Marfan syndrome

Marfan syndrome is a disorder that affects the connective tissue in many parts of the body. Connective tissue provides strength and flexibility to structures such as bones, ligaments, muscles, blood vessels, and heart valves. The signs and symptoms of Marfan syndrome vary widely in severity, timing of onset, and rate of progression.

Because connective tissue is found throughout the body, Marfan syndrome can affect many systems, often causing abnormalities in the heart, blood vessels, eyes, bones, and joints. The two primary features of Marfan syndrome are vision problems caused by a dislocated lens (ectopia lentis) in one or both eyes and defects in the large blood vessel that distributes blood from the heart to the rest of the body (the aorta). The aorta can weaken and stretch, which may lead to a bulge in the blood vessel wall (an aneurysm). Stretching of the aorta may cause the aortic valve to leak, which can lead to a sudden tearing of the layers in the aorta wall (aortic dissection). Aortic aneurysm and dissection can be life threatening.

Many people with Marfan syndrome have additional heart problems including a leak in the valve that connects two of the four chambers of the heart (mitral valve prolapse) or the valve that regulates blood flow from the heart into the aorta (aortic valve regurgitation). Leaks in these valves can cause shortness of breath, fatigue, and an irregular heartbeat felt as skipped or extra beats (palpitations).

Individuals with Marfan syndrome are usually tall and slender, have elongated fingers and toes (arachnodactyly), loose joints, and have an arm span that exceeds their body height. Other common features include a long and narrow face, crowded teeth, an abnormal curvature of the spine (scoliosis or kyphosis), stretch marks (striae) not related to weight gain or loss, and either a sunken chest (pectus excavatum) or a protruding chest (pectus carinatum). Some individuals develop an abnormal accumulation of air in the chest cavity that can result in the collapse of a lung (spontaneous pneumothorax). A membrane called the dura, which surrounds the brain and spinal cord, can be abnormally enlarged (dural ectasia) in people with Marfan syndrome. Dural ectasia can cause pain in the back, abdomen, legs, or head. Most individuals with Marfan syndrome have some degree of nearsightedness (myopia). Clouding of the lens (cataract) may occur in mid-adulthood, and increased pressure within the eye (glaucoma) occurs more frequently in people with Marfan syndrome than in those without the condition.

The features of Marfan syndrome can become apparent anytime between infancy and adulthood. Depending on the onset and severity of signs and symptoms, Marfan syndrome can be fatal early in life; however, with proper treatment, many affected individuals have normal lifespans.
Frequency
The incidence of Marfan syndrome is approximately 1 in 5,000 worldwide.

Genetic Changes
Mutations in the \textit{FBN1} gene cause Marfan syndrome. The \textit{FBN1} gene provides instructions for making a protein called fibrillin-1. Fibrillin-1 attaches (binds) to other fibrillin-1 proteins and other molecules to form threadlike filaments called microfibrils. Microfibrils become part of the fibers that provide strength and flexibility to connective tissue. Additionally, microfibrils bind to molecules called growth factors and release them at various times to control the growth and repair of tissues and organs throughout the body. A mutation in the \textit{FBN1} gene can reduce the amount of functional fibrillin-1 that is available to form microfibrils, which leads to decreased microfibril formation. As a result, microfibrils cannot bind to growth factors, so excess growth factors are available and elasticity in many tissues is decreased, leading to overgrowth and instability of tissues in Marfan syndrome.

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.

At least 25 percent of Marfan syndrome cases result from a new mutation in the \textit{FBN1} gene. These cases occur in people with no history of the disorder in their family.

Other Names for This Condition
- Marfan's syndrome
- MFS

Diagnosis & Management

Genetic Testing
- Genetic Testing Registry: Marfan syndrome

Other Diagnosis and Management Resources
- GeneReview: Marfan Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK1335
- MarfanDX
  http://www.marfan.org/dx/home
- MedlinePlus Encyclopedia: Aortic Dissection
  https://medlineplus.gov/ency/article/000181.htm
- MedlinePlus Encyclopedia: Marfan Syndrome
  https://medlineplus.gov/ency/article/000418.htm
• MedlinePlus Encyclopedia: Thoracic Aortic Aneurysm
https://medlineplus.gov/ency/article/001119.htm

• The Marfan Foundation: Diagnosis
http://info.marfan.org/marfan-syndrome-diagnosis

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

MedlinePlus

• Encyclopedia: Aortic Dissection
https://medlineplus.gov/ency/article/000181.htm

• Encyclopedia: Marfan Syndrome
https://medlineplus.gov/ency/article/000418.htm

• Encyclopedia: Thoracic Aortic Aneurysm
https://medlineplus.gov/ency/article/001119.htm

• Health Topic: Marfan Syndrome
https://medlineplus.gov/marfansyndrome.html

Genetic and Rare Diseases Information Center

• Marfan syndrome

Additional NIH Resources

• National Heart Lung and Blood Institute
https://www.nhlbi.nih.gov/health-topics/marfan-syndrome

• National Human Genome Research Institute
https://www.genome.gov/19519224/

• National Institute of Arthritis and Musculoskeletal and Skin Diseases
https://www.niams.nih.gov/health-topics/marfan-syndrome
Educational Resources

- Disease InfoSearch: Marfan syndrome
  http://www.diseaseinfosearch.org/Marfan+syndrome/4466
- KidsHealth from Nemours Foundation
- MalaCards: marfan syndrome
  http://www.malacards.org/card/marfan_syndrome
- Orphanet: Marfan syndrome
  https://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=558
- Your Genes Your Health from Cold Spring Harbor Laboratory
  http://www.ygyh.org/marfan/whatisit.htm

Patient Support and Advocacy Resources

- Genetic Aortic Disorders Association Canada
  http://www.gadacanada.ca/
- March of Dimes
- National Organization for Rare Disorders (NORD)
  https://rarediseases.org/rare-diseases/marfan-syndrome/
- The Marfan Foundation
  http://www.marfan.org

GeneReviews

- Marfan Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK1335

ClinicalTrials.gov

- ClinicalTrials.gov
  https://clinicaltrials.gov/ct2/results?cond=%22marfan+syndrome%22

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Marfan+Syndrome%5BMAJR%5D%29+AND+%28Marfan+syndrome%5BTI%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1080+days%22%5Bdp%5D

OMIM

- MARFAN SYNDROME
  http://omim.org/entry/154700
Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/20351703

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17242442

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/19117906

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/18506019

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21784848
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3173189/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/20591885

• OMIM: MARFAN SYNDROME
  http://omim.org/entry/154700

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17061023

• National Institute of Arthritis and Musculoskeletal and Skin Diseases
  https://www.niams.nih.gov/health-topics/marfan-syndrome

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/18695204
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2909440/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/22140025
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/22237449

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16571647
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2563177/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16799921

• The Marfan Foundation
  http://www.marfan.org

Reprinted from Genetics Home Reference:

Reviewed: May 2018
Published: July 3, 2018

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services