Overview

Diagnostic ultrasound, also called sonography or diagnostic medical sonography, is an imaging method that uses sound waves to produce images of structures within your body. The images can provide valuable information for diagnosing and directing treatment for a variety of diseases and conditions.

Most ultrasound examinations are done using an ultrasound device outside your body, though some involve placing a small device inside your body.

Why it's done

Ultrasound is used for many reasons, including to:

View the uterus and ovaries during pregnancy and monitor the developing baby's health

Diagnose gallbladder disease

Evaluate blood flow

Guide a needle for biopsy or tumor treatment

Examine a breast lump

Check the thyroid gland

Find genital and prostate problems

Assess joint inflammation (synovitis)

Evaluate metabolic bone disease

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Risks

Diagnostic ultrasound is a safe procedure that uses low-power sound waves. There are no known risks.

Ultrasound is a valuable tool, but it has limitations. Sound waves don't travel well through air or bone, so ultrasound isn't effective at imaging body parts that have gas in them or are hidden by bone, such as the lungs or head. Ultrasound may also be unable to see objects that are located very deep in the human body. To view these areas, your health care provider may order other imaging tests, such as CT or MRI scans or X-rays.

How you prepare

Most ultrasound exams require no preparation. However, there are a few exceptions:

For some scans, such as a gallbladder ultrasound, your care provider may ask that you not eat or drink for a certain period of time before the exam.

Others, such as a pelvic ultrasound, may require a full bladder. Your doctor will let you know how much water you need to drink before the exam. Do not urinate until the exam is done.

Young children may need additional preparation. When scheduling an ultrasound for yourself or your child, ask your doctor if there are any specific instructions you'll need to follow.

Clothing and personal items

Wear loose clothing to your ultrasound appointment. You may be asked to remove jewelry during your ultrasound, so it's a good idea to leave any valuables at home.

What you can expect

Before the procedure

Ultrasound of breast cyst

Enlarge image

Close

Ultrasound of breast cyst

Ultrasound of breast cyst

This ultrasound shows a breast cyst.

Ultrasound of liver tumor

Enlarge image

Close

Ultrasound of liver tumor

Ultrasound of liver tumor

An ultrasound uses sound waves to create an image. This ultrasound shows a noncancerous (benign) liver tumor.

Ultrasound of gallstones

Enlarge image

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Ultrasound of gallstones

Ultrasound of gallstones

This ultrasound shows gallstones in the gallbladder.

Ultrasound of needle-guided procedure

Enlarge image

Close

Ultrasound of needle-guided procedure

Ultrasound of needle-guided procedure

These images show how ultrasound can help guide a needle into a tumor (left), where material is injected (right) to destroy tumor cells.

Transvaginal ultrasound

Enlarge image

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Transvaginal ultrasound

Transvaginal ultrasound

During a transvaginal ultrasound, you lie on an exam table while a wandlike device, known as a transducer, is placed into the vagina. Sound waves from the transducer create images of the uterus, ovaries and fallopian tubes.

Before your ultrasound begins, you may be asked to do the following:

Remove any jewelry from the area being examined.

Remove or reposition some or all of your clothing.

Change into a gown.

You'll be asked to lie on an examination table.

During the procedure

Gel is applied to your skin over the area being examined. It helps prevent air pockets, which can block the sound waves that create the images. This safe, water-based gel is easy to remove from skin and, if needed, clothing.

A trained technician (sonographer) presses a small, hand-held device (transducer) against the area being studied and moves it as needed to capture the images. The transducer sends sound waves into your body, collects the ones that bounce back and sends them to a computer, which creates the images.

Sometimes, ultrasounds are done inside your body. In this case, the transducer is attached to a probe that's inserted into a natural opening in your body. Examples include:

Transesophageal echocardiogram.

A transducer, inserted into the esophagus, obtains heart images. It's usually done while under sedation.

Transrectal ultrasound.

This test creates images of the prostate by placing a special transducer into the rectum.

Transvaginal ultrasound.

A special transducer is gently inserted into the vagina to look at the uterus and ovaries.

Ultrasound is usually painless. However, you may experience mild discomfort as the sonographer guides the transducer over your body, especially if you're required to have a full bladder, or inserts it into your body.

A typical ultrasound exam takes from 30 minutes to an hour.

Results

When your exam is complete, a doctor trained to interpret imaging studies (radiologist) analyzes the images and sends a report to your doctor. Your doctor will share the results with you.

You should be able to return to normal activities immediately after an ultrasound.

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Andreas A, et al., eds. Grainger & Allison's Diagnostic Radiology: A Textbook of Medical Imaging. 7th ed. Elsevier; 2021. https://www.clinicalkey.com. Accessed Jan. 28, 2022.

General ultrasound. RadiologyInfo.org. https://www.radiologyinfo.org/en/info/genus. Accessed Jan. 28, 2022.

McKenzie GA (expert opinion). Mayo Clinic. Feb. 1, 2022.

