Jervell and Lange-Nielsen syndrome

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.

Genetic Changes

Jervell and Lange-Nielsen syndrome is caused by mutations in the \textit{KCNE1} and \textit{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 \textit{KCNQ1} gene; \textit{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.

Inheritance Pattern

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 \textit{KCNQ1} or \textit{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

**Diagnosis & Management**

**Formal Diagnostic Criteria**

- ACT Sheet: Congenital hearing loss >~30db
  https://www.ncbi.nlm.nih.gov/books/NBK55827/bin/Hearing_Loss.pdf

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/24011539

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/22083145

**Formal Treatment/Management Guidelines**

- Orphanet: Anaesthesia Recommendations for Patients Suffering from Long QT Syndrome
  https://www.orpha.net/data/patho/Pro/en/Long_QT_EN.pdf

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/24011539
Genetic Testing

• Genetic Testing Registry: Jervell and Lange-Nielsen syndrome

• Genetic Testing Registry: Jervell and Lange-Nielsen syndrome 1

• Genetic Testing Registry: Jervell and Lange-Nielsen syndrome 2

Other Diagnosis and Management Resources

• GeneReview: Jervell and Lange-Nielsen Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK1405

General Information from MedlinePlus

• Diagnostic Tests
  https://medlineplus.gov/diagnostictests.html

• Drug Therapy
  https://medlineplus.gov/drugtherapy.html

• Genetic Counseling
  https://medlineplus.gov/geneticcounseling.html

• Palliative Care
  https://medlineplus.gov/palliativecare.html

• Surgery and Rehabilitation
  https://medlineplus.gov/surgeryandrehabilitation.html

Additional Information & Resources

MedlinePlus

• Encyclopedia: Arrhythmias
  https://medlineplus.gov/ency/article/001101.htm

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

• Health Topic: Congenital Heart Defects
  https://medlineplus.gov/congenitalheartdefects.html

• Health Topic: Hearing Disorders and Deafness
  https://medlineplus.gov/hearingdisordersanddeafness.html
Genetic and Rare Diseases Information Center

- Jervell and Lange-Nielsen syndrome 2

- Jervell Lange-Nielsen syndrome

Additional NIH Resources

- National Heart, Lung, and Blood Institute: What is Long QT syndrome?
  https://www.nhlbi.nih.gov/health-topics/long-qt-syndrome

Educational Resources

- American Heart Association: Types of Arrhythmia in Children
  http://www.heart.org/HEARTORG/Conditions/Arrhythmia/AboutArrhythmia/Types-of-Arrhythmia-in-Children_UCM_302023_Article.jsp

- Centre for Genetics Education (Australia): Primary Arrhythmogenic Disorders

- Disease InfoSearch: Jervell and Lange-Nielsen syndrome 2

- Disease InfoSearch: Jervell Lange-Nielsen syndrome
  http://www.diseaseinfosearch.org/Jervell+Lange-Nielsen+syndrome/3904

- KidsHealth from the Nemours Foundation: Arrhythmias

- MalaCards: jervell and lange-nielsen syndrome 2
  http://www.malacards.org/card/jervell_and_lange_nielsen_syndrome_2


- Orphanet: Familial long QT syndrome
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=768

- Orphanet: Jervell and Lange-Nielsen syndrome
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=90647
Patient Support and Advocacy Resources

• Centre for Genetics Education (Australia): Primary Arrhythmogenic Disorders
  primary-arrhythmogenic-disorders

• National Association of the Deaf
  https://www.nad.org/

• National Organization for Rare Disorders (NORD)

• Resource List from the University of Kansas Medical Center: Heart/Cardiology
  Conditions
  http://www.kumc.edu/gec/support/conghart.html

• Sudden Arrhythmia Death Syndromes (SADS) Foundation: Long QT Syndrome
  https://www.sads.org/What-is-SADS/Long-QT-Syndrome#.Vds7xZdGdD8

GeneReviews

• Jervell and Lange-Nielsen Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK1405

ClinicalTrials.gov

• ClinicalTrials.gov
  OR+%22Long+QT+Syndrome%22

Scientific Articles on PubMed

• PubMed
  OR+%28Jervell%5BTIAB%5D+and+Lange-Nielsen%5BTIAB%5D%29+AND+english%5Bla%
  ndrome%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

OMIM

• JERVELL AND LANGE-NIELSEN SYNDROME 1
  http://omim.org/entry/220400

• JERVELL AND LANGE-NIELSEN SYNDROME 2
  http://omim.org/entry/612347
MedGen

- Jervell and Lange-Nielsen syndrome
- Jervell and Lange-Nielsen syndrome 1
- Jervell and Lange-Nielsen syndrome 2

Sources for This Summary

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