

Circulation

JOURNAL OF THE AMERICAN HEART ASSOCIATION



Carotid Artery Disease

Piotr Sobieszczyk and Joshua Beckman

Circulation 2006;114:e244-e247

DOI: 10.1161/CIRCULATIONAHA.105.542860

Circulation is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75214

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/114/7/e244>

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>



Carotid Artery Disease

Piotr Sobieszczyk, MD; Joshua Beckman, MD, MS

Carotid arteries are the blood vessels that deliver blood through the neck to the brain. There is one carotid artery on each side of the neck, where its pulsation can be felt with a finger below the jaw bone. Blockages in the carotid artery decrease blood flow to the brain, causing a medical condition known as carotid artery disease. Interruptions in blood flow to the brain (commonly known as stroke) can cause permanent injury. This Cardiology Patient Page describes how blockages resulting from carotid artery disease cause stroke and what you and your doctor can do to prevent it.

What Is Carotid Artery Disease and Why Is It Important?

Stroke, or cerebrovascular accident, is most frequently caused by a sudden stoppage of blood flow to a portion of the brain. Every year in the United States, an estimated 750 000 people become victims of stroke. There are 2 common causes of stroke. First, an irregular heart rhythm, called atrial fibrillation, can cause stroke when small blood clots form as the heart is quivering instead of beating normally. Once a small blood clot is formed, it can be launched by the heart through the carotid arteries, block a blood vessel in the brain, and deprive that part of

the brain of blood, resulting in a stroke.

The other common cause of stroke is a blockage in the carotid arteries. The carotid arteries carry blood to the brain; like the blood vessels that supply blood to the heart, these arteries can become narrowed or blocked. The blockages are deposits of cholesterol, or atherosclerosis, that narrow the blood flow channel in the carotid arteries (Figure 1). If these cholesterol deposits or blockages break or rupture, small blood clots and cholesterol fragments break off from the plaque, enter the blood flow to the brain, and can get caught in a smaller blood vessel in the brain, thus stopping blood flow to that area of the brain. The larger the cholesterol plaque and more severe the blockage of the carotid artery, the higher the risk of stroke is.

What Are the Symptoms of Carotid Artery Disease?

Carotid artery blockage often has no symptoms and is unknown to the patient and doctor until it disrupts blood flow to the brain. Once an area of the brain is deprived of blood, it stops functioning. The symptoms you may experience (Table 1) depend on the location of the blocked brain blood vessel. For instance, you may notice that you lose vision in one eye, begin

to slur your words, or have difficulty finding words and expressing yourself. Stroke victims often lose strength or feeling in an arm, leg, or entire side of the body. You may notice numbness and heaviness involving your arm or leg. Some patients describe a feeling of loss of control of their leg or arm. One side of your face may become numb and droopy. If you develop any of these symptoms, you should seek immediate medical attention to prevent further brain injury. Sometimes, these symptoms may last for only minutes or hours. Although you may feel back to normal, you should still talk to your doctor immediately. Any of these symptoms may be a warning sign of a transient ischemic accident (TIA) or small stroke and means that you are at high risk for a permanent stroke. To prevent a stroke, your doctor will try to find the cause of the TIA before it causes permanent injury to the brain.

How Will Your Doctor Find a Narrowing in the Carotid Artery?

Your doctor can find a blockage in the carotid artery by listening with a stethoscope to the blood flow in your neck. A narrowing in the artery creates a characteristic “swooshing” sound called a bruit. When a bruit is heard or when your doctor suspects a carotid

From the Cardiovascular Division, Brigham and Women's Hospital, Boston Mass.

Correspondence to Joshua Beckman, MD, MS, Cardiovascular Division, Brigham and Women's Hospital, 75 Francis St, Boston, MA 02115. E-mail jbeckman@partners.org

(*Circulation*. 2006;114:e244-e247.)

© 2006 American Heart Association, Inc.

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

DOI: 10.1161/CIRCULATIONAHA.105.542860

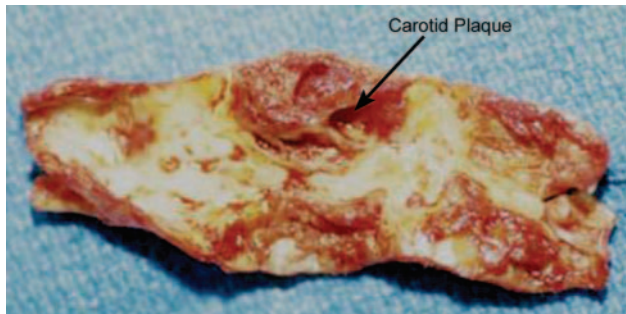


Figure 1. The accumulation of cholesterol in the wall of the carotid artery is shown after surgical removal of that artery. Photograph courtesy of Dr E. Gravereaux, Harvard Medical School, Boston, Mass.

