

## **Carotid Ultrasound**

- ***What is Carotid Ultrasound Imaging?***
- ***What are some common uses of the Carotid Ultrasound procedure?***
- ***How should I prepare for my Carotid Ultrasound procedure?***
- ***How does the Carotid Ultrasound procedure work?***
- ***How is the Carotid Ultrasound performed?***
- ***What will I experience during my Carotid Ultrasound procedure?***
- ***What are the benefits vs. risks of Carotid Ultrasound?***
- ***What are the limitations of Carotid Ultrasound Imaging?***

### *What is Carotid Ultrasound Imaging?*

Ultrasound, also called sonography, uses high-frequency sound waves to image a particular region or organ in the body or to monitor blood flow. It is a totally noninvasive procedure that causes no discomfort. Sound waves are focused at a part of the body, and the returning echoes are processed by computer to yield clear and accurate images of the part of the body being examined. The returning sound waves, or echoes, reflect the size and shape of the structure and whether it is solid, fluid, or something in between. In a carotid ultrasound exam, it is the carotid arteries, which are the large vessels in the neck that deliver blood to the brain, being examined. Carotid ultrasound can depict plaque that narrows the artery and may limit the free flow of blood to the brain.

Unlike x-rays, ultrasound requires no exposure to ionizing radiation, meaning that repeat imaging may be carried out without concern of accumulating radiation exposure. In addition, carotid ultrasound is a real-time technique that provides a picture of blood flow as it is at the very moment of imaging.



*Ultrasound: Carotid bifurcation.*

*What are some common uses of the Carotid Ultrasound procedure?*

The most frequent reason for a carotid ultrasound exam is to detect narrowing, or stenosis, of the carotid artery, which substantially increases the risk of stroke. If your primary care physician detects high blood pressure or a carotid bruit (pronounced brU-E)—an abnormal sound in the neck that is heard with the stethoscope—carotid ultrasound may be needed. Other risk factors calling for ultrasound are advanced age, diabetes, elevated blood cholesterol, and a family history of stroke or heart disease.

If the exam shows narrowing of one or both carotid arteries, your physician may suggest medication, noninvasive angiography, or an operation to restore normal blood flow to the brain. In this way a stroke may be prevented.

Other reasons for performing carotid ultrasound are:

- To locate a hematoma, a collection of clotted blood that may slow and eventually stop blood flow.
- To detect dissection of the carotid artery, a split between layers of the artery wall that may lead to obstruction of blood flow or a weakening of the wall of the artery.
- To check the state of the carotid artery after surgery to restore normal blood flow.
- To verify the position of a metal stent placed to maintain carotid blood flow.

### *How should I prepare for my Carotid Ultrasound procedure?*

No special preparation is needed for carotid ultrasound. Wear a loose-fitting, open necked shirt or blouse for the exam. You will be asked to remove any jewelry or other objects from around your neck.



*Ultrasound of carotid.*

### *How does the Carotid Ultrasound procedure work?*

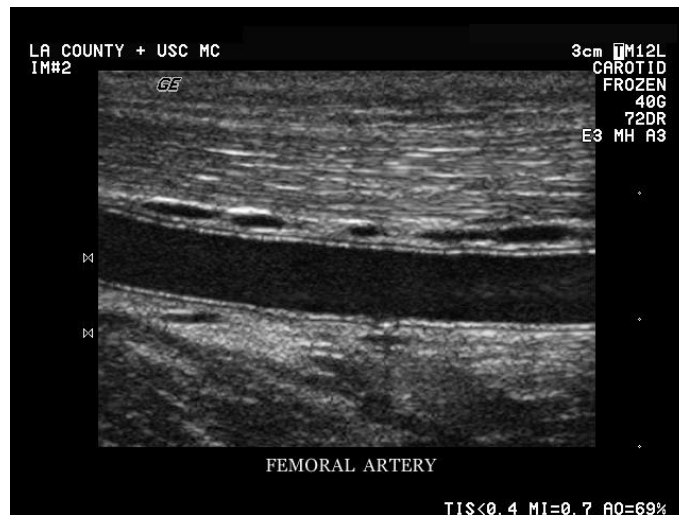
Ultrasound is based on the same principle as sonar, used by Navy ships to detect large underwater objects such as submarines, or by fishermen to locate large schools of fish. An example of the principle from nature is the bat, which uses a sonar-like system instead of eyesight to avoid colliding with nearby objects and to find insects to eat.

