Ellis-van Creveld syndrome

Ellis-van Creveld syndrome is an inherited disorder of bone growth that results in very short stature (dwarfism). People with this condition have particularly short forearms and lower legs and a narrow chest with short ribs. Ellis-van Creveld syndrome is also characterized by the presence of extra fingers and toes (polydactyly), malformed fingernails and toenails, and dental abnormalities. More than half of affected individuals are born with a heart defect, which can cause serious or life-threatening health problems.

The features of Ellis-van Creveld syndrome overlap with those of another, milder condition called Weyers acrofacial dysostosis. Like Ellis-van Creveld syndrome, Weyers acrofacial dysostosis involves tooth and nail abnormalities, although affected individuals have less pronounced short stature and typically do not have heart defects. The two conditions are caused by mutations in the same genes.

Frequency

In most parts of the world, Ellis-van Creveld syndrome occurs in 1 in 60,000 to 200,000 newborns. It is difficult to estimate the exact prevalence because the disorder is very rare in the general population. This condition is much more common in the Old Order Amish population of Lancaster County, Pennsylvania, and in the indigenous (native) population of Western Australia.

Causes

Ellis-van Creveld syndrome can be caused by mutations in the \textit{EVC} or \textit{EVC2} gene. Little is known about the function of these genes, although they appear to play important roles in cell-to-cell signaling during development. In particular, the proteins produced from the \textit{EVC} and \textit{EVC2} genes are thought to help regulate the Sonic Hedgehog signaling pathway. This pathway plays roles in cell growth, cell specialization, and the normal shaping (patterning) of many parts of the body.

The mutations that cause Ellis-van Creveld syndrome result in the production of an abnormally small, nonfunctional version of the EVC or EVC2 protein. It is unclear how the defective proteins lead to the specific signs and symptoms of this condition. Studies suggest that they prevent normal Sonic Hedgehog signaling in the developing embryo, disrupting the formation and growth of the bones, teeth, and other parts of the body.

Together, mutations in the \textit{EVC} and \textit{EVC2} genes account for more than half of all cases of Ellis-van Creveld syndrome. The cause of the remaining cases is unknown.
Inheritance Pattern
This condition is inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

Other Names for This Condition
• chondroectodermal dysplasia
• Ellis-van Creveld dysplasia

Diagnosis & Management
Genetic Testing Information
• What is genetic testing? /primer/testing/genetictesting

Research Studies from ClinicalTrials.gov
• ClinicalTrials.gov https://clinicaltrials.gov/ct2/results?cond=%22Ellis-van+Creveld+syndrome%22

Other Diagnosis and Management Resources
• MedlinePlus Encyclopedia: Congenital Heart Disease https://medlineplus.gov/ency/article/001114.htm

Additional Information & Resources
Health Information from MedlinePlus
• Encyclopedia: Congenital Heart Disease https://medlineplus.gov/ency/article/001114.htm
• Encyclopedia: Ellis-van Creveld Syndrome https://medlineplus.gov/ency/article/001667.htm
• Encyclopedia: Polydactyly https://medlineplus.gov/ency/article/003176.htm
• Health Topic: Dwarfism https://medlineplus.gov/dwarfism.html
Genetic and Rare Diseases Information Center

- Ellis-Van Creveld syndrome

Educational Resources

- MalaCards: ellis-van creveld syndrome
  https://www.malacards.org/card/ellis_van_creveld_syndrome

- Nemours Children's Health System
  https://www.nemours.org/services/skeletal-dysplasia/ellisvancreveld.html?
tab=about

- Orphanet: Ellis Van Creveld syndrome
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=289

Patient Support and Advocacy Resources

- American Heart Association
  https://www.heart.org/en/health-topics/congenital-heart-defects

- Human Growth Foundation
  https://www.hgfound.org/

- International Skeletal Dysplasia Registry, UCLA
  https://www.uclahealth.org/ortho/isdr

- Little People of America
  https://www.lpaonline.org/

- Little People UK
  https://littlepeopleuk.org/

- National Organization for Rare Disorders (NORD)
  https://rarediseases.org/rare-diseases/ellis-van-creveld-syndrome/

- Resource list from the University of Kansas Medical Center: Dwarfism / Short Stature
  http://www.kumc.edu/gec/support/skeldysp.html

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Ellis-Van+Creveld+Syndrome%5BMAJR%5D%29+AND+%28Ellis-van+Creveld+syndrome%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- ELLIS-VAN CREVELD SYNDROME
  http://omim.org/entry/225500
Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17547743  
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1891277/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12468274

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