Familial porencephaly

Familial porencephaly is part of a group of conditions called the \textit{COL4A1}-related disorders. The conditions in this group have a range of signs and symptoms that involve fragile blood vessels. In familial porencephaly, fluid-filled cysts develop in the brain (porencephaly) during fetal development or soon after birth. These cysts typically occur in only one side of the brain and vary in size. The cysts are thought to be the result of bleeding within the brain (hemorrhagic stroke). People with this condition also have leukoencephalopathy, which is a change in a type of brain tissue called white matter that can be seen with magnetic resonance imaging (MRI).

During infancy, people with familial porencephaly typically have paralysis affecting one side of the body (infantile hemiplegia). Affected individuals may also have recurrent seizures (epilepsy), migraine headaches, speech problems, intellectual disability, and uncontrolled muscle tensing (dystonia). Some people are severely affected, and others may have no symptoms related to the brain cysts.

Frequency

Familial porencephaly is a rare condition, although the exact prevalence is unknown. At least eight affected families have been described in the scientific literature.

Causes

Mutations in the \textit{COL4A1} gene cause familial porencephaly. The \textit{COL4A1} gene provides instructions for making one component of a protein called type IV collagen. Type IV collagen molecules attach to each other to form complex protein networks. These protein networks are the main components of basement membranes, which are thin sheet-like structures that separate and support cells in many tissues. Type IV collagen networks play an important role in the basement membranes in virtually all tissues throughout the body, particularly the basement membranes surrounding the body’s blood vessels (vasculature).

The \textit{COL4A1} gene mutations that cause familial porencephaly result in the production of a protein that disrupts the structure of type IV collagen. As a result, type IV collagen molecules cannot attach to each other to form the protein networks in basement membranes. Basement membranes without normal type IV collagen are unstable, leading to weakening of the tissues that they surround. In people with familial porencephaly, the vasculature in the brain weakens, which can lead to blood vessel breakage and hemorrhagic stroke. Bleeding within the brain is followed by the formation of fluid-filled cysts characteristic of this condition. It is thought that the pressure and stress on the head during birth contributes to vessel breakage in people with this condition; however in some individuals, bleeding in the brain can occur before birth.
Inheritance Pattern

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

Other Names for This Condition

- autosomal dominant porencephaly type 1
- infantile hemiplegia with porencephaly
- porencephaly type 1

Diagnosis & Management

Genetic Testing Information

- What is genetic testing?
  https://primer/testing/genetictesting
- Genetic Testing Registry: Familial porencephaly

Other Diagnosis and Management Resources

- GeneReview: COL4A1-Related Disorders
  https://www.ncbi.nlm.nih.gov/books/NBK7046

Additional Information & Resources

Health Information from MedlinePlus

- Health Topic: Brain Diseases
  https://medlineplus.gov/braindiseases.html
- Health Topic: Hemorrhagic Stroke
  https://medlineplus.gov/hemorrhagicstroke.html
- Health Topic: Migraine
  https://medlineplus.gov/migraine.html

Genetic and Rare Diseases Information Center

- Familial porencephaly
  https://rarediseases.info.nih.gov/diseases/2258/familial-porencephaly

Additional NIH Resources

- National Institute of Neurological Disorders and Stroke: Epilepsy Information Page
  https://www.ninds.nih.gov/Disorders/All-Disorders/Epilepsy-Information-Page
- National Institute of Neurological Disorders and Stroke: Stroke Information Page
  https://www.ninds.nih.gov/Disorders/All-Disorders/Stroke-Information-Page
Educational Resources

- Cedars-Sinai Medical Center: Cerebral Hemorrhage
  https://www.cedars-sinai.edu/Patients/Health-Conditions/Hemorrhagic-Stroke.aspx
- Johns Hopkins Children's Center: Pediatric Stroke
  https://www.hopkinsmedicine.org/health/conditions-and-diseases/stroke/pediatric-stroke
- Johns Hopkins Medicine Department of Neurology and Neurosurgery: Intracerebral Hemorrhage
  https://www.hopkinsmedicine.org/neurology_neurosurgery/centers_clinics/pediatric_neurovascular/conditions/intracerebral_hemorrhage.html
- Johns Hopkins Medicine Department of Neurology and Neurosurgery: Stroke
  https://www.hopkinsmedicine.org/neurology_neurosurgery/centers_clinics/cerebrovascular/conditions/stroke.html
- MalaCards: familial porencephaly
  https://www.malacards.org/card/familial_porencephaly
- Orphanet: Familial porencephaly
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=99810

Patient Support and Advocacy Resources

- Family Caregiver Alliance: Stroke
  https://www.caregiver.org/health-issues/stroke
- National Organization for Rare Disorders (NORD)
  https://rarediseases.org/rare-diseases/autosomal-dominant-porencephaly-type-i/

Clinical Information from GeneReviews

- COL4A1-Related Disorders
  https://www.ncbi.nlm.nih.gov/books/NBK7046

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28porencephaly%5BTIAB%5D%29+AND+%28COL4A1%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- BRAIN SMALL VESSEL DISEASE 1 WITH OR WITHOUT OCULAR ANOMALIES
  http://omim.org/entry/175780
Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16107487  
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2593028/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21357838

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21157337

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