Otopalatodigital Syndrome Type 2

Subjects: Genetics & Heredity
Contributor: Rita Xu

Otopalatodigital syndrome type 2 is a disorder primarily involving abnormalities in skeletal development.

Keywords: genetic conditions

1. Introduction

It is a member of a group of related conditions called otopalatodigital spectrum disorders, which also includes otopalatodigital syndrome type 1, frontometaphyseal dysplasia, Melnick-Needles syndrome, and terminal osseous dysplasia. In general, these disorders involve hearing loss caused by malformations in the tiny bones in the ears (ossicles), problems in the development of the roof of the mouth (palate), and skeletal abnormalities involving the fingers or toes (digits). Otopalatodigital syndrome type 2 also tends to cause problems in other areas of the body, such as the brain and heart.

People with otopalatodigital syndrome type 2 have characteristic facial features including wide-set and downward-slanting eyes; prominent brow ridges; a broad, flat nose; and a very small lower jaw and chin (micrognathia). Affected individuals often have abnormalities of the fingers and toes, such as unusual curvature of the fingers (camptodactyly) and shortened or absent thumbs and big toes. People with otopalatodigital syndrome type 2 usually have short stature, abnormally curved (bowed) bones in the arms and legs, and other abnormal or absent bones. Underdeveloped ribs can cause problems with breathing in affected individuals. Some people with this condition have an opening in the roof of the mouth (a cleft palate) or hearing loss.

In addition to skeletal abnormalities, individuals with otopalatodigital syndrome type 2 may have developmental delay, increased fluid in the center of the brain (hydrocephalus), protrusion of the abdominal organs through the navel (omphalocele), heart defects, chest abnormalities, obstruction of the ducts between the kidneys and bladder (ureters), and, in males, opening of the urethra on the underside of the penis (hypospadias).

Males with otopalatodigital syndrome type 2 generally have much more severe signs and symptoms compared to affected females. Males with this condition typically do not survive past infancy because of respiratory failure due to an underdeveloped rib cage.

2. Frequency

Otopalatodigital syndrome type 2 is a rare disorder, affecting fewer than 1 in every 100,000 individuals. Its specific incidence is unknown.

3. Causes

Otopalatodigital syndrome type 2 is caused by mutations in the *FLNA* gene. The *FLNA* gene provides instructions for producing the protein filamin A, which helps build the network of protein filaments (cytoskeleton) that gives structure to cells and allows them to change shape and move. Filamin A binds to another protein called actin, and helps the actin to form the branching network of filaments that make up the cytoskeleton. Filamin A also links actin to many other proteins to perform various functions within the cell.

The *FLNA* gene mutations that cause otopalatodigital syndrome type 2 all result in changes to the filamin A protein in the region that binds to actin. The mutations are described as "gain-of-function" because they appear to lead to a protein with an increased ability to bind to actin. Researchers believe that the mutations impair the stability of the cytoskeleton and disrupt cellular processes involved in skeletal development, but it is not known how changes in the protein relate to the specific signs and symptoms of otopalatodigital syndrome type 2.

The Gene Associated with Otopalatodigital Syndrome Type 2

- FLNA

4. Inheritance

This condition is inherited in an X-linked pattern. A condition is considered X-linked if the mutated gene that causes the disorder is located on the X chromosome, one of the two sex chromosomes in each cell. In males, who have only one X chromosome, a mutation in the only copy of the gene in each cell is sufficient to cause the condition. In females, who have two copies of the X chromosome, one altered copy of the gene in each cell can lead to less severe features of the condition or may cause no signs or symptoms at all. A characteristic of X-linked inheritance is that fathers cannot pass X-linked traits to their sons.

5. Other Names for This Condition

- cranioorodigital syndrome
- faciopalatoosseous syndrome
- FPO
- OPD syndrome, type 2
- oto-palato-digital syndrome, type II
- Taybi syndrome

References

1. Batra P, Ryan FS, Witherow H, Calvert ML. Distraction in a case ofotopalatodigital syndrome type II. Int J Paediatr Dent. 2006 Jul;16(4):286-91.
2. Mariño-Enríquez A, Lapunzina P, Robertson SP, Rodríguez JI. Otopalatodigitalsyndrome type 2 in two siblings with a novel filamin A 629G>T mutation: clinical,pathological, and molecular findings. Am J Med Genet A. 2007 May15;143A(10):1120-5.
3. Moutton S, Fergelot P, Naudion S, Cordier MP, Solé G, Guerineau E, Hubert C,Rooryck C, Vuillaume ML, Houcinat N, Deforges J, Bouron J, Devès S, Le Merrer M, David A, Geneviève D, Giuliano F, Journel H, Megarbane A, Faivre L, Chassaing N, Francannet C, Sarrazin E, Stattin EL, Vigneron J, Leclair D, Abadie C, Sarda P,Baumann C, Delrue MA, Arveiler B, Lacombe D, Goizet C, Coupry I. Otopalatodigitalspectrum disorders: refinement of the phenotypic and mutational spectrum. J HumGenet. 2016 Aug;61(8):693-9. doi: 10.1038/jhg.2016.37.
4. Murphy-Ryan M, Babovic-Vuksanovic D, Lindor N. Bifid tongue, corneal clouding,and Dandy-Walker malformation in a male infant with otopalatodigital syndrometype 2. Am J Med Genet A. 2011 Apr;155A(4):855-9. doi: 10.1002/ajmg.a.33901.
5. Naudion S, Moutton S, Coupry I, Sole G, Deforges J, Guerineau E, Hubert C,Deves S, Pilliod J, Rooryck C, Abel C, Le Breton F, Collardeau-Frachon S, CordierMP, Delezoide AL, Goldenberg A, Loget P, Melki J, Odent S, Patrier S, Verloes A, Viot G, Blesson S, Bessières B, Lacombe D, Arveiler B, Goizet C, Fergelot P.Fetal phenotypes in otopalatodigital spectrum disorders. Clin Genet. 2016Mar;89(3):371-7. doi: 10.1111/cge.12679.
6. Robertson S. X-Linked Otopalatodigital Spectrum Disorders. 2005 Nov 30[updated 2019 Oct 3]. In: Adam MP, Ardinger HH, Pagon RA, Wallace SE, Bean LJH,Stephens K, Amemiya A, editors. GeneReviews® [Internet]. Seattle (WA): Universityof Washington, Seattle; 1993-2020. Available fromhttp://www.ncbi.nlm.nih.gov/books/NBK1393/
7. Robertson SP, Twigg SR, Sutherland-Smith AJ, Biancalana V, Gorlin RJ, Horn D, Kenwrick SJ, Kim CA, Morava E, Newbury-Ecob R, Orstavik KH, Quarrell OW, SchwartzCE, Shears DJ, Suri M, Kendrick-Jones J, Wilkie AO; OPD-spectrum DisordersClinical Collaborative Group. Localized mutations in the gene encoding thecytoskeletal protein filamin A cause diverse malformations in humans. Nat Genet. 2003 Apr;33(4):487-91.
8. Robertson SP. Otopalatodigital syndrome spectrum disorders: otopalatodigitalsyndrome types 1 and 2, frontometaphyseal dysplasia and Melnick-Needles syndrome.Eur J Hum Genet. 2007 Jan;15(1):3-9.