For the exam, the transducer is pressed against the skin on both sides of the neck from the collarbone to the angle of the jaw. As it is moved, it directs a stream of high-frequency sound waves toward the carotid arteries.

The sound waves are reflected back at a frequency that varies with how fast blood is flowing through the artery. The transducer changes electrical signals into the outgoing sound waves. It then receives the reflected sound waves and converts them back into electrical signals.

These signals are measured and displayed on the computer screen, providing a real-time picture of arterial structure and blood flow. The transducer, in effect, acts as a loudspeaker to create sound vibrations and also as a microphone to record them. The images may be recorded on videotape, and freeze-frame still pictures usually are obtained as well. Most

often, black-and-white images are satisfactory, but a special type of ultrasound unit—called Doppler ultrasound—is able to display color images to demonstrate flow in the arteries and veins.



*Ultrasound: Femoral artery.*

#### *How is the Carotid Ultrasound performed?*

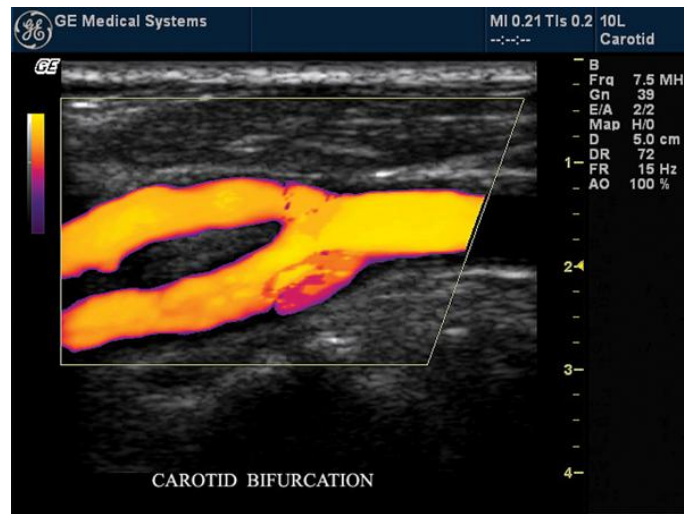
Carotid ultrasound is performed as an outpatient office procedure. You will be asked to lie flat on your back on a bed that can tilt and move. It may be necessary to tilt or rotate your head for the best exposure. It also helps to keep your arm and shoulder down. Your head will be supported to keep it still.

A warm water-based gel is applied to the skin surface to eliminate air pockets and ensure that the transducer will make secure contact with the skin. The radiologic technologist then will move the transducer up and down the entire length of your neck to obtain views of the artery from different perspectives. The procedure then is repeated on the other side of the neck. After reviewing the findings, the radiologist may wish to obtain further images to clarify the findings.

#### *What will I experience during my Carotid Ultrasound procedure?*

You should not experience pain or discomfort during a carotid ultrasound examination. You will lie on the examining table in a slightly darkened room. You may hear some pulse-like sounds depending on the type of ultrasound being performed. You may be offered a chance to watch the screen along with the technologist. If you choose to do so, you should not hesitate to ask questions about what you are seeing. A carotid ultrasound is usually completed within 30 minutes, though the exam may sometimes take an

hour. The technologist will remove the gel from your skin, and you may leave and immediately resume your normal activities.



*Ultrasound: Carotid bifurcation*

*What are the benefits vs. risks of Carotid Ultrasound?*

### **Benefits**

- Ultrasound exams, unlike most other forms of imaging, involve no radiation exposure. The procedure is painless and totally noninvasive, and there are no known complications or side effects. Adverse reactions to contrast material are avoided.
- Ultrasound uses no ionizing radiation, and is the preferred imaging modality for diagnosis and monitoring of pregnant women.
- If a carotid ultrasound exam shows narrowing of one or both carotid arteries, measures can be taken to restore the free flow of blood to the brain. Many strokes are prevented as a result.
- An ultrasound exam is less costly than an alternative imaging method, CT scanning.

### **Risks**

- In nearly 50 years of experience, carotid ultrasound has proved to be a risk-free procedure.

*What are the limitations of Carotid Ultrasound Imaging?*

- Carotid ultrasound may be difficult or impossible if a patient has a dressing covering a wound or surgical scar in the neck.

- An occasional patient is difficult to examine because of the size or contour of the neck.
- Calcium deposits in the wall of the carotid artery may make it difficult to evaluate the vessel.
- A small amount of soft plaque that produces low-level echoes may go undetected.
- Ultrasound may not clearly depict the end segment of the carotid artery, but this is very seldom a site of disease.