

Circulation

JOURNAL OF THE AMERICAN HEART ASSOCIATION



Syncope

Gunjan J. Shukla and Peter J. Zimetbaum

Circulation 2006;113:e715-e717

DOI: 10.1161/CIRCULATIONAHA.105.602250

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 72514

Copyright © 2006 American Heart Association. All rights reserved. Print ISSN: 0009-7322. Online ISSN: 1524-4539

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://circ.ahajournals.org/cgi/content/full/113/16/e715>

Subscriptions: Information about subscribing to *Circulation* is online at
<http://circ.ahajournals.org/subscriptions/>

Permissions: Permissions & Rights Desk, Lippincott Williams & Wilkins, a division of Wolters Kluwer Health, 351 West Camden Street, Baltimore, MD 21202-2436. Phone: 410-528-4050. Fax: 410-528-8550. E-mail:
journalpermissions@lww.com

Reprints: Information about reprints can be found online at
<http://www.lww.com/reprints>



Syncope

Gunjan J. Shukla, MD; Peter J. Zimetbaum, MD



Syncope (SIN'ko-pe) is the sudden and temporary loss of consciousness that is also described as fainting or passing out. Usually, it occurs when a fall in blood pressure (BP) causes a disruption in the sustained oxygen supply to the brain. Typically, syncope lasts for several seconds, after which consciousness is regained. Some people with so-called syncope do not actually faint but come close to it. This is called presyncope and is akin to a dimming of the lights during a reduction in electric power.

Syncope is a common problem that affects 1 million Americans every year. It also accounts for 3% of all emergency department visits and 6% of all hospital visits. Approximately one third of us will have syncope at least once in our lifetime. Sometimes syncope indicates a life-threatening condition, and therefore it is important to rule out dangerous causes.

What Causes Syncope?

The causes of syncope can be divided into 3 major categories: heart-related (cardiac), noncardiac, or unknown.

Cardiac Causes

Cardiac abnormalities can cause syncope through a temporary reduction in

blood flow to the brain. This can occur if the heart's electric system malfunctions (producing a heart rate that is abnormally slow or fast) or if there is an obstruction of blood flow out of the heart caused by a narrow heart valve or a thick heart muscle.

Excessively slow heart rate (bradyarrhythmia) (less than 40 beats per minute) can develop from dysfunction of the body's natural pacemaker or damage to the electric network, which activates the heart muscle. These abnormalities develop most often as a result of aging or as a side effect of medications.

Excessively rapid heart rate (tachyarrhythmia) (greater than 100 beats per minute) can develop in the top chambers of the heart (supraventricular tachycardia) or the bottom chambers of the heart (ventricular tachycardia/ventricular fibrillation). Supraventricular tachycardia usually causes palpitations but rarely causes syncope. It is best treated with catheter ablation or medication. Ventricular tachycardia/ventricular fibrillation can also cause syncope and may be a life-threatening rhythm abnormality. It typically occurs in patients with a history of heart disease and requires prompt medical attention. A catheter-

based study (also known as an electrophysiology study) of the heart's electric system is often necessary, and a device to treat the rapid ventricular rhythm may be implanted (implantable cardioverter/defibrillator [ICD]) (for more information about ICDs, please see the Cardiology Patient Page entitled "The implantable cardioverter-defibrillator: a patient perspective." *Circulation*. 2002;105:1022-1024).

Narrowed heart valves, particularly the aortic valve, can lead to syncope. This most often occurs when patients are exercising or taking a medication that may cause the BP or heart rate to drop. A narrowed aortic valve (aortic stenosis) can be a result of aging, can be inherited, or can be a consequence of rheumatic heart disease.

Extreme thickening of the heart muscle (hypertrophic cardiomyopathy) can also obstruct blood flow and cause syncope.

Noncardiac Causes

Fortunately, most syncope is not cardiac in nature.

Vasomotor syncope is the most common cause of syncope. It occurs when a large proportion of blood is pooled in the legs. This causes a fall in BP, lack of blood flow to the brain, and syncope.

The information contained in this *Circulation* Cardiology Patient Page is not a substitute for medical advice, and the American Heart Association recommends consultation with your doctor or healthcare professional.

From Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Mass.

Correspondence to Gunjan J. Shukla, MD, Beth Israel Deaconess Medical Center, Harvard Medical School, 185 Pilgrim Rd, W/Palmer 402, Boston, MA 02215. E-mail gshukla@bidmc.harvard.edu

(*Circulation*. 2006;113:e715-e717.)

