Congenital myasthenic syndrome

Congenital myasthenic syndrome is a group of conditions characterized by muscle weakness (myasthenia) that worsens with physical exertion. The muscle weakness typically begins in early childhood but can also appear in adolescence or adulthood. Facial muscles, including muscles that control the eyelids, muscles that move the eyes, and muscles used for chewing and swallowing, are most commonly affected. However, any of the muscles used for movement (skeletal muscles) can be affected in this condition. Due to muscle weakness, affected infants may have feeding difficulties. Development of motor skills such as crawling or walking may be delayed. The severity of the myasthenia varies greatly, with some people experiencing minor weakness and others having such severe weakness that they are unable to walk.

Some individuals have episodes of breathing problems that may be triggered by fevers or infection. Severely affected individuals may also experience short pauses in breathing (apnea) that can lead to a bluish appearance of the skin or lips (cyanosis).

Frequency
The prevalence of congenital myasthenic syndrome is unknown. At least 600 families with affected individuals have been described in the scientific literature.

Causes
Mutations in many genes can cause congenital myasthenic syndrome. Mutations in the CHRNE gene are responsible for more than half of all cases. A large number of cases are also caused by mutations in the RAPSN, CHAT, COLQ, and DOK7 genes. All of these genes provide instructions for producing proteins that are involved in the normal function of the neuromuscular junction. The neuromuscular junction is the area between the ends of nerve cells and muscle cells where signals are relayed to trigger muscle movement.

Gene mutations lead to changes in proteins that play a role in the function of the neuromuscular junction and disrupt signaling between the ends of nerve cells and muscle cells. Disrupted signaling between these cells results in an impaired ability to move skeletal muscles, muscle weakness, and delayed development of motor skills. The respiratory problems in congenital myasthenic syndrome result from impaired movement of the muscles of the chest wall and the muscle that separates the abdomen from the chest cavity (the diaphragm).

Mutations in other genes that provide instructions for proteins involved in neuromuscular signaling have been found to cause some cases of congenital myasthenic syndrome, although these mutations account for only a small number of
cases. Some people with congenital myasthenic syndrome do not have an identified mutation in any of the genes known to be associated with this condition.

Inheritance Pattern
This condition is most commonly inherited in an autosomal recessive pattern, which means both copies of the gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene, but they typically do not show signs and symptoms of the condition.

Rarely, 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. In some cases, an affected person inherits the mutation from one affected parent. Other cases result from new mutations in the gene and occur in people with no history of the disorder in their family.

Other Names for This Condition
- CMS
- congenital myasthenia
- congenital myasthenic syndromes

Diagnosis & Management
Genetic Testing
• Genetic Testing Registry: Myasthenic syndrome, congenital, associated with acetylcholine receptor deficiency

• Genetic Testing Registry: Myasthenic syndrome, slow-channel congenital

Other Diagnosis and Management Resources
• GeneReview: Congenital Myasthenic Syndromes
  https://www.ncbi.nlm.nih.gov/books/NBK1168

General Information from MedlinePlus
• Diagnostic Tests
  https://medlineplus.gov/diagnostictests.html

• Drug Therapy
  https://medlineplus.gov/drugtherapy.html

• Genetic Counseling
  https://medlineplus.gov/geneticcounseling.html

• Palliative Care
  https://medlineplus.gov/palliativecare.html

• Surgery and Rehabilitation
  https://medlineplus.gov/surgeryandrehabilitation.html

Additional Information & Resources

Health Information from MedlinePlus
• Health Topic: Neuromuscular Disorders
  https://medlineplus.gov/neuromusculardisorders.html

Genetic and Rare Diseases Information Center
• Congenital myasthenic syndrome

Additional NIH Resources
• National Institute of Neurological Disorders and Stroke: Congenital Myasthenia Information Page
  https://www.ninds.nih.gov/Disorders/All-Disorders/Congenital-myasthenia-Information-Page
Educational Resources
- Boston Children's Hospital: Muscle Weakness (Hypotonia) in Children
  http://www.childrenshospital.org/conditions-and-treatments/conditions/m/muscle-weakness-hypotonia
- Boston Children's Hospital: Respiratory Distress in Children
  http://www.childrenshospital.org/conditions-and-treatments/conditions/r/respiratory-distress
- MalaCards: congenital myasthenic syndrome
  http://www.malacards.org/card/congenital_myasthenic_synrome
- Orphanet: Congenital myasthenic syndrome
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=590
- Washington University, St. Louis: Neuromuscular Disease Center
  https://neuromuscular.wustl.edu/synmg.html#cmgtop

Patient Support and Advocacy Resources
- Muscular Dystrophy Association
  https://www.mda.org/disease/congenital-myasthenic-syndromes
- Myasthenia Gravis Foundation of America: Congenital Myasthenia
  http://myastheniao.web708.discountasp.net/LinkClick.aspx?ticket=7X4UXeybJH4%3D&tabid=84

Clinical Information from GeneReviews
- Congenital Myasthenic Syndromes
  https://www.ncbi.nlm.nih.gov/books/NBK1168

Research Studies from ClinicalTrials.gov
- ClinicalTrials.gov
  https://clinicaltrials.gov/ct2/results?cond=%22congenital+myasthenic+syndrome%22

Scientific Articles on PubMed
- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Myasthenic+Syndromes,+Congenital%5BMAJR%5D%29+AND+%28congenital+myasthenic+syndrome%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D
Catalog of Genes and Diseases from OMIM

- MYASTHENIC SYNDROME, CONGENITAL, 1A, SLOW-CHANNEL
  http://omim.org/entry/601462
- MYASTHENIC SYNDROME, CONGENITAL, 1B, FAST-CHANNEL
  http://omim.org/entry/608930
- MYASTHENIC SYNDROME, CONGENITAL, 4C, ASSOCIATED WITH ACETYLCHOLINE RECEPTOR DEFICIENCY
  http://omim.org/entry/608931
- MYASTHENIC SYNDROME, CONGENITAL, 5
  http://omim.org/entry/603034
- MYASTHENIC SYNDROME, CONGENITAL, 6, PRESYNAPTIC
  http://omim.org/entry/254210
- MYASTHENIC SYNDROME, CONGENITAL, 10
  http://omim.org/entry/254300
- MYASTHENIC SYNDROME, CONGENITAL, 12
  http://omim.org/entry/610542
- MYASTHENIC SYNDROME, CONGENITAL, 16
  http://omim.org/entry/614198
- MYASTHENIC SYNDROME, CONGENITAL, 16
  http://omim.org/entry/614198

Medical Genetics Database from MedGen

- Congenital myasthenic syndrome

Sources for This Summary

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  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/18567858

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/19688192
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3050586/
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/22104196
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3269564/

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  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3035713/

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