Bernard-Soulier syndrome

Bernard-Soulier syndrome is a bleeding disorder associated with abnormal platelets, which are blood cell fragments involved in blood clotting. In affected individuals, platelets are unusually large and fewer in number than usual (a combination known as macrothrombocytopenia). People with Bernard-Soulier syndrome tend to bruise easily and have an increased risk of nosebleeds (epistaxis). They may also experience abnormally heavy or prolonged bleeding following minor injury or surgery or even without trauma (spontaneous bleeding). In some affected individuals, bleeding under the skin causes tiny red or purple spots on the skin called petechiae. Women with Bernard-Soulier syndrome often have heavy or prolonged menstrual periods (menorrhagia).

Frequency

Bernard-Soulier syndrome is estimated to occur in 1 in 1 million individuals; however, some doctors think the condition is underdiagnosed and may be more common.

Genetic Changes

Bernard-Soulier syndrome is caused by mutations in one of three genes: \textit{GP1BA}, \textit{GP1BB}, or \textit{GP9}. The proteins produced from these genes are pieces (subunits) of a protein complex called glycoprotein (GP)Ib-IX-V. This complex is found on the surface of platelets and plays an important role in blood clotting.

The GPIb-IX-V complex can attach (bind) to a protein called von Willebrand factor, fitting together like a lock and its key. Von Willebrand factor is found on the inside surface of blood vessels, particularly when there is an injury. Binding of the GPIb-IX-V complex to von Willebrand factor allows platelets to stick to the blood vessel wall at the site of the injury. These platelets form clots, plugging holes in the blood vessels to help stop bleeding.

Most mutations in \textit{GP1BA}, \textit{GP1BB}, or \textit{GP9} prevent the formation of the GPIb-IX-V complex on the surface of platelets. Other mutations impair the complex's interaction with von Willebrand factor. All of these mutations impair clot formation, which leads to the excessive bleeding characteristic of Bernard-Soulier syndrome.

Inheritance Pattern

Most cases of Bernard-Soulier syndrome are inherited in an autosomal recessive pattern, which means both copies of the \textit{GP1BA}, \textit{GP1BB}, or \textit{GP9} gene in each cell have mutations. The parents of an individual with an autosomal recessive condition each carry one copy of the mutated gene. Although most people with only one copy
of the mutated gene do not show signs and symptoms of the condition, some have platelets that are slightly larger than normal or very mild bleeding abnormalities.

Rare cases of Bernard-Soulier syndrome caused by mutations in the \( GP1BA \) or \( GP1BB \) gene are inherited in an autosomal dominant pattern, which means one copy of the altered gene in each cell is sufficient to cause the disorder. These individuals inherit the condition from an affected parent.

**Other Names for This Condition**

- BDPLT1
- bleeding disorder, platelet-type, 1
- BSS
- deficiency of platelet glycoprotein 1b
- giant platelet syndrome
- glycoprotein 1b, platelet, deficiency of
- hemorrhagioparous thrombocytic dystrophy
- macrothrombocytopenia, familial Bernard-Soulier type
- platelet glycoprotein 1b deficiency
- von Willebrand factor receptor deficiency

**Diagnosis & Management**

**Genetic Testing**

- Genetic Testing Registry: Bernard Soulier syndrome

**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: Blood Clotting  
  https://medlineplus.gov/ency/anatomyvideos/000011.htm

- Health Topic: Bleeding Disorders  
  https://medlineplus.gov/bleedingdisorders.html

- Health Topic: Platelet Disorders  
  https://medlineplus.gov/plateletdisorders.html

**Educational Resources**

- Disease InfoSearch: Bernard-Soulier syndrome type C  
  http://www.diseaseinfosearch.org/Bernard-Soulier+syndrome+type+C/7810

- Disease InfoSearch: Bernard-Soulier syndrome, type A  
  http://www.diseaseinfosearch.org/Bernard-Soulier+syndrome%2C+type+A/7811

- Disease InfoSearch: Bernard-Soulier syndrome, type A2, autosomal dominant  
  http://www.diseaseinfosearch.org/Bernard-Soulier+syndrome%2C+type+A%2C+autosomal+dominant/7812

- Johns Hopkins Medicine: What are Platelets and Why are They Important?  
  https://www.hopkinsmedicine.org/heart_vascular_institute/clinical_services/centers_excellence/womens_cardiovascular_health_center/patient_information/health_topics/platelets.html

- MalaCards: bernard-soulier syndrome type a  
  http://www.malacards.org/card/bernard_soulier_syndrome_type_a

- MalaCards: bernard-soulier syndrome, type a2  
  http://www.malacards.org/card/bernard_soulier_syndrome_type_a2

- MalaCards: bernard-soulier syndrome, type c  
  http://www.malacards.org/card/bernard_soulier_syndrome_type_c

  https://www.merckmanuals.com/home/blood-disorders/blood-clotting-process/how-blood-clots

- Orphanet: Bernard-Soulier syndrome  
  http://www.orpha.net/consor/cgi-bin/OC_Exp.php?Lng=EN&Expert=274
Patient Support and Advocacy Resources

• Canadian Hemophilia Society

• Foundation for Women and Girls with Blood Disorders
  http://www.fwgbd.org/

• Hemophilia Federation of America
  http://www.hemophiliafed.org/

• National Hemophilia Foundation
  https://www.hemophilia.org/

• National Organization for Rare Disorders (NORD)
  https://rarediseases.org/rare-diseases/bernard-soulier-syndrome/

• World Federation of Hemophilia

Scientific Articles on PubMed

• PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28Bernard-Soulier+Syndrome%5BMAJR%5D%29+AND+%28Bernard-Soulier+syndrome%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

OMIM

• BERNARD-SOULIER SYNDROME
  http://omim.org/entry/231200

• BERNARD-SOULIER SYNDROME, TYPE A2, AUTOSOMAL DOMINANT
  http://omim.org/entry/153670

Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/25370924

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/11132103

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/23336709
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3696474/
Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/24934643

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21173099
Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3046273/

Reprinted from Genetics Home Reference:

Reviewed: June 2016
Published: March 27, 2018

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