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Tracheostomy

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Tracheostomy

Tracheostomy

A tracheostomy is a surgically created hole (stoma) in your windpipe (trachea) that provides an alternative airway for breathing. A tracheostomy tube is inserted through the hole and secured in place with a strap around your neck.

Tracheostomy (tray-key-OS-tuh-me) is a hole that surgeons make through the front of the neck and into the windpipe (trachea). A tracheostomy tube is placed into the hole to keep it open for breathing. The term for the surgical procedure to create this opening is tracheotomy.

A tracheostomy provides an air passage to help you breathe when the usual route for breathing is somehow blocked or reduced. A tracheostomy is often needed when health problems require long-term use of a machine (ventilator) to help you breathe. In rare cases, an emergency tracheotomy is performed when the airway is suddenly blocked, such as after a traumatic injury to the face or neck.

When a tracheostomy is no longer needed, it's allowed to heal shut or is surgically closed. For some people, a tracheostomy is permanent.

Mayo Clinic's approach

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Why it's done

Situations that may call for a tracheostomy include:

Medical conditions that make it necessary to use a breathing machine (ventilator) for an extended period, usually more than one or two weeks

Medical conditions that block or narrow your airway, such as vocal cord paralysis or throat cancer

Paralysis, neurological problems or other conditions that make it difficult to cough up secretions from your throat and require direct suctioning of the windpipe (trachea) to clear your airway

Preparation for major head or neck surgery to assist breathing during recovery

Severe trauma to the head or neck that obstructs breathing

Other emergency situations when breathing is obstructed and emergency personnel can't put a breathing tube through your mouth and into your trachea

Emergency care

Most tracheotomies are performed in a hospital setting. However, in the case of an emergency, it may be necessary to create a hole in a person's throat when outside of a hospital, such as at the scene of an accident.

Emergency tracheotomies are difficult to perform and have an increased risk of complications. A related and somewhat less risky procedure used in emergency care is a cricothyrotomy (kry-koe-thie-ROT-uh-me). This procedure creates a hole directly into the voice box (larynx) at a site immediately below the Adam's apple (thyroid cartilage).

Once a person is transferred to a hospital and stabilized, a cricothyrotomy is replaced by a tracheostomy if there's a need for long-term breathing assistance.

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Risks

Tracheostomies are generally safe, but they do have risks. Some complications are particularly likely during or shortly after surgery. The risk of such problems greatly increases when the tracheotomy is performed as an emergency procedure.

Immediate complications include:

Bleeding

Damage to the trachea, thyroid gland or nerves in the neck

Misplacement or displacement of the tracheostomy tube

Air trapped in tissue under the skin of the neck (subcutaneous emphysema), which can cause breathing problems and damage to the trachea or food pipe (esophagus)

Buildup of air between the chest wall and lungs (pneumothorax), which causes pain, breathing problems or lung collapse

A collection of blood (hematoma), which may form in the neck and compress the trachea, causing breathing problems

Long-term complications are more likely the longer a tracheostomy is in place. These problems include:

Obstruction of the tracheostomy tube

Displacement of the tracheostomy tube from the trachea

Damage, scarring or narrowing of the trachea

Development of an abnormal passage between the trachea and the esophagus (tracheoesophageal fistula), which can increase the risk of fluids or food entering the lungs

Development of a passage between the trachea and the large artery that supplies blood to the right arm and right side of the head and neck (tracheoinnominate fistula), which can result in life-threatening bleeding

Infection around the tracheostomy or infection in the trachea and bronchial tubes (tracheobronchitis) and lungs (pneumonia)

If you still need a tracheostomy after you've left the hospital, you'll need to keep regularly scheduled appointments for monitoring possible complications. You'll also receive instructions about when you should call your doctor about problems, such as:

Bleeding at the tracheostomy site or from the trachea

Difficulty breathing through the tube

Pain or a change in comfort level

Redness or swelling around the tracheostomy

A change in the position of your tracheostomy tube

How you prepare

How you prepare for a tracheostomy depends on the type of procedure you'll undergo. If you'll be receiving general anesthesia, your doctor may ask that you avoid eating and drinking for several hours before your procedure. You may also be asked to stop certain medications.

Plan for your hospital stay

After the tracheostomy procedure, you'll likely stay in the hospital for several days as your body heals. If possible, plan ahead for your hospital stay by bringing:

Comfortable clothing, such as pajamas, a robe and slippers

Personal care items, such as your toothbrush and shaving supplies

Entertainment to help you pass the time, such as books, magazines or games

A communication method, such as a pencil and a pad of paper, a smartphone, or a computer, as you'll be unable to talk at first

What you can expect

During the procedure

A tracheotomy is most commonly performed in an operating room with general anesthesia, which makes you unaware of the surgical procedure. A local anesthetic to numb the neck and throat is

used if the surgeon is worried about the airway being compromised from general anesthesia or if the procedure is being done in a hospital room rather than an operating room.

