Campomelic dysplasia

Campomelic dysplasia is a severe disorder that affects development of the skeleton, reproductive system, and other parts of the body. This condition is often life-threatening in the newborn period.

The term "campomelic" comes from the Greek words for "bent limb." Affected individuals are typically born with bowing of the long bones in the legs, and occasionally, bowing in the arms. Bowing can cause characteristic skin dimples to form over the curved bone, especially on the lower legs. People with campomelic dysplasia usually have short legs, dislocated hips, underdeveloped shoulder blades, 11 pairs of ribs instead of 12, bone abnormalities in the neck, and inward- and upward-turning feet (clubfeet). These skeletal abnormalities begin developing before birth and can often be seen on ultrasound. When affected individuals have features of this disorder but do not have bowed limbs, they are said to have acampomelic campomelic dysplasia.

Many people with campomelic dysplasia have external genitalia that do not look clearly male or clearly female (ambiguous genitalia). Approximately 75 percent of affected individuals with a typical male chromosome pattern (46,XY) have ambiguous genitalia or normal female genitalia. Internal reproductive organs may not correspond with the external genitalia; the internal organs can be male (testes), female (ovaries), or a combination of the two. For example, an individual with female external genitalia may have testes or a combination of testes and ovaries.

Affected individuals have distinctive facial features, including a small chin, prominent eyes, and a flat face. They also have a large head compared to their body size. A particular group of physical features, called Pierre Robin sequence, is common in people with campomelic dysplasia. Pierre Robin sequence includes an opening in the roof of the mouth (a cleft palate), a tongue that is placed further back than normal (glossoptosis), and a small lower jaw (micrognathia). People with campomelic dysplasia are often born with weakened cartilage that forms the upper respiratory tract. This abnormality, called laryngotracheomalacia, partially blocks the airway and causes difficulty breathing. Laryngotracheomalacia contributes to the poor survival of infants with campomelic dysplasia.

Only a few people with campomelic dysplasia survive past infancy. As these individuals age, they may develop an abnormal curvature of the spine (scoliosis) and other spine abnormalities that compress the spinal cord. People with campomelic dysplasia may also have short stature and hearing loss.

Frequency

The prevalence of campomelic dysplasia is uncertain; estimates range from 1 in 40,000 to 200,000 people.
Causes

Mutations in or near the SOX9 gene cause campomelic dysplasia. This gene provides instructions for making a protein that plays a critical role in the formation of many different tissues and organs during embryonic development. The SOX9 protein regulates the activity of other genes, especially those that are important for development of the skeleton and reproductive organs.

Most cases of campomelic dysplasia are caused by mutations within the SOX9 gene. These mutations prevent the production of the SOX9 protein or result in a protein with impaired function. About 5 percent of cases are caused by chromosome abnormalities that occur near the SOX9 gene; these cases tend to be milder than those caused by mutations within the SOX9 gene. The chromosome abnormalities disrupt regions of DNA that normally regulate the activity of the SOX9 gene. All of these genetic changes prevent the SOX9 protein from properly controlling the genes essential for normal development of the skeleton, reproductive system, and other parts of the body. Abnormal development of these structures causes the signs and symptoms of campomelic dysplasia.

Inheritance Pattern

Campomelic dysplasia is inherited in an autosomal dominant pattern, which means one copy of the altered gene in each cell is sufficient to cause the disorder. Most cases result from new mutations in or near the SOX9 gene and occur in people with no history of the disorder in their family. Rarely, affected individuals inherit a chromosome abnormality from a parent who may or may not show mild signs and symptoms of campomelic dysplasia.

Other Names for This Condition

- campomelic dwarfism
- campomelic syndrome
- camptomelic dysplasia

Diagnosis & Management

Genetic Testing Information

- What is genetic testing? /primer/testing/genetictesting
Other Diagnosis and Management Resources

- European Skeletal Dysplasia Network
  http://www.esdn.org/
- GeneReview: Campomelic Dysplasia
  https://www.ncbi.nlm.nih.gov/books/NBK1760
- MedlinePlus Encyclopedia: Ambiguous Genitalia
  https://medlineplus.gov/ency/article/003269.htm
- MedlinePlus Encyclopedia: Pierre-Robin Syndrome
  https://medlineplus.gov/ency/article/001607.htm
- The Hospital for Sick Children
  https://www.aboutkidshealth.ca/Article?contentid=880&language=English

Additional Information & Resources

Health Information from MedlinePlus

- Encyclopedia: Ambiguous Genitalia
  https://medlineplus.gov/ency/article/003269.htm
- Encyclopedia: Pierre-Robin Syndrome
  https://medlineplus.gov/ency/article/001607.htm
- Health Topic: Bone Diseases
  https://medlineplus.gov/bonediseases.html
- Health Topic: Dwarfism
  https://medlineplus.gov/dwarfism.html

Genetic and Rare Diseases Information Center

- Campomelic dysplasia
  https://rarediseases.info.nih.gov/diseases/10027/campomelic-dysplasia

Educational Resources

- MalaCards: campomelic dysplasia
  https://www.malacards.org/card/campomelic_dysplasia
- Nemours Children’s Health System
  https://www.nemours.org/services/skeletal-dysplasia/campomelic.html?tab=about
- Orphanet: Campomelic dysplasia
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=140
Patient Support and Advocacy Resources

- Accord Alliance
  http://www.accordalliance.org/
- Compassionate Friends
  https://www.compassionatefriends.org/
- 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/campomelic-syndrome/
- The MAGIC Foundation
  https://www.magicfoundation.org/

Clinical Information from GeneReviews

- Campomelic Dysplasia
  https://www.ncbi.nlm.nih.gov/books/NBK1760

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28campomelic+dysplasia%5BTA%5D%29+OR+%28campomelic+dwarfism%5BTA%5D%29+OR+%28campomelic+syndrome%5BTA%5D%29+OR+%28campomelic+dysplasia%5BTA%5D%29+AND+english%5BLa%5D+AND+human%5BMh%5D+AND+%22last+1800+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- CAMPOMELIC DYSPLASIA
  http://omim.org/entry/114290
Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/24451061

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/19253311

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17409199

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  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1199303/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16467253

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