Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy

Cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy, usually called CADASIL, is an inherited condition that causes stroke and other impairments. This condition affects blood flow in small blood vessels, particularly cerebral vessels within the brain. The muscle cells surrounding these blood vessels (vascular smooth muscle cells) are abnormal and gradually die. In the brain, the resulting blood vessel damage (arteriopathy) can cause migraines, often with visual sensations or auras, or recurrent seizures (epilepsy).

Damaged blood vessels reduce blood flow and can cause areas of tissue death (infarcts) throughout the body. An infarct in the brain can lead to a stroke. In individuals with CADASIL, a stroke can occur at any time from childhood to late adulthood, but typically happens during mid-adulthood. People with CADASIL often have more than one stroke in their lifetime. Recurrent strokes can damage the brain over time. Strokes that occur in the subcortical region of the brain, which is involved in reasoning and memory, can cause progressive loss of intellectual function (dementia) and changes in mood and personality.

Many people with CADASIL also develop leukoencephalopathy, which is a change in a type of brain tissue called white matter that can be seen with magnetic resonance imaging (MRI).

The age at which the signs and symptoms of CADASIL first begin varies greatly among affected individuals, as does the severity of these features.

CADASIL is not associated with the common risk factors for stroke and heart attack, such as high blood pressure and high cholesterol, although some affected individuals might also have these health problems.

Frequency

CADASIL is likely a rare condition; however, its prevalence is unknown.

Causes

Mutations in the NOTCH3 gene cause CADASIL. The NOTCH3 gene provides instructions for producing the Notch3 receptor protein, which is important for the normal function and survival of vascular smooth muscle cells. When certain molecules attach (bind) to Notch3 receptors, the receptors send signals to the nucleus of the cell. These signals then turn on (activate) particular genes within vascular smooth muscle cells.
\textit{NOTCH3} gene mutations lead to the production of an abnormal Notch3 receptor protein that impairs the function and survival of vascular smooth muscle cells. Disruption of Notch3 functioning can lead to the self-destruction (apoptosis) of these cells. In the brain, the loss of vascular smooth muscle cells results in blood vessel damage that can cause the signs and symptoms of CADASIL.

\textbf{Inheritance Pattern}

This condition is inherited in an autosomal dominant pattern, which means one copy of the altered \textit{NOTCH3} gene in each cell is sufficient to cause the disorder.

In most cases, an affected person inherits the mutation from one affected parent. A few rare cases may result from new mutations in the \textit{NOTCH3} gene. These cases occur in people with no history of the disorder in their family.

\textbf{Other Names for This Condition}

- CADASIL
- cerebral arteriopathy with subcortical infarcts and leukoencephalopathy
- familial vascular leukoencephalopathy
- hereditary dementia, multi-infarct type

\textbf{Diagnosis & Management}

\textbf{Genetic Testing Information}

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

\textbf{Research Studies from ClinicalTrials.gov}

- ClinicalTrials.gov https://clinicaltrials.gov/ct2/results?cond=%22cadasil%22

\textbf{Other Diagnosis and Management Resources}

- Butler Hospital: Treatment of CADASIL http://www.butler.org/memory/cadasil/treatment.cfm
Additional Information & Resources

Health Information from MedlinePlus

• Encyclopedia: Multi-Infarct Dementia
  https://medlineplus.gov/ency/article/000746.htm

• Health Topic: Dementia
  https://medlineplus.gov/dementia.html

• Health Topic: Stroke
  https://medlineplus.gov/stroke.html

Genetic and Rare Diseases Information Center

• CADASIL
  https://rarediseases.info.nih.gov/diseases/1049/cadasil

Additional NIH Resources

• National Institute of Neurological Disorders and Stroke: CADASIL Information Page
  https://www.ninds.nih.gov/Disorders/All-Disorders/Cadasil-Information-Page

• National Institute of Neurological Disorders and Stroke: Stroke: Hope Through Research

Educational Resources

• Orphanet: CADASIL
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=136

Patient Support and Advocacy Resources

• American Stroke Association
  http://www.strokeassociation.org/index_stroke.html

• CADASIL Together We Have Hope
  http://www.cadasilfoundation.org/

• Cure CADASIL
  https://curecadasil.org/

• United Leukodystrophy Foundation

Clinical Information from GeneReviews

• CADASIL
  https://www.ncbi.nlm.nih.gov/books/NBK1500
Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28Dementia,+Multi-Infarct%5B
  MAJR%5D%29+OR+%28CADASIL%5BMAJR%5D%29%29+AND+%28CADASIL
  %5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+
  %22last+720+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- CEREBRAL ARTERIOPATHY, AUTOSOMAL DOMINANT, WITH SUBCORTICAL
  INFARCTS AND LEUKOENCEPHALOPATHY, TYPE 1
  http://omim.org/entry/125310

Medical Genetics Database from MedGen

- Cerebral autosomal dominant arteriopathy with subcortical infarcts and
  leukoencephalopathy

Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16421118
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2077584/

- Dichgans M. Cerebral autosomal dominant arteriopathy with subcortical infarcts and
  leukoencephalopathy: phenotypic and mutational spectrum. J Neurol Sci. 2002 Nov 15;203-204:
  77-80. Review.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12417361

- Haritunians T, Boulter J, Hicks C, Buhrman J, DiSibio G, Shawber C, Weinmaster G, Nofziger D,
  Schanen C. CADASIL Notch3 mutant proteins localize to the cell surface and bind ligand. Circ Res.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/11909813
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3690627/

  V, Cécillion M, Marechal E, Maciazek J, Vayssiere C, Cruaud C, Cabanis EA, Ruchoux MM,
  Weissenbach J, Bach JF, Bousser MG, Tournier-Lasserve E. Notch3 mutations in CADASIL, a
  707-10.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/8878478

- Kalaria RN, Viitanen M, Kalimo H, Dichgans M, Tabira T; CADASIL Group of Vas-Cog. The
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15537516

- Louvi A, Arboleda-Velasquez JF, Artavanis-Tsakonas S. CADASIL: a critical look at a Notch
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16508299
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15364702

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17218610

Reprinted from Genetics Home Reference:

Reviewed: May 2013
Published: September 18, 2018

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