© 2006 American Heart Association, Inc.

Circulation is available at <http://www.circulationaha.org>

DOI: 10.1161/CIRCULATIONAHA.105.602250

The 2 major mechanisms of vasomotor syncope are as follows:

1. A drop in BP when standing is known as orthostatic hypotension. In this case, there is a failure in the body's normal ability to constrict blood vessels to prevent pooling of the blood in lower extremities. This commonly occurs as a result of dehydration, use of prescription drugs, and diabetes.
2. More than 80% of syncopal events are vasovagal (neurocardiogenic). When a person is exposed to some sort of stimulus (such as prolonged standing), a reflex controlled by the vasomotor center in brain stem is initiated. This center, which maintains the normal level of contraction of blood vessels, signals the blood vessels in the legs to dilate, causing pooling of blood in the legs and syncope. It also causes a drop in heart rate. Once the patient falls, gravity is no longer pulling the blood away from the brain, and consciousness is regained.

The vasovagal reflex can be activated by variety of stimuli such as feeling extreme pain, standing in a hot and crowded area, seeing blood, taking a warm shower, urinating, or defecating. It may be preceded by warning symptoms, which include sudden yawning, lightheadedness, nausea, sweating, ringing in the ears, or visual effects such as a "grayout." There is often a feeling of profound fatigue or of being "washed out" after recovery from a vasovagal episode. People who have frequent episodes may be able to recognize the warning signals of syncope and lie down, thereby aborting the syncope.

The most common neurological cause of syncope is a seizure. The seizure may be preceded by a characteristic sensation described as an "aura" and sometimes by jerky movements of the body.

Strokes or near strokes rarely can cause syncope. A particular subtype of stroke that affects the back of the brain may result in a sudden loss of stability

and a fall, but consciousness is usually maintained.

Metabolic/endocrine causes of syncope are usually rare and include low blood sugar level (hypoglycemia), reduced oxygen concentration in the blood (hypoxia), or BP drop caused by abnormally low steroid levels (Addison's disease).

How Is Syncope Evaluated?

Patient history and physical examination are the cornerstones in the evaluation of syncope.

A history that describes every syncopal episode is valuable. The situation before the syncopal episodes, hydration status of the patient, symptoms preceding the episode, time and length of the episode, trauma during syncope, and status of the patient on awakening are all relevant information. Patients can assist healthcare providers by supplying a detailed account of the circumstances surrounding a syncopal episode.

A complete physical evaluation is also vital. Healthcare providers will check the heart rate and BP in both the supine and standing positions. BP should also be measured in both the arms and the legs. A thorough heart examination with special attention to abnormal heart sounds is also performed, along with a detailed neurological evaluation.

The history and physical examination provide most of the clues to the diagnosis. Tests can be ordered to verify the diagnosis (Figure). Further testing, which is often helpful, includes an electrocardiogram, measuring of blood glucose level and electrolytes (such as the blood potassium and sodium levels), and complete blood count.

If vasomotor causes are suspected, therapy should be initiated. In some cases, a tilt table test may be useful in confirming the diagnosis. During the tilt table test, patients are placed on an examining table, which is rotated to the vertical position while the heart rate and BP are obtained.

If cardiac causes are suspected, a noninvasive cardiac workup is ordered that includes an echocardiogram, heart rhythm monitoring, and/or an exercise stress test. Rarely, specialized tests such as an electrophysiology study (a form of cardiac catheterization in which the electric system of the heart is evaluated) and cardiac magnetic resonance imaging to evaluate certain familial causes of cardiac syncope are ordered.

If neurological causes are suspected, a computed tomography and/or magnetic resonance imaging scan of the brain is often ordered. An electroencephalogram to screen for seizure activity is also helpful.

How Is Syncope Treated?

