNE1* mutation have a long QT interval with related heart abnormalities, but their hearing is normal.

Other Names for This Condition

- Autosomal recessive long QT syndrome (LQTS)
- Cardio-auditory-syncope syndrome
- Cardioauditory syndrome of Jervell and Lange-Nielsen
- Deafness, congenital, and functional heart disease
- Jervell-Lange Nielsen syndrome
- JLNS
- Prolonged QT interval in EKG and sudden death
- Surdo-cardiac syndrome

Additional Information & Resources

Genetic Testing Information

- Genetic Testing Registry: Jervell and Lange-Nielsen syndrome (https://www.ncbi.nlm.nih.gov/gtr/conditions/C0022387/)
- Genetic Testing Registry: Jervell and Lange-Nielsen syndrome 1 (https://www.ncbi.nlm.nih.gov/gtr/conditions/C4551509/)
- Genetic Testing Registry: Jervell and Lange-Nielsen syndrome 2 (https://www.ncbi.nlm.nih.gov/gtr/conditions/C2676723/)

Genetic and Rare Diseases Information Center

- Jervell and Lange-Nielsen syndrome (https://rarediseases.info.nih.gov/diseases/3048/index)

Patient Support and Advocacy Resources

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

Clinical Trials

- ClinicalTrials.gov (https://clinicaltrials.gov/search?cond=%22Jervell and Lange-Niel

sen syndrome%22)

Catalog of Genes and Diseases from OMIM

- JERVELL AND LANGE-NIELSEN SYNDROME 1; JLNS1 (https://omim.org/entry/220400)
- JERVELL AND LANGE-NIELSEN SYNDROME 2; JLNS2 (https://omim.org/entry/612347)

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28Jervell-Lange+Nielsen+Syndrome%5BMAJR%5D%29+OR+%28%28Jervell%5BTIAB%5D%29+AND+%28Lange-Nielsen%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D)

References

- Mizusawa Y, Horie M, Wilde AA. Genetic and clinical advances in congenitallong QT syndrome. Circ J. 2014;78(12):2827-33. doi: 10.1253/circj.cj-14-0905.Epub 2014 Oct 1. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/25274057)
- Modell SM, Lehmann MH. The long QT syndrome family of cardiac ionchannelopathies: a HuGE review. Genet Med. 2006 Mar;8(3):143-55. doi:10.1097/01.gim.0000204468.85308.86. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16540748)
- Nakano Y, Shimizu W. Genetics of long-QT syndrome. J Hum Genet. 2016Jan;61(1):51-5. doi: 10.1038/jhg.2015.74. Epub 2015 Jun 25. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/26108145)
- Priori SG, Wilde AA, Horie M, Cho Y, Behr ER, Berul C, Blom N, Brugada J,Chiang CE, Huikuri H, Kannankeril P, Krahn A, Leenhardt A, Moss A, Schwartz PJ,Shimizu W, Tomaselli G, Tracy C. HRS/EHRA/APHRS expert consensus statement on thediagnosis and management of patients with inherited primary arrhythmia syndromes:document endorsed by HRS, EHRA, and APHRS in May 2013 and by ACCF, AHA, PACES,and AEPC in June 2013. Heart Rhythm. 2013 Dec;10(12):1932-63. doi:10.1016/j.hrthm.2013.05.014. Epub 2013 Aug 30. No abstract available. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/24011539)
- Schwartz PJ, Crotti L. QTc behavior during exercise and genetic testing forthe long-QT syndrome. Circulation. 2011 Nov 15;124(20):2181-4. doi:10.1161/CIRCULATIONAHA.111.062182. No abstract available. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/22083145)
- Schwartz PJ, Spazzolini C, Crotti L, Bathen J, Amlie JP, Timothy K,Shkolnikova M, Berul CI, Bitner-Glindzicz M, Toivonen L, Horie M, Schulze-Bahr E,Denjoy I. The Jervell and Lange-Nielsen syndrome: natural history, molecularbasis, and clinical

outcome. Circulation. 2006 Feb 14;113(6):783-90. doi:10.1161/CIRCULATIONAHA.105.592899. Epub 2006 Feb 6. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16461811)

- Tranebjaerg L, Samson RA, Green GE. Jervell and Lange-Nielsen Syndrome. 2002Jul 29 [updated 2017 Aug 17]. In: Adam MP, Feldman J, Mirzaa GM, Pagon RA, Wallace SE, Bean LJH, Gripp KW, Amemiya A, editors. GeneReviews(R)[Internet]. Seattle (WA): University of Washington, Seattle; 1993-2024. Availablefrom http://www.ncbi.nlm.nih.gov/books/NBK1405/ Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/20301579)
- Wang Z, Li H, Moss AJ, Robinson J, Zareba W, Knilans T, Bowles NE, Towbin JA. Compound heterozygous mutations in KvLQT1 cause Jervell and Lange-Nielsensyndrome. Mol Genet Metab. 2002 Apr;75(4):308-16. doi:10.1016/S1096-7192(02)00007-0. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/12051962)

Last updated September 1, 2017