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For patients

Breast Ultrasound

Ultrasound imaging of the breast uses sound waves to produce pictures of the internal structures of the breast. It is used to help diagnose breast lumps or other abnormalities found during a physical exam, or on a mammogram or breast MRI. Ultrasound is safe, noninvasive, and does not use radiation.

This exam requires little to no special preparation. Leave jewelry at home and wear loose, comfortable clothing. You will need to undress from the waist up and to wear a gown during the exam.

What is Ultrasound Imaging of the Breast?

Ultrasound imaging is a noninvasive medical test that helps physicians diagnose and treat medical conditions. It is safe and painless. It produces pictures of the inside of the body using sound waves. Ultrasound imaging is also called sonography. It uses a small probe called a transducer and gel placed directly on the skin. High-frequency sound waves travel from the probe through the gel into the body. The probe collects the sounds that bounce back. A computer uses those sound waves to create an image. Ultrasound exams do not use radiation (x-rays). Because ultrasound captures images in real-time, it can show the structure and movement of the body's internal organs. The images can also show blood flowing through blood vessels.

Doppler ultrasound is a special ultrasound technique that evaluates movement of materials in the body. It allows the doctor to see and evaluate blood flow through arteries and veins in the body.

Ultrasound (US) of the breast produces a picture of the internal structures of the breast.

During a breast ultrasound exam, the sonographer or doctor may use Doppler techniques to evaluate blood flow or lack of flow in any breast mass. In some cases, this may provide additional information as to the cause of the mass.

What are some common uses of the procedure?

- **Determining the Nature of a Breast Abnormality**
  Doctors use breast ultrasound to help diagnose breast abnormalities detected during a physical exam. These may include a lump or spontaneous bloody/clear nipple discharge. They also use ultrasound to characterize potential abnormalities seen on mammography or breast magnetic resonance imaging (MRI).

  Breast ultrasound can help determine if an abnormality is solid (which may be a non-cancerous lump of tissue or a cancerous tumor), fluid-filled (such as a benign cyst), or both cystic and solid.

- **Supplemental Breast Cancer Screening**
  Mammography (https://www.radiologyinfo.org/en/info/mammo) is the only screening tool for breast cancer that is known to reduce deaths due to breast cancer through early detection. Even so, mammograms do not detect all breast cancers. Some breast lesions and abnormalities are not visible or are difficult to interpret on mammograms. In breasts that are dense – meaning there are a lot of ducts, glands, and fibrous tissue and less fat – many cancers can be hard to see on mammography.

Many studies have shown that breast ultrasound and MRI can help supplement mammography by detecting cancers that may not be visible with mammography. Screening breast ultrasound may identify abnormalities that are not visible with mammography, including some that may require biopsy. Many of the abnormalities found with screening breast ultrasound are not cancer (false positives). MRI is more sensitive than ultrasound in depicting breast cancer, but MRI may not be available to all women. If you obtain a screening MRI, screening ultrasound is not needed. *See the Breast Cancer Screening page (https://www.radiologyinfo.org/en/info/screening-breast) for more information.*

Breast ultrasound can be offered as a screening tool for women who:

- are at high risk for breast cancer and unable to undergo an MRI exam.
- are pregnant or should not be exposed to x-rays (which is necessary for a mammogram).
- have increased breast density — when the breasts have a lot of glandular and connective tissue and not much fatty tissue *(see the Dense Breasts (https://www.radiologyinfo.org/en/info/dense-breasts) page for more information).*

- **Ultrasound-guided Breast Biopsy**
  When a breast ultrasound reveals a suspicious abnormality, the radiologist may recommend an ultrasound-guided biopsy. Because ultrasound provides real-time images, doctors often use it to guide biopsy procedures. A breast ultrasound exam will usually be necessary before the biopsy to plan the procedure and to determine if this method can be used.

  See the Ultrasound-guided Breast Biopsy (https://www.radiologyinfo.org/en/info/breastbius) page for more information.

How should I prepare?

You will need to undress from the waist up and to wear a gown during the exam.

What does the equipment look like?

Ultrasound machines consist of a computer console, video monitor and an attached transducer. The transducer is a small hand-held device that resembles a microphone. Some exams may use different transducers (with different capabilities) during a single exam. The transducer sends out inaudible, high-frequency sound waves into the body and listens for the returning echoes. The same principles apply to sonar used by boats and submarines.

The technologist applies a small amount of gel to the area under examination and places the transducer there. The gel allows sound waves to travel back and forth between the transducer and the area under examination. The ultrasound image is immediately visible on a video monitor. The computer creates the image based on the loudness (amplitude), pitch (frequency), and time it takes for the ultrasound signal to return to the transducer. It also considers what type of body structure and/or tissue the sound is traveling through.

How does the procedure work?

Ultrasound imaging uses the same principles as the sonar that bats, ships, and fishermen use. When a sound wave strikes an object, it bounces back or echoes. By measuring these echo waves, it is possible to determine how far away the object is as well as its size, shape, and consistency. This includes whether the object is solid or filled with fluid.

