Williams Syndrome

Subjects: Genetics & Heredity
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Williams syndrome is a developmental disorder that affects many parts of the body. This condition is characterized by mild to moderate intellectual disability or learning problems, unique personality characteristics, distinctive facial features, and heart and blood vessel (cardiovascular) problems.

Keywords: genetic conditions

1. Introduction

People with Williams syndrome typically have difficulty with visual-spatial tasks such as drawing and assembling puzzles, but they tend to do well on tasks that involve spoken language, music, and learning by repetition (rote memorization). Affected individuals have outgoing, engaging personalities and tend to take an extreme interest in other people. Attention deficit disorder (ADD), problems with anxiety, and phobias are common among people with this disorder.

Young children with Williams syndrome have distinctive facial features including a broad forehead, a short nose with a broad tip, full cheeks, and a wide mouth with full lips. Many affected people have dental problems such as teeth that are small, widely spaced, crooked, or missing. In older children and adults, the face appears longer and more gaunt.

A form of cardiovascular disease called supravalvular aortic stenosis (SVAS) occurs frequently in people with Williams syndrome. Supravalvular aortic stenosis is a narrowing of the large blood vessel that carries blood from the heart to the rest of the body (the aorta). If this condition is not treated, the aortic narrowing can lead to shortness of breath, chest pain, and heart failure. Other problems with the heart and blood vessels, including high blood pressure (hypertension), have also been reported in people with Williams syndrome.

Additional signs and symptoms of Williams syndrome include abnormalities of connective tissue (tissue that supports the body's joints and organs) such as joint problems and soft, loose skin. Affected people may also have increased calcium levels in the blood (hypercalcemia) in infancy, developmental delays, problems with coordination, and short stature. Medical problems involving the eyes and vision, the digestive tract, and the urinary system are also possible.

2. Frequency

Williams syndrome affects an estimated 1 in 7,500 to 10,000 people.

3. Causes

Williams syndrome is caused by the deletion of genetic material from a specific region of chromosome 7. The deleted region includes 26 to 28 genes, and researchers believe that a loss of several of these genes probably contributes to the characteristic features of this disorder.

CLIP2, *ELN*, *GTF2I*, *GTF2IRD1*, and *LIMK1* are among the genes that are typically deleted in people with Williams syndrome. Researchers have found that loss of the *ELN* gene is associated with the connective tissue abnormalities and cardiovascular disease (specifically supravalvular aortic stenosis) found in many people with this disease. Studies suggest that deletion of *CLIP2*, *GTF2I*, *GTF2IRD1*, *LIMK1*, and perhaps other genes may help explain the characteristic difficulties with visual-spatial tasks, unique behavioral characteristics, and other cognitive difficulties seen in people with Williams syndrome. Loss of the *GTF2IRD1* gene may also contribute to the distinctive facial features often associated with this condition.

Researchers believe that the presence or absence of the *NCF1* gene on chromosome 7 is related to the risk of developing hypertension in people with Williams syndrome. When the *NCF1* gene is included in the part of the chromosome that is deleted, affected individuals are less likely to develop hypertension. Therefore, the loss of this gene appears to be a protective factor. People with Williams syndrome whose *NCF1* gene is not deleted have a higher risk of developing hypertension.

The relationship between other genes in the deleted region of chromosome 7 and the signs and symptoms of Williams syndrome is under investigation or unknown.

3.1 The genes and chromosome associated with Williams syndrome

- CLIP2
- ELN
- GTF2I
- GTF2IRD1
- LIMK1
- NCF1
- chromosome 7

4. Inheritance

Most cases of Williams syndrome are not inherited but occur as random events during the formation of reproductive cells (eggs or sperm) in a parent of an affected individual. These cases occur in people with no history of the disorder in their family.

Williams syndrome is considered an autosomal dominant condition because one copy of the altered chromosome 7 in each cell is sufficient to cause the disorder. In a small percentage of cases, people with Williams syndrome inherit the chromosomal deletion from a parent with the condition.

5. Other Names for This Condition

- Beuren syndrome
- elfin facies syndrome
- elfin facies with hypercalcemia
- hypercalcemia-supravalvar aortic stenosis
- infantile hypercalcemia
- supravalvar aortic stenosis syndrome
- WBS
- Williams-Beuren syndrome
- WMS
- WS

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