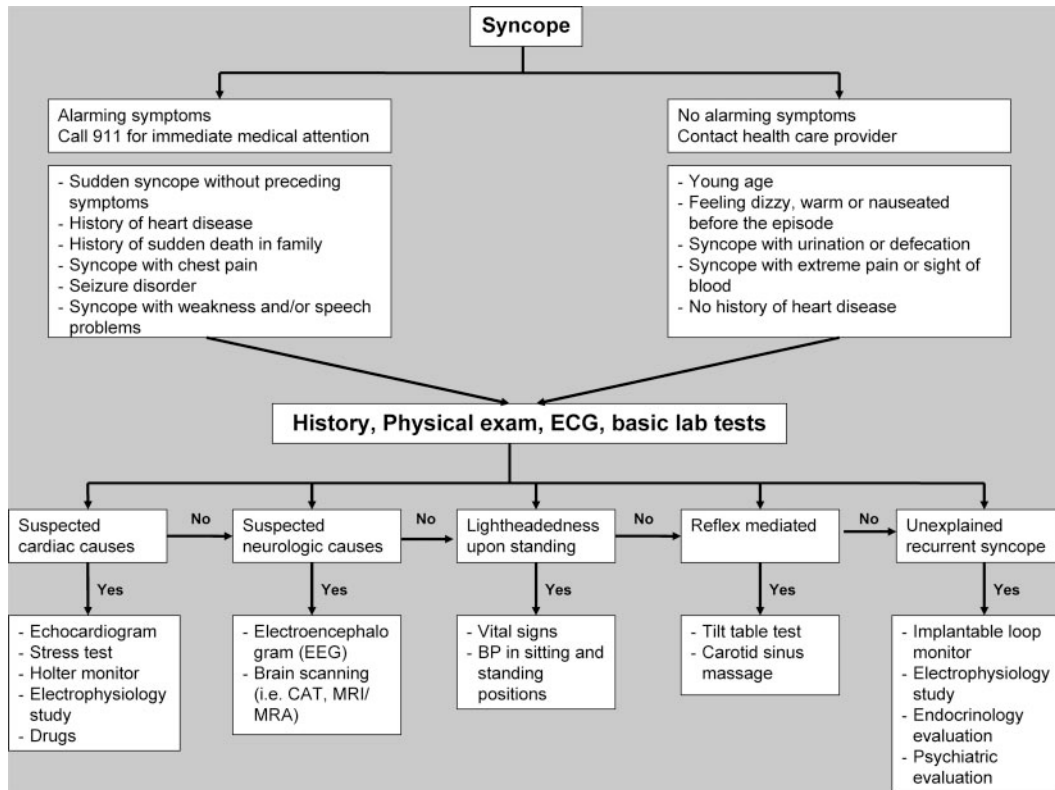
The treatment of syncope depends on the cause.

Bradycardia is treated most often with implantation of a pacemaker. If a medication is causing bradycardia, a different drug that does not cause this side effect may be substituted.

Tachycardia can be treated by several methods. (1) Drugs may be used, but they may be toxic and may actually provoke a worse rhythm disturbance. Therefore, they are used rarely as a primary treatment for tachycardia. (2) Ablation involves evaluation of the electric system of the heart along with the identification and freezing of the offending tissue. (3) An implantable defibrillator is an electronic device that is placed under the skin with wires in the heart; it detects arrhythmias and can terminate them by electric shock.

Aortic stenosis is managed by valve replacement. Hypertrophic cardiomyopathy is treated with medications and sometimes with an ICD.

Vasomotor syncope is primarily related to vasovagal episodes. As discussed above, these episodes may give enough warning beforehand to allow the patient to abort the episode by quickly lying down and elevating the legs. The patient should avoid dehydration. Resistant cases can be treated



Algorithm for evaluation of syncope and suggested diagnostic workup. ECG indicates electrocardiogram; CAT, computed-assisted tomography; MRI, magnetic resonance imaging; and MRA, magnetic resonance angiography.

by a variety of drugs, which, unfortunately, are not very effective. These include drugs to constrict the blood vessels and/or to increase the blood volume. Beta-blockers and some antidepressant medications are also used, with variable effectiveness.

Neurological and endocrinological

causes of syncope are managed with medication in consultation with specialists.

Disclosures

None.

Additional Resources

The Heart Rhythm Society. Fainting (syncope). Available at: <http://www.hrspatients.org/>

patients/signs_symptoms/fainting/default.asp. Accessed March 30, 2006.
 emedicine. Syncope. Available at: <http://emedicine.com/emerg/topic876.htm>. Accessed March 30, 2006.
 About, Inc. Syncope, part I: cardiac syncope. Available at: <http://heartdisease.about.com/cs/arrhythmias/a/Syncope1.htm>. Accessed March 30, 2006.