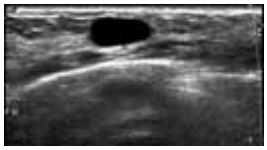
Ultrasound - Breast

What is Ultrasound Imaging of the Breast?



Ultrasound imaging, also called ultrasound scanning or sonography, involves exposing part of the body to high-frequency sound waves to produce pictures of the inside of the body. Ultrasound exams do not use ionizing radiation (as used in x-rays). Because ultrasound images are captured in real-time, they can show the structure and movement of the body's internal organs, as well as blood flowing through blood vessels.

Ultrasound imaging is a noninvasive medical test that helps physicians diagnose and treat medical conditions.

Ultrasound imaging of the breast produces a picture of the internal structures of the breast.

Doppler ultrasound is a special ultrasound technique that evaluates blood flow through a blood vessel, including the body's major arteries and veins in the abdomen, arms, legs and neck.

During a breast ultrasound examination the sonographer or physician performing the test 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**
  The primary use of breast ultrasound today is to help diagnose breast abnormalities detected by a physician during a physical exam (such as a lump or bloody or spontaneous clear nipple discharge) and to characterize potential abnormalities seen on mammography.

  Ultrasound imaging can help to determine if an abnormality is solid (which may be a non-cancerous lump of tissue or a cancerous tumor) or fluid-filled (such as a benign cyst) or both cystic and solid. Ultrasound can also help show additional features of the abnormal area.

  Doppler ultrasound is used to assess blood supply in breast lesions.

- **Supplemental Breast Cancer Screening**
  Mammography 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 is a lot of glandular tissue and less fat,

many cancers can be hard to see on mammography.

Many studies have shown that ultrasound and magnetic resonance imaging (MRI) can help supplement mammography by detecting small breast cancers that may not be visible with mammography. MRI is more sensitive than ultrasound in depicting breast cancer, but not all women can tolerate contrast-enhanced breast MRI. MRI is not offered to all women who may benefit from it. Screening ultrasound can be an alternative to MRI for women who cannot tolerate MRI. If screening MRI is performed, then screening ultrasound is not needed, though ultrasound may be used to characterize and biopsy abnormalities seen on MRI. When ultrasound is used for screening, many abnormalities are seen which may require biopsy but are not cancer (false positives), and this limits its cost effectiveness.

Ultrasound can be offered as a screening tool for women who:

- are at high risk for breast cancer and unable to tolerate an MRI examination.
- are at intermediate risk for breast cancer based on family history, personal history of breast cancer, or prior biopsy showing an abnormal result.
- have dense breasts.
- have silicone breast implants and very little tissue can be included on the mammogram.
- are pregnant or should not to be exposed to x-rays (which is necessary for a mammogram).

Several types of automated devices have been developed for whole breast ultrasound. Further evaluation of such approaches is needed.

- **Ultrasound-guided Breast Biopsy**
  When an ultrasound examination reveals a suspicious breast abnormality, a physician may choose to perform an ultrasound-guided biopsy. Because ultrasound provides real-time images, it is often used to guide biopsy procedures.

  For more information on this procedure, please refer to the Ultrasound-guided Breast Biopsy page (www.RadiologyInfo.org/en/info.cfm?pg=breastbius).

How should I prepare?

You will be asked to undress from the waist up and to wear a gown during the procedure.

What does the equipment look like?

Ultrasound scanners consist of a console containing a computer and electronics, a video display screen and a transducer that is used to scan the body and blood vessels. The transducer is a small hand-held device that resembles a microphone, attached to the scanner by a cord. The transducer sends out high frequency sound waves into the body and then listens for the returning echoes from the tissues in the body. The principles are similar to sonar used by boats and submarines.

The ultrasound image is immediately visible on a nearby video display screen

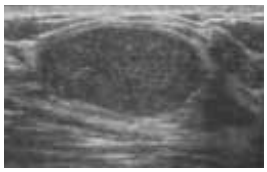
that looks much like a computer or television monitor. The image is created based on the amplitude (strength), frequency and time it takes for the sound signal to return from the patient to the transducer and the type of body structure the sound travels through.