artery blockage because of the symptoms that you describe, he or she will order an imaging test to determine whether a blockage is present. The most frequently ordered test is an ultrasound of the carotid arteries. This quick test uses sound waves and is performed by a technologist who puts an ultrasound probe on the side of your neck. A picture of the artery and the blood flowing through it is displayed on a monitor and can show the location of a blockage (Figure 2). Two other tests used to detect narrowing in the neck arteries are the computed tomography angiogram and magnetic resonance angiogram (Figure 3). During these tests, you lie in a scanner and a contrast dye is injected into a vein in your arm to allow the scanner to take detailed pictures of the arteries. Any of these tests will provide your doctor with the information to determine the severity of the narrowing.

What Is the Treatment for Carotid Artery Disease?

The best treatment for carotid artery narrowing is the prevention of progression. You should talk with your doctor to

TABLE 1. Common Symptoms in TIA or Stroke

A loss of vision in one or both eyes
Difficulty speaking or slurring of speech
Difficulty finding words or expressing yourself
Weakness or numbness in a limb
Facial numbness or droopiness
Difficulty with balance or walking

find out if you have medical conditions or lifestyle habits that put you at risk for developing and worsening carotid artery blockages (Table 2). If you are at risk or if your doctor finds a narrowing in the carotid artery, he or she will discuss with you several ways to keep the blockage from becoming more severe.

Treatment of High Blood Pressure (Hypertension)

There is strong evidence that high blood pressure leads to cholesterol deposits in the carotid arteries, thus increasing the chance of plaque rupture and stroke. Blood pressure measurement is a routine part of a physical examination, and high blood pressure is

easy to detect. It is recommended that the first, or top, number in your blood pressure measurement should be below 140. If you have diabetes, that number should be lower than 130. If your blood pressure is higher than these numbers, your doctor will choose one of many blood pressure-lowering medications to treat your hypertension. The degree to which your blood pressure is lowered is more important than the type of medication used. Weight loss and regular exercise also lower your blood pressure and are strongly recommended as part of every treatment program.

Treatment of High Cholesterol

Elevated cholesterol levels in your blood lead to cholesterol deposits and blockages in the arteries. Lowering your cholesterol level can prevent carotid artery blockage formation and progression, as well as stroke. Changing your diet, losing weight, and exercising are some important ways to control your cholesterol level. Your doctor may also recommend treatment with a cholesterol-lowering medication (called a “statin”) to reach a healthy cholesterol level, especially if a narrowing is already present.

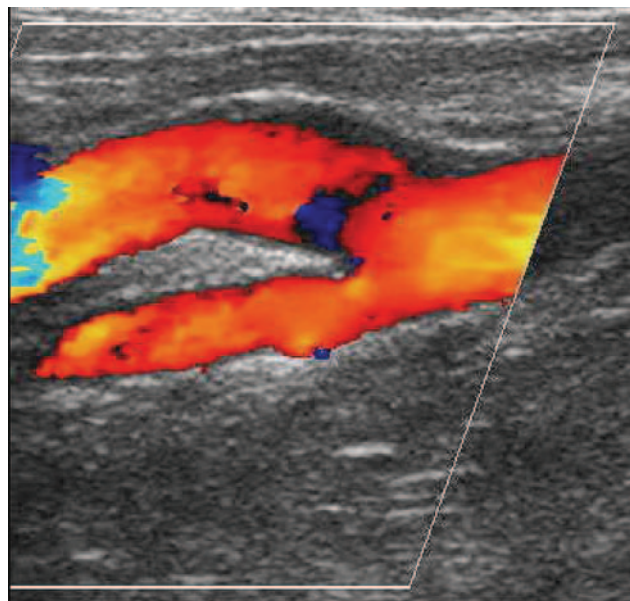


Figure 2. Ultrasound image of a healthy carotid artery and its 2 branches. The red color indicates blood flow through the artery.