The type of procedure you undergo depends on why you need a tracheostomy and whether the procedure was planned. There are essentially two options:

Surgical tracheotomy

can be performed in an operating room or in a hospital room. The surgeon usually makes a horizontal incision through the skin at the lower part of the front of your neck. The surrounding muscles are carefully pulled back and a small portion of the thyroid gland is cut, exposing the windpipe (trachea). At a specific spot on your windpipe near the base of your neck, the surgeon creates a tracheostomy hole.

Minimally invasive tracheotomy (percutaneous tracheotomy)

is typically performed in a hospital room. The doctor makes a small incision near the base of the front of the neck. A special lens is fed through the mouth so that the surgeon can view the inside of the throat. Using this view of the throat, the surgeon guides a needle into the windpipe to create the tracheostomy hole, then expands it to the appropriate size for the tube.

For both procedures, the surgeon inserts a tracheostomy tube into the hole. A neck strap attached to the face plate of the tube keeps it from slipping out of the hole, and temporary sutures can be used to secure the faceplate to the skin of your neck.

After the procedure

You'll likely spend several days in the hospital as your body heals. During that time, you'll learn skills necessary for maintaining and coping with your tracheostomy:

Caring for your tracheostomy tube.

A nurse will teach you how to clean and change your tracheostomy tube to help prevent infection and reduce the risk of complications. You'll continue to do this as long as you have a tracheostomy.

Speaking.

Generally, a tracheostomy prevents speaking because exhaled air goes out the tracheostomy opening rather than up through your voice box. But there are devices and techniques for redirecting airflow enough to produce speech. Depending on the type of tube, width of your trachea and condition of your voice box, you may be able to speak with the tube in place. If necessary, a speech therapist or a nurse trained in tracheostomy care can suggest options for communicating and help you learn to use your voice again.

Eating.

While you're healing, swallowing will be difficult. You'll receive nutrients through an intravenous (IV) line inserted into a vein in your body, a feeding tube that passes through your mouth or nose, or a tube inserted directly into your stomach. When you're ready to eat again, you may need to work with a speech therapist, who can help you regain the muscle strength and coordination needed for swallowing.

Coping with dry air.

The air you breathe will be much drier because it no longer passes through your moist nose and throat before reaching your lungs. This can cause irritation, coughing and excess mucus coming out of the tracheostomy. Putting small amounts of saline directly into the tracheostomy tube, as directed, may help loosen secretions. Or a saline nebulizer treatment may help. A device called a heat and moisture exchanger captures moisture from the air you exhale and humidifies the air you inhale. A humidifier or vaporizer adds moisture to the air in a room.

Managing other effects.

Your health care team will show you ways to care for other common effects related to having a tracheostomy. For example, you may learn to use a suction machine to help you clear secretions from your throat or airway.

Results

In most cases, a tracheostomy is temporary, providing an alternative breathing route until other medical issues are resolved. If you need to remain connected to a ventilator indefinitely, the tracheostomy is often the best permanent solution.

Your health care team will help you determine when it's appropriate to remove the tracheostomy tube. The hole may close and heal on its own, or it can be closed surgically.

By Mayo Clinic Staff

Tracheostomy care at Mayo Clinic

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Show references

Brown AY. Allscripts EPSi. Mayo Clinic. Aug. 28, 2019.

Tracheostomy. National Heart, Lung, and Blood Institute. https://www.nhlbi.nih.gov/health-topics/tracheostomy. Accessed Sept. 23, 2019.

Tracheostomy and ventilator dependence. American Speech-Language-Hearing Association. https://www.asha.org/public/speech/disorders/tracheostomies/. Accessed Sept. 19, 2019.

Surgical airway. Merck Manual Professional Version. https://www.merckmanuals.com/professional/critical-care-medicine/respiratory-arrest/surgical-airway#. Accessed Sept. 23, 2019.

Roberts JR, et al., eds. Tracheostomy care. In: Roberts and Hedges' Clinical Procedures in Emergency Medicine and Acute Care. 7th ed. Elsevier; 2019. https://www.clinicalkey.com. Accessed Sept. 23, 2019.

Patton J. Tracheostomy care. British Journal of Nursing. 2019; doi:10.12968/bjon.2019.28.16.1060.

Mitchell RB, et al. Clinical consensus statement: Tracheostomy care. Otolaryngology — Head and Neck Surgery. 2013; doi:10.1177/0194599812460376.

Landsberg JW. Pulmonary and critical care pearls. In: Clinical Practice Manual for Pulmonary and Critical Care Medicine. Elsevier; 2018. https://www.clinicalkey.com. Accessed Sept. 25, 2019.

Rashid AO, et al. Percutaneous tracheostomy: A comprehensive review. Journal of Thoracic Disease. 2017; doi:10.21037/jtd.2017.09.33.

Moore EJ (expert opinion). Mayo Clinic. Oct. 1, 2019.

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