



## Ultrasound - Thyroid

Thyroid ultrasound uses sound waves to produce pictures of the thyroid gland within the neck. It does not use ionizing radiation and is commonly used to evaluate lumps or nodules found during a routine physical or other imaging exam.

This procedure requires little to no special preparation. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.



## What is an Ultrasound of the Thyroid?

Ultrasound is safe and painless, and produces pictures of the inside of the body using sound waves. Ultrasound imaging, also called ultrasound scanning or sonography, involves the use of a small transducer (probe) and ultrasound gel placed directly on the skin. High-frequency sound waves are transmitted from the probe through the gel into the body. The transducer collects the sounds that bounce back and a computer then uses those sound waves to create an image. Ultrasound examinations do not use ionizing radiation (as used in x-rays), thus there is no radiation exposure to the patient. 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.

An ultrasound of the thyroid produces pictures of the thyroid gland and the adjacent structures in the neck. The thyroid gland is located in front of the neck just above the collar bones and is shaped like a butterfly, with one lobe on either side of the neck connected by a narrow band of tissue. It is one of nine endocrine glands located throughout the body that make and send hormones into the bloodstream.

The thyroid gland makes the thyroid hormone, which helps to regulate a variety of body functions including how fast the heart beats. It is very common for patchy areas or nodules to develop in the thyroid that may or may not be felt on the skin surface. About five to 10 percent of adults will have lumps in their thyroid that a doctor can identify on an exam. These are called palpable nodules. Ultrasound is very

sensitive and shows many nodules that cannot be felt. In some age groups, nodules are seen on ultrasound in as many as 70 percent of adults. The vast majority of these are benign regions of thyroid tissue that pose no health risk. The minority of these are true tumors of the thyroid and may require further diagnosis or treatment.

## What are some common uses of the procedure?

An ultrasound of the thyroid is typically used:

- to determine if a lump in the neck is arising from the thyroid or an adjacent structure
- to analyze the appearance of thyroid nodules and determine if they are the more common benign nodule or if the nodule has features that require a biopsy. If biopsy is required, ultrasound-guided fine needle aspiration can help improve accuracy of the biopsy.
- to look for additional nodules in patients with one or more nodules felt on physical exam
- to see if a thyroid nodule has substantially grown over time

Because ultrasound provides real-time images, images that are renewed continuously, it also can be used to guide procedures such as needle biopsies, in which needles are used to extract sample cells from an abnormal area for laboratory testing. Ultrasound may also be used to guide the insertion of a catheter or other drainage device and helps assure safe and accurate placement and fluid drainage for diagnosis and/or relief of patient discomfort.

## How should I prepare?

You should wear comfortable, loose-fitting clothing for your ultrasound exam. You may need to remove all clothing and jewelry in the area to be examined.

You may be asked to wear a gown during the procedure.

No other preparation is required.

Ultrasound examinations are very sensitive to motion, and an active or crying child can prolong the examination process. To ensure a smooth experience, it often helps to explain the procedure to the child prior to the exam. Bringing books, small toys, music or games can help to distract the child and make the time pass quickly. The ultrasound exam room may have a television. Feel free to ask for your child's favorite channel.

## 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 do the scanning. The transducer is a small hand-held device that resembles a microphone, attached to the scanner by a cord. Some exams may use different transducers (with different capabilities) during a single exam. The transducer sends out high-frequency sound waves

(that the human ear cannot hear) 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 video display screen that looks like a computer or television monitor. The image is created based on the amplitude (loudness), frequency (pitch) and time it takes for the ultrasound signal to return from the area within the patient that is being examined to the transducer (the device placed on the patient's skin to send and receive the returning sound waves), as well as the type of body structure and composition of body tissue through which the sound travels. A small amount of gel is put on the skin to allow the sound waves to travel from the transducer to the examined area within the body and then back again. Ultrasound is an excellent modality for some areas of the body while other areas, especially air-filled lungs, are poorly suited for ultrasound.

## 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 as well as the object's size, shape and consistency (whether the object is solid or filled with fluid).

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

In an ultrasound examination, a transducer both sends the sound waves into the body and receives 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 internal organs, fluids and tissues, the sensitive receiver 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. Short video loops of the images may also be saved.

## How is the procedure performed?

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

A pillow may be placed behind the shoulders to extend the area to be scanned for a thyroid ultrasound exam. This is especially important for a small child with very little space between the chin and the chest.

After you are positioned on the examination table, the radiologist (a physician specifically trained to supervise and interpret radiology examinations) or sonographer will apply a warm water-based gel to the area of the body being studied. The gel will help the transducer make secure contact with the body and eliminate air pockets between the transducer and the skin that can block the sound waves from passing into your body. The transducer is placed on the body and moved 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. However, if scanning is performed over an area of tenderness, you may feel pressure or minor pain from the transducer.

Once the imaging is complete, the clear ultrasound gel will be wiped off your skin. Any portions that are not wiped off will dry quickly. The ultrasound gel does not usually stain or discolor clothing.

## What will I experience during and after the procedure?

Ultrasound examinations are painless and easily tolerated by most patients.

An ultrasound of the thyroid is usually completed within 30 minutes.

During the exam, you may need to extend your neck to help the sonographer (technologist) examine your thyroid with ultrasound. If you suffer from neck pain, inform the technologist so that they can help situate you in a comfortable position for the exam.

When the examination is complete, you may be asked to dress and wait while the ultrasound images are reviewed.

After an ultrasound examination, 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 to the physician or other healthcare provider who requested the exam. Usually, the referring physician or health care provider will share the results with you. In some cases, the radiologist may discuss results with you at the conclusion of your examination.

Follow-up examinations may be necessary. Your doctor will explain the exact reason why another exam is requested. Sometimes a follow-up exam is done because a potential abnormality needs further evaluation with additional views or a special imaging technique. A follow-up examination may also be necessary so that any change in a known abnormality can be monitored over time. Follow-up examinations are sometimes the best way to see if treatment is working or if a finding is stable or changed over time.

## 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 other imaging methods.
- Ultrasound imaging is extremely safe and 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 fluid aspiration.

## Risks

- For standard diagnostic ultrasound, there are no known harmful effects on humans.

## What are the limitations of an Ultrasound of the Thyroid?

If one or more nodules are detected within the thyroid gland, the radiologist will examine the features of the nodules. Some features are strongly suggestive that a nodule is benign nature, and some raise concern that the nodule may be a true tumor. In other cases, the radiologist cannot distinguish between benign and malignant lumps with complete certainty. A fine needle biopsy and review of tissue under a microscope may be recommended for further evaluation, but in some cases surveillance and a repeat sonogram after a few months looking for stability may suffice.

It is not possible to determine thyroid function—that is, whether the thyroid gland is underactive, overactive, or normal—with ultrasound. For that determination, your doctor may order a blood test or a radioactive iodine uptake test.

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