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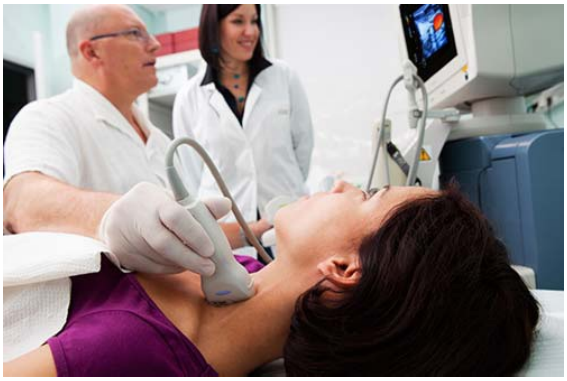
For patients

Carotid Artery Screening

What is carotid artery screening?



Screening exams find disease before symptoms begin. The goal of screening is to detect disease at its earliest and most treatable stage. In order to be widely accepted and recommended by medical practitioners, a screening program must meet a number of criteria (https://www.radiologyinfo.org/en/info/safety-hiw_05) , including reducing the number of deaths from the given disease.

Screening tests may include lab tests that check blood and other fluids, genetic tests that look for inherited genetic markers linked to disease, and imaging exams that produce pictures of the inside of the body. These tests are typically available to the general population. However, an individual's needs for a specific screening test are based on factors such as age, gender, and family history.

In carotid artery screening, individuals who have no signs or symptoms of carotid artery disease undergo ultrasound (US) imaging of the carotid arteries, such as:

- carotid duplex ultrasound
- carotid intima media thickness (IMT) ultrasound.

Ultrasound Imaging

Ultrasound imaging (https://www.radiologyinfo.org/en/info/genus) , also called ultrasound scanning or sonography or carotid duplex, is a safe and painless way to produce pictures of the inside of the body using sound waves. Conventional US involves the use of a small transducer (http://www.radiologyinfo.org) (probe) to expose the body to high-frequency sound waves. Doppler ultrasound (http://www.radiologyinfo.org) is a special ultrasound technique that evaluates blood flow — including both its speed and direction— through a blood vessel.

- Carotid duplex US uses a combination of conventional and Doppler ultrasound to:
  - assess blood flow in the carotid arteries
  - measure the speed of the blood flow
  - estimate the diameter of a blood vessel and degree of obstruction, if present.
- Carotid intima media thickness (IMT) US uses ultrasound pictures of the carotid arteries to measure the thickness of the two innermost layers (the intima (http://www.radiologyinfo.org) and media (http://www.radiologyinfo.org)) of the carotid artery walls and to help identify plaque buildup. An abnormal thickening of the artery walls may signal the development of cardiovascular disease.

About Carotid Artery Disease

The carotid arteries are the two main arteries that carry oxygen-rich blood from the heart to the brain. These two blood vessels extend through each side of the neck.

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Carotid artery disease occurs when plaque (http://www.radiologyinfo.org) (a build-up of fat, cholesterol (http://www.radiologyinfo.org) and other substances) collects and forms along the walls of the carotid arteries. This buildup of plaque and the injury it causes is called atherosclerosis (http://www.radiologyinfo.org) . Over time, the walls of affected arteries thicken and become stiff and the blood vessel may also become narrowed (a condition called stenosis (https://www.radiologyinfo.org/en/info/carotidstenosis)), limiting blood flow.

Left untreated, carotid artery disease increases the risk for stroke (http://www.radiologyinfo.org) . A stroke occurs when blood flow to the brain is obstructed by plaque or blood clots, when bits of plaque break free and travel to smaller arteries in the brain, or when a blood vessel in the brain ruptures. A lack of oxygen and other essential nutrients may cause permanent damage to the brain or death.

According to the Centers for Disease Control and Prevention (CDC), stroke is the fourth leading cause of death in the United States and a leading cause of long-term severe disability.

Risk Factors

Anything that increases an individual's chances of developing disease is called a risk factor. Risk factors for carotid artery disease include:

- age
- high blood pressure
- diabetes
- tobacco smoking
- high cholesterol
- coronary artery disease (CAD)
- obesity
- physical inactivity
- family history of atherosclerosis and/or stroke

Who should consider carotid artery screening?