How does the procedure work?

Ultrasound imaging is based on the same principles involved in the sonar used by bats, ships and fishermen. 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 and its size, shape, and consistency (whether the object is solid, filled with fluid, or both).

In medicine, ultrasound is used to detect changes in appearance of organs, tissues, and vessels or detect abnormal masses, such as tumors.

In an ultrasound examination, a transducer both sends the sound waves and records the echoing waves. When the transducer is pressed against the skin, it directs small pulses of inaudible, high-frequency sound waves into the body. As the sound waves bounce off of internal organs, fluids and tissues, the sensitive microphone in the transducer records tiny changes in the sound's pitch and direction. These signature waves are instantly measured and displayed by a computer, which in turn creates a real-time picture on the monitor. One or more frames of the moving pictures are typically captured as still images.



Doppler ultrasound, a special application of ultrasound, 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 with your arm raised above your head on the examining table.

A clear water-based gel is applied to the area of the body being studied to help the transducer make secure contact with the body and eliminate air pockets between the transducer and the skin. The sonographer (ultrasound technologist) or radiologist then presses the transducer firmly against the skin in various locations, sweeping over the area of interest or angling the sound beam from a farther location to better see an area of concern.

Doppler sonography is performed using the same transducer.

When the examination is complete, the patient may be asked to dress and wait while the ultrasound images are reviewed. However, the sonographer or radiologist is often able to review the ultrasound images in real-time as they are acquired and the patient can be released immediately.

This ultrasound examination is usually completed within 30 minutes.

What will I experience during and after the procedure?

Most ultrasound examinations are painless, fast and easy.

After you are positioned on the examination table, the radiologist or sonographer will apply some warm water-based gel on your skin and then place the transducer firmly against your body, moving it back and forth over the area of interest until the desired images are captured. There is usually no discomfort from pressure as the transducer is pressed against the area being examined.

If scanning is performed over an area of tenderness, you may feel pressure or minor pain from the transducer.

If a Doppler ultrasound study is performed, you may actually hear pulse-like sounds that change in pitch as the blood flow is monitored and measured.

You may be asked to change positions during the exam.

Once the imaging is complete, the gel will be wiped off your skin.

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 physician specifically trained to supervise and interpret radiology examinations, will analyze the images and send a signed report to your primary care physician or the physician who referred you for the exam, who will share the results with you. In some cases the radiologist may discuss results with you at the conclusion of your examination.

What are the benefits vs. risks?

Benefits

- Most ultrasound scanning is noninvasive (no needles or injections) and is usually painless.
- Ultrasound is widely available, easy-to-use and less expensive than other imaging methods.
- Ultrasound imaging does not use any ionizing 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, making it a good tool for guiding minimally invasive procedures such as needle biopsies and needle 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, physicians 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 sufficient to determine whether an area of concern needs a biopsy or not.

Risks

- For standard diagnostic ultrasound there are no known harmful effects on humans.
- Interpretation of a breast ultrasound examination may lead to additional procedures such as follow-up ultrasound and/or aspiration or biopsy. Many of the areas thought to be of concern only on ultrasound turn out to be non-cancerous.

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 and careful clinical breast examination.
- Many cancers are not visible on ultrasound.
- Biopsy may be recommended to determine if a suspicious abnormality is cancer or not.
- Many calcifications seen on mammography cannot be seen on ultrasound. Some early breast cancers only show up as calcifications on mammography.
- Many facilities do not offer ultrasound screening, 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 .

Additional Information and Resources

RadiologyInfo

Breast Cancer:
www.RadiologyInfo.org/en/info.cfm?PG=breastcancer

RTAnswers.org

Radiation Therapy for Breast Cancer:
www.rtanswers.com/treatmentinformation/cancertypes/breast/index.aspx

particular purpose. All information is provided "as is" without express or implied warranty.

Please visit the RadiologyInfo Web site at **http://www.radiologyinfo.org** to view or download the latest information.

Note: Images may be shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

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