Doctors use ultrasound to detect changes in the appearance of organs, tissues, and vessels and to detect abnormal masses, such as tumors.

In an ultrasound exam, a transducer both sends the sound waves and records the echoing (returning) waves. When the transducer is pressed against the skin, it sends small pulses of inaudible, high-frequency sound waves into the body. As the sound waves bounce off internal organs, fluids and tissues, the sensitive receiver in the transducer records tiny changes in the sound's pitch and

direction. A computer instantly measures these signature waves and displays them as real-time pictures on a monitor. The technologist typically captures one or more frames of the moving pictures as still images. They may also save short video loops of the images.

Doppler ultrasound, a special ultrasound technique, measures the direction and speed of blood cells as they move through vessels. The movement of blood cells causes a change in pitch of the reflected sound waves (called the Doppler effect). A computer collects and processes the sounds and creates graphs or color pictures that represent the flow of blood through the blood vessels.

How is the procedure performed?

You will lie on your back or on your side on the exam table. The sonographer may ask you to raise your arm(s) above your head.

The radiologist (a doctor specifically trained to supervise and interpret radiology exams) or sonographer will position you on the exam table. They will apply a water-based gel to the area of the body under examination. The gel will help the transducer make secure contact with the body. It also eliminates air pockets between the transducer and the skin that can block the sound waves from passing into your body. The sonographer places the transducer on the body and moves it back and forth over the area of interest until it captures the desired images.

There is usually no discomfort from pressure as they press the transducer against the area being examined. However, if the area is tender, you may feel pressure or minor pain from the transducer.

Doctors perform Doppler sonography with the same transducer.

Once the imaging is complete, the technologist will wipe off the clear ultrasound gel from your skin. Any portions that remain will dry quickly. The ultrasound gel does not usually stain or discolor clothing.

What will I experience during and after the procedure?

Most ultrasound exams are painless, fast, and easily tolerated.

Breast ultrasound is usually completed within 30 minutes.

If the doctor performs a Doppler ultrasound exam, you may hear pulse-like sounds that change in pitch as they monitor and measure the blood flow.

You may need to change positions during the exam.

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

After an ultrasound exam, you should be able to resume your normal activities immediately.

Who interprets the results and how do I get them?

A radiologist, a doctor trained to supervise and interpret radiology exams, will analyze the images. The radiologist will send a signed report to the doctor who requested the exam. Your doctor will then share the results with you. In some cases, the radiologist may discuss results with you after the exam.

You may need a follow-up exam. If so, your doctor will explain why. Sometimes a follow-up exam further evaluates a potential issue with more views or a special imaging technique. It may also see if there has been any change in an issue over time. Follow-up exams are often the best way to see if treatment is working or if a problem needs attention.

What are the benefits vs. risks?

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.
- 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 provides real-time imaging. This makes it a good tool for guiding minimally invasive procedures such as needle biopsies and fluid aspiration.
- Ultrasound imaging can help detect lesions in women with dense breasts.
- Ultrasound may help detect and classify a breast lesion that cannot be interpreted adequately through mammography alone.
- Using ultrasound, doctors are able to determine that many areas of clinical concern are due to normal tissue (such as fat lobules) or benign cysts. For most women 30 years of age and older, a mammogram will be used together with ultrasound. For women under age 30, ultrasound alone is often enough to determine whether an area of concern needs a biopsy or not.

Risks

- Standard diagnostic ultrasound has no known harmful effects on humans.
- Interpretation of a breast ultrasound exam may lead to additional procedures such as follow-up ultrasound and/or aspiration or biopsy. Many of the areas thought to be of concern turn out to be non-cancerous (false positives).

What are the limitations of Ultrasound Imaging of the Breast?

- Ultrasound is one of the tools used in breast imaging, but it does not replace annual mammography.
- Many cancers are not visible on ultrasound. Many calcifications seen on mammography cannot be seen on ultrasound. Some early breast cancers only show up as calcifications on mammography. MRI findings that are due to cancer are not always seen with ultrasound.
- Biopsy may be recommended to determine if a suspicious abnormality is cancer or not.
- Most suspicious findings on ultrasound that require biopsy are not cancers.
- Many facilities do not offer ultrasound screening, even in women with dense breasts, and the procedure may not be covered by some insurance plans.
- It is important to choose a facility with expertise in breast ultrasound, preferably one where the radiologists specialize in breast imaging. Ultrasound depends on the abnormality being recognized at the time of the scan as it is a "real-time" examination. This requires experience and good equipment. One measure of a facility's expertise in breast ultrasound can be found in its ACR accreditation status. Check the facilities in your area by searching the ACR-accredited facilities database (https://www.acraccreditation.org/accredited-facility-search) .

Which test, procedure or treatment is best for me?

- *Breast Imaging of Pregnant and Lactating Women (https://www.radiologyinfo.org/en/info/acs-breast-imaging-pregnant-lactating)*
- *Breast Implant Evaluation (https://www.radiologyinfo.org/en/info/acs-breast-implant-evaluation)*

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