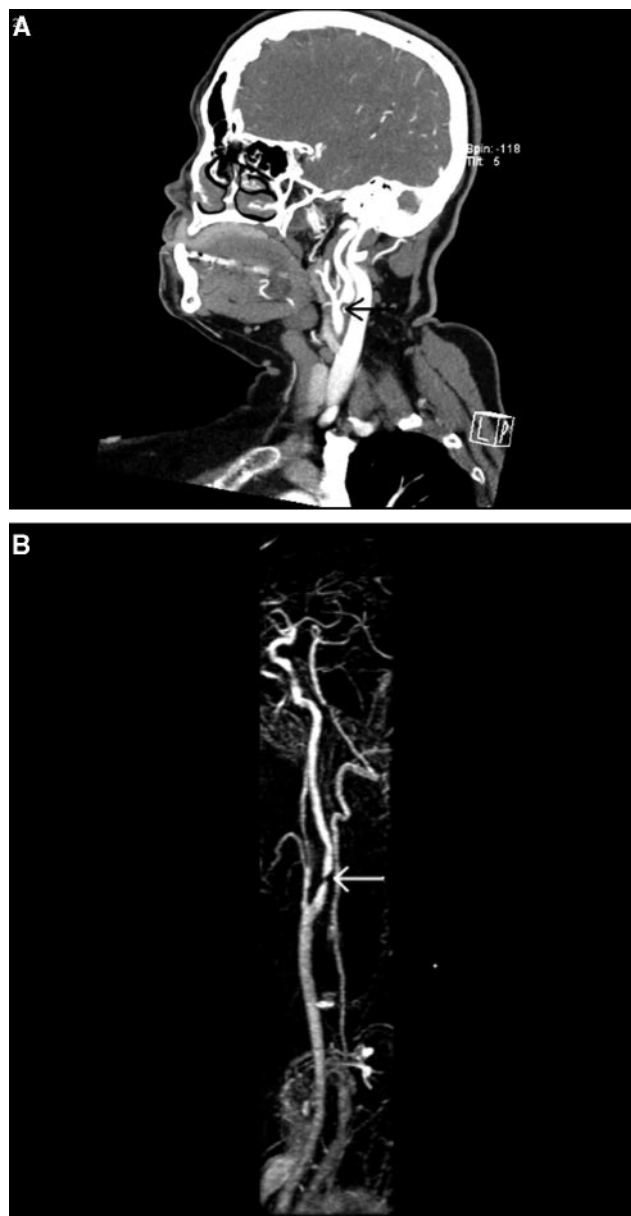


Figure 3. A, Computed tomography angiogram scan of a carotid artery in the neck. B, Magnetic resonance angiogram of the carotid artery. The arrow in each image indicates a blockage.

Smoking

Smoking damages the lining of the blood vessels and makes cholesterol deposits more likely to form. Smoking can be linked to nearly 1 of every 4 strokes in the United States. Stopping smoking is extremely important to keep carotid artery blockages from worsening and to prevent stroke. The high risk of stroke observed among smokers returns to that of nonsmokers

within 5 years of smoking cessation, suggesting that it is never too late to quit.

Treatment of Diabetes

People with diabetes are more likely to have high blood pressure and high cholesterol and are much more likely to develop cholesterol blockages in their arteries. If you have diabetes, your risk of carotid disease and stroke

TABLE 2. Common Carotid Artery Disease Risk Factors

Smoking
High blood pressure
High cholesterol
Diabetes
Advanced age (>70 years)

is 4 times higher than that of people without diabetes. Controlling blood pressure and cholesterol and glucose levels with medications is even more important for people with diabetes because of their higher risk for carotid artery disease.

Blood Thinning

Platelets are blood cells responsible for the first stages of blood clot formation in the arteries. Medications such as aspirin or clopidogrel block the function of platelets and reduce the ability of platelets to stick together and form a clot. In a carotid artery narrowed by cholesterol deposits, small blood clots can form, break off, and block smaller arteries in the brain. Antiplatelet medications are effective in preventing this from happening and are recommended for patients with carotid artery blockages.

Treatment of Severe Carotid Artery Narrowing

The risk of stroke is related to the severity of the blockage in the carotid artery. If your blockage becomes severe, particularly if you experienced a short-lived TIA, your doctor may recommend a procedure to remove the blockage from the carotid artery and thus improve the blood flow through it. There are 2 accepted methods of opening blocked carotid arteries.

Carotid endarterectomy is an operation performed under anesthesia. The carotid artery is opened through an incision in the neck, the cholesterol blockage is “scooped-out,” and the vessel is stitched back together (Figure 4). The surgery itself carries a low risk of stroke, heart attack, or death and is reserved for severe narrowing of the carotid artery. Carotid endarterectomy

