

Supravalvular Aortic Stenosis

Subjects: Genetics & Heredity

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Supravalvular aortic stenosis (SVAS) is a heart defect that develops before birth.

Keywords: genetic conditions

1. Introduction

Supravalvular aortic stenosis (SVAS) is a heart defect that develops before birth. This defect is a narrowing (stenosis) of the large blood vessel that carries blood from the heart to the rest of the body (the aorta). The condition is described as supravalvular because the section of the aorta that is narrowed is located just above the valve that connects the aorta with the heart (the aortic valve). Some people with SVAS also have defects in other blood vessels, most commonly stenosis of the artery from the heart to the lungs (the pulmonary artery). An abnormal heart sound during a heartbeat (heart murmur) can often be heard during a chest exam. If SVAS is not treated, the aortic narrowing can lead to shortness of breath, chest pain, and ultimately heart failure.

The severity of SVAS varies considerably, even among family members. Some affected individuals die in infancy, while others never experience symptoms of the disorder.

2. Frequency

SVAS occurs in 1 in 20,000 newborns worldwide.

3. Causes

Mutations in the *ELN* gene cause SVAS. The *ELN* gene provides instructions for making a protein called tropoelastin. Multiple copies of the tropoelastin protein attach to one another and are processed to form a mature protein called elastin. Elastin is the major component of elastic fibers, which are slender bundles of proteins that provide strength and flexibility to connective tissue (tissue that supports the body's joints and organs). Elastic fibers are found in the intricate lattice that forms in the spaces between cells (the extracellular matrix), where they give structural support to organs and tissues such as the heart, skin, lungs, ligaments, and blood vessels. Elastic fibers make up approximately 50 percent of the aorta, the rest being primarily muscle cells called vascular smooth muscle cells that line the aorta. Together, elastic fibers and vascular smooth muscle cells provide flexibility and resilience to the aorta.

Most of the *ELN* gene mutations that cause SVAS lead to a decrease in the production of tropoelastin. A shortage of tropoelastin reduces the amount of mature elastin protein that is processed and available for forming elastic fibers. As a result, elastic fibers that make up the aorta are thinner than normal. To compensate, the smooth muscle cells that line the aorta increase in number, making the aorta thicker and narrower than usual. A thickened aorta is less flexible and resilient to the stress of constant blood flow and pumping of the heart. Over time, the wall of the aorta can become damaged. Aortic narrowing causes the heart to work harder to pump blood through the aorta, resulting in the signs and symptoms of SVAS.

3.1 Learn more about the gene associated with Supravalvular aortic stenosis

- [ELN](#)

4. Inheritance

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. However, some people who inherit the altered gene never develop features of SVAS. (This situation is known as reduced penetrance.)

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

5. Other Names for This Condition

- aortic stenosis, supraaortic
- stenosis, aortic supraaortic
- stenosis, supraaortic aortic
- supraaortic stenosis, aortic
- SVAS

References

1. Metcalfe K, Rucka AK, Smoot L, Hofstadler G, Tuzler G, McKeown P, Siu V, Rauch A, Dean J, Dennis N, Ellis I, Reardon W, Cytrynbaum C, Osborne L, Yates JR, Read AP, Donnai D, Tassabehji M. Elastin: mutational spectrum in supraaortic stenosis. *Eur J Hum Genet.* 2000 Dec;8(12):955-63.
2. Micale L, Turturo MG, Fusco C, Augello B, Jurado LA, Izzì C, Digilio MC, Milani D, Lapi E, Zelante L, Merla G. Identification and characterization of seven novel mutations of elastin gene in a cohort of patients affected by supraaortic stenosis. *Eur J Hum Genet.* 2010 Mar;18(3):317-23. doi:10.1038/ejhg.2009.181.
3. Rodríguez-Reventa L, Badenas C, Carrió A, Milà M. Elastin mutation screening in a group of patients affected by vascular abnormalities. *Pediatr Cardiol.* 2005 Nov-Dec;26(6):827-31.
4. Tassabehji M, Urban Z. Congenital heart disease: Molecular diagnostics of supraaortic stenosis. *Methods Mol Med.* 2006;126:129-56.
5. Urbán Z, Riazi S, Seidl TL, Katahira J, Smoot LB, Chitayat D, Boyd CD, Hinek A. Connection between elastin haploinsufficiency and increased cell proliferation in patients with supraaortic stenosis and Williams-Beuren syndrome. *Am J Hum Genet.* 2002 Jul;71(1):30-44.

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