Screening Recommendations

Carotid Duplex US
Joint guidelines (https://circ.ahajournals.org/content/124/4/e54.full.pdf) issued by the American College of Cardiology Foundation, American Heart Association, American Stroke Association and other healthcare groups suggest that carotid duplex US may be considered for asymptomatic (http://www.radiologyinfo.org) patients who have peripheral artery disease (http://www.radiologyinfo.org) , coronary artery disease (http://www.radiologyinfo.org) , atherosclerotic aortic aneurysm (http://www.radiologyinfo.org) , or at least two risk factors for stroke including:

- high blood pressure
- high cholesterol
- tobacco smoking
- a first-degree relative with atherosclerosis that developed before age 60
- a family history of ischemic stroke (http://www.radiologyinfo.org)

According to the Society for Vascular Medicine guidelines (http://www.vascularweb.org/about/positionstatements/Pages/svs-position-statement-on-vascular-screening.aspx) , carotid duplex US may be beneficial for assessing stroke risk in individuals who are 55 years of age or older with cardiovascular risk factors such as a history of:

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- high blood pressure
- diabetes
- smoking
- high cholesterol
- known cardiovascular disease

The American Heart Association guidelines also state that carotid duplex US is a reasonable approach for asymptomatic patients with carotid bruit (http://www.radiologyinfo.org) , an abnormal sound that may indicate turbulent blood flow, detected by a stethoscope when placed on top of the carotid arteries in the neck.

Carotid intima media thickness (IMT) US
Carotid IMT US is not universally accepted as a means of screening for carotid artery disease. However, the thickness of the innermost layers of the carotid artery walls is an independent marker for atherosclerosis.

According to the Society for Vascular Medicine (https://journals.sagepub.com/doi/full/10.1177/1358863X14557722) and the American Society for Echocardiography (ASE), the use of carotid IMT US is most useful for refining the risk for cardiovascular disease in patients who are at intermediate risk for developing the disease. According to the ASE, the test may also be considered for individuals:

- with a family history of premature cardiovascular disease in a first-degree relative (disease that occurs in a man before he is 55 years old or in a woman before she is 65 years old).
- who are younger than 60 years old with severe abnormalities in a profound, single risk factor who otherwise would not be candidates for medication therapy.
- who are female, younger than 60 years old and have at least two cardiovascular disease risk factors.

You should consult with your doctor to determine which screening tests for carotid artery disease are appropriate for you.

How is carotid artery screening performed?

For most ultrasound exams, you will lie face-up on an exam table that can be tilted or moved. Patients may turn to either side to improve the quality of the images.

The technologist applies a clear water-based gel to the body area under examination. This helps the transducer make secure contact with the body. It also helps eliminate air pockets between the transducer and the skin that can block the sound waves from passing into your body. The technologist or radiologist places the transducer on the skin in various locations, sweeping over the area of interest. They may also angle the sound beam from a different location to better see an area of concern.

Doppler sonography and Carotid IMT US are performed using the same transducer.

When the exam is complete, the technologist may ask you to dress and wait while they review the ultrasound images.

What are the benefits and risks of carotid screening?

Carotid Ultrasound

Benefits

- Most ultrasound scanning is noninvasive (no needles or injections).
- Occasionally, an ultrasound exam may be temporarily uncomfortable, but it should not be painful.
- Ultrasound is widely available, easy to use, and less expensive than most other imaging methods.

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- Ultrasound imaging is extremely safe and does not use radiation.
- Ultrasound scanning gives a clear picture of soft tissues that do not show up well on x-ray images.
- Ultrasound may allow early detection of and intervention for cardiovascular disease.
- If a carotid ultrasound exam shows narrowing of one or both carotid arteries, treatment can be taken to restore the free flow of blood to the brain. Many strokes are prevented as a result.

Risks

- Standard diagnostic ultrasound (http://www.radiologyinfo.org) has no known harmful effects on humans.
- In nearly 50 years of experience, carotid ultrasound has proved to be a risk-free procedure.
- False positive results can occur. The ultrasound test may produce results suggesting blockages when there are none.
- Carotid IMT US is dependent on both the expertise of the sonographer and the resolution of the ultrasound machine being used.

What happens if something is detected on my screening exam?

If your carotid artery screening reveals that you have narrowing of the carotid arteries, hence are at risk of a stroke or other cardiovascular issue, your doctor may recommend one of the following therapies, depending on the severity of blockage in your arteries.

Treatments for carotid artery disease may include medication to reduce cholesterol levels and high blood pressure, lifestyle changes (including healthy diet, exercise, and no smoking) and interventional procedures such as angioplasty (http://www.radiologyinfo.org) and stenting (http://www.radiologyinfo.org) or surgical procedures such as carotid endarterectomy (http://www.radiologyinfo.org) to restore adequate blood flow to the brain.

In angioplasty and vascular stenting, a balloon catheter (http://www.radiologyinfo.org) is inserted to open the artery and a metal mesh tube called a stent (http://www.radiologyinfo.org) is placed at the site of the blockage to keep the artery open. In carotid endarterectomy, plaque buildup is surgically removed. *For more information, see the Angioplasty and Vascular Stenting (https://www.radiologyinfo.org/en/info/angioplasty) procedure page.*

Where can I find more information about carotid artery screening?

You can find more information on carotid artery screening at:

- *American Heart Association (https://www.heart.org/)*

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