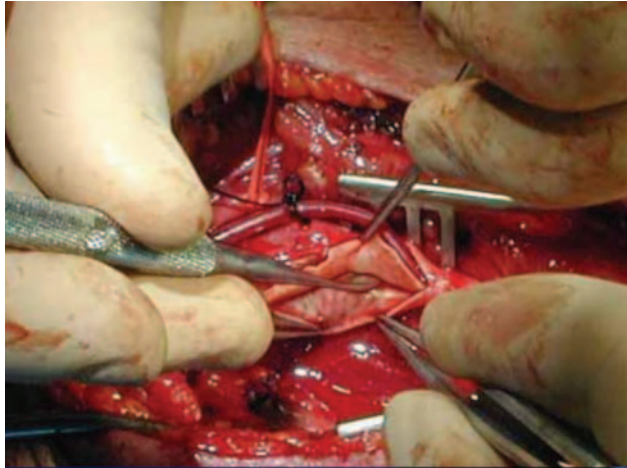


Figure 4. The carotid artery during carotid surgery is shown. Photograph courtesy of Dr E. Gravereaux, Harvard Medical School, Boston, Mass.

is appropriate for patients who have had a stroke or a TIA and who have a carotid artery narrowing of 50% or more. Your doctor may also recommend this surgery if you never had a stroke or TIA but your carotid artery is narrowed by 70% or more.

Carotid artery stenting is a procedure that is performed under local anesthesia using a small tube that is inserted into an artery in the groin area of the leg. Under x-ray guidance, a flexible tube-like wire mesh (a stent) is

positioned and expanded across the blockage in the artery. The stent pushes the cholesterol deposit out of the way and restores blood flow (Figure 5). Carotid artery stenting is an alternative to surgery for patients who are too ill to undergo carotid endarterectomy. The risks of heart attack, stroke, or death associated with this procedure are very low.

What Is the Best Treatment for Me?

Every patient at risk of developing or who already has a carotid artery blockage should receive aggressive medical therapy to stop the blockage from worsening and to prevent stroke. The treatments include lifestyle modification and administration of cholesterol lowering medications, aspirin, and medications to control blood pressure. A procedure to clear up the blockage may be necessary if the narrowing becomes severe or if you experience stroke symptoms. Your doctor will help you decide on the type of procedure that is appropriate for you.

Patients who have carotid artery disease are likely to have blockages (atherosclerosis) in other arteries of the body, especially in the arteries of the heart and legs, and are much more likely to have a heart attack or stroke than are patients without carotid artery disease. If you are diagnosed with a blockage in your carotid arteries, your doctor will work closely with you to decrease your risk of having a heart attack or stroke.

Disclosures

None.

Additional Resources

American Stroke Association. Heart and stroke encyclopedia. Available at: <http://www.strokeassociation.org/presenter.jhtml?identifier=10000067>. Accessed on February 20, 2006.

Vascular Disease Foundation. Carotid artery disease: what is it? Available at: <http://www.vdf.org/Carotid/>. Accessed February 20, 2006.

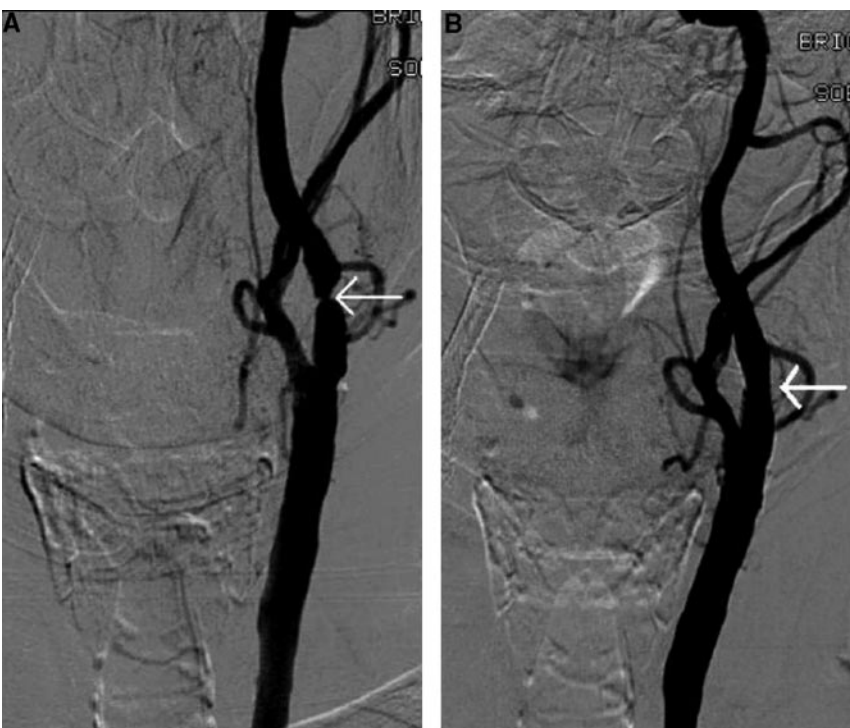


Figure 5. A blockage in the carotid artery (arrow) before (A) and after (B